STRESS AND WELL-BEING IN BREAST CANCER SURVIVORS: THE INFLUENCE OF PERSONALITY, SOCIO-DEMOGRAPHICS, CANCER-RELATED CHARACTERISTICS, AND PHYSICAL ACTIVITY LEVELS

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ABSTRACT

Cancer is now considered to be one of the most prevalent chronic diseases in Canada, with breast cancer emerging as the most common type of cancer diagnosed in Canadian women (Canadian-Cancer-Society, 2009). As breast cancer patients move to long-term survivorship, they face new challenges that extend beyond end of treatment (Deimling et al, 2003) which can have direct influences on quality of life (Ferrell et al., 1995). Previous research has often failed to use stress frameworks to examine stress relationships faced by breast cancer survivors (BCS) and has seldom investigated the effect of specific cancer-related stressors and their meaning on quality of life. To address these limitations, the current study investigated the influence of stress-related variables on quality of life of BCS post-treatment using Lazarus' framework. Moreover, the direct and indirect effects of individual characteristics, including physical activity and personality trait, as well as cancer-related characteristics on stress-related variables were investigated. The final sample included 365 women who had been diagnosed with breast cancer, had completed treatment, and were between the age of 29 and 90 years (M_{age} = 61.58, *SD* = 11.36). Structural equation modeling techniques were used to test a hypothesized model based on Lazarus' framework. The measurement and structural models testing the most global hypothesized model showed good model fit (RMSEA < .08, CFI > .90, TLI > .90), whereby direct and indirect effects of stressors, physical activity, and optimism on quality of life were shown. Together, these constructs explained 61% and 70% of the variance in physical and mental health respectively, highlighting the direct effect of stressors on quality of life above and beyond the role of cognitive appraisal. Experiencing more stressors was significantly associated with reporting lower levels of quality of life. Furthermore, personality had a direct effect on

mental health whereas being physically active was positively associated with physical health. Overall, findings provided partial support for Lazarus' model and highlighted some of the potential benefits of physical activity for cancer survivors. These results could be used to guide the design of interventions aimed at increasing physical and mental health in breast cancer survivors.

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DEDICATION

To family and friends who helped me along the way. Thank you for helping me become the person I am today.

CHAPTER 1: INTRODUCTION

1.1 Breast Cancer

Cancer is now considered to be one of the most prevalent chronic diseases in Canada, with breast cancer emerging as the most common type of cancer diagnosed in Canadian women (Canadian-Cancer-Society, 2009). It strikes women from all cultural and socioeconomic backgrounds from a wide range of ages. It may be viewed as a major stressful life event characterized by a number of recurrent stressful situations that pose serious challenges to adaptation (de Ridder, Schreurs, & Bensing, 1998). As breast cancer patients move to long-term survivorship (i.e., 5 years post-treatment), they will constantly face new challenges associated with diagnosis and treatment (e.g., fatigue, weight gain, and sexual difficulties) that extend far beyond the end of treatment (Deimling, Kahana, Bowman, & Schaefer, 2002) and that will directly influence their quality of life (Ferrell, Hassey Dow, & Grant, 1995).

This paper will focus on the influence of stress-related variables and physical activity on quality of life of breast cancer survivors post-treatment. First, a general review of quality of life research with cancer survivors will be presented and will be linked to current research with breast cancer survivors specifically. Next, stress and coping literature in psychosocial oncology research will be reviewed and links between specific cancer-related stressors, the appraisals of those stressors, and quality of life will be highlighted. It will be argued that those two components of the stress process are likely to affect one's quality of life directly and indirectly. The role of physical activity in the stress process will also be examined. This paper will look beyond the already known physical and psychological benefits associated with physical activity for populations of cancer survivors and will try to identify relationships with stress-related constructs.

Finally, potential moderators/mediators (e.g., physical activity, personal and cancer-related characteristics) will be examined and their role in the stress process will be determined.

1.1.1 Quality of Life

Quality of life has received a lot of attention in the literature. While researchers recognize the multidimensionality of this construct, they are still in disagreement regarding the specific nature of the dimensions that should be included in a quality of life model. Nevertheless, most researchers usually agree that four out of the five following dimensions are important quality of life domains: (i) physical, (ii)(Kornblith et al.) psychological, (iii) social, (iv) somatic/disease and treatment-related symptoms, and (v) spiritual (Fayers & Machin, 2000).

While the nature and number of the quality of life domains varies across studies, most of these domains have been shown to be directly influenced by personal characteristics, as well as by cancer-related distress/characteristics often reported by patients (Bower et al., 2000; Dow, Ferrell, Leigh, Ly, & Gulasekaram, 1996). For example, women who are not Caucasian or survivors who did not have a partner at diagnosis have been shown to report lower levels of psychosocial quality of life (Carver, Smith, Petronis, & Antoni, 2006). Furthermore, undergoing adjuvant treatments such as chemotherapy has been associated with lower levels of sexual and cognitive functions (Broeckel, Thors, Jacobsen, Small, & Cox, 2002; Phillips, 2003). These relationships have also been found in people suffering from a variety of chronic diseases (Smith, Avis, & Assmann, 1999), including different types of cancer, and can be generalizable, more specifically, to breast cancer survivors.

In psychosocial oncology research, one definition of quality of life encompasses the individual's sense of well-being as well as cancer-related components. Quality of life is defined as the state of well-being that is composed of two components: the ability to perform everyday activities that reflect physical, psychological, and social well-being; and patient satisfaction with levels of functioning and control of the disease (Avis et al., 2005). Regardless of the definition used, quality of life research in psychosocial oncology research usually serves one of three functions: (i) discrimination (i.e., comparison between groups with no well defined norm/standard); (ii) prediction (i.e., comparison between groups when a norm/standard is available); (iii) evaluation (i.e., to assess progression in quality of life longitudinally).

To fulfill at least one of these three functions, two different types of quality of life measures have been previously used in the literature: cancer-specific quality of life instrument (e.g., Avis et al., 2005; Cella, 1994) and health profiles such as the Medical Outcome Survey SF-36 (Ware, Kosinski, & Gandek, 2000) which assess general domains of quality of life. Although cancer-specific instruments are necessary to determine the immediate impact of a cancer diagnosis or treatment on one's quality of life, items in these scales can often be confounded with stressful events or stressors often reported by cancer patients (e.g., worried that family members may have cancer genes, financial problems from cost of treatment, issues with hair loss due to treatment). Furthermore, these instruments may be more appropriate for survivors who are in the midst of treatment or have just completed their treatment as they are more likely to experience side effects. These challenges, albeit relevant during or following treatment, may not have a major effect on one's quality of life once the five-year survival period has been

reached. Hence, general quality of life instruments (e.g., MOS SF-36) may provide valuable information and allow comparison between long term quality of life of cancer patients and healthy individuals.

Examining quality of life in long term cancer survivors is necessary because long-term survivors can be faced with treatment side effects that may linger for years or new cancer-related concerns can develop over time (Ferrell et al., 1995). These concerns have been shown to have a direct influence on quality of life (Bloom, Stewart, Chang, & Banks, 2004; Carver et al., 2006; Gotay, Holup, & Pagano, 2002). Studies have also identified other threats to survivors' physical and psychological well-being that seem to be more prevalent during the survivorship phase.

1.1.1.1. Individual and cancer-related differences

Personal and cancer-related characteristics of breast cancer survivors such as age and type of treatment have been linked to reduced quality of life (Carver, 2006; King, Kenny, & Shiell, 2000; Wenzel et al., 1999). Overall, younger women report lower levels of emotional well-being shortly after the end of treatment compared to older women (Wenzel et al., 1999) whereas older survivors report impaired physical functioning (e.g., fatigue, muscle pain after exercising, and limited range of motion). The latter relationship may be influenced by age as aging is often associated with a reduction in range of motion and increased fatigue (Spirduso, Francis, & MacRae, 2005). Nevertheless, younger survivors seem to report more quality of life-related disruptions compared to their older counterparts once treatment is completed.

Chemotherapy treatment has been shown to impact specific areas of quality of life. Chemotherapy is an adjuvant therapy often used once the primary tumor has been

removed surgically in younger or healthier women. This type of treatment is often seen as a harsh treatment and has been associated with secondary effects such as hair loss and weakening of immune system (Wenzel et al., 1999). Other adjuvant treatments include radiation therapy or hormonal therapy, or a combination of these treatments. Nevertheless, the majority of research has examined the effect of chemotherapy on patients' quality of life. Such treatment is associated with increased experience of sexual dysfunction, poorer body image (i.e., psychological well-being), and more psychological distress compared to survivors treated by hormonal therapy and radiation (Wenzel et al., 1999). Other less intrusive treatments (e.g., lumpectomy, lymph or axillary node dissection) are less likely to have direct effects on any dimension of quality of life as these treatments are normally associated with minimal side effects.

The impact of other key individual differences such as ethnicity on quality of life of cancer patients has only received limited attention. Overall, these studies reported small or no significant differences in quality of life among various ethnicities (Ashing-Giwa, Ganz, & Petersen, 1999; Gotay et al., 2002). When differences were found, the trend was that Caucasian survivors reported higher scores of quality of life compared to African-American, Hispanic, and Asian women. However, it was shown that long-term breast cancer survivors of all ethnic backgrounds can look forward to favorable health-related quality of life as their scores seem to be extremely close to health perceptions of healthy, age-matched women when adaptive coping strategies are used to manage lingering stressors (Ashing-Giwa et al., 1999).

1.1.1.2. Physical activity

Along with the psychological and physical effects of breast cancer on quality of life, breast cancer can also restrict the ability to perform daily tasks and strongly limit the capacity and desire to be physically active. Engaging in the recommended amount of physical activity is a challenge often reported by cancer survivors. Research has shown that physical activity levels tend to decrease significantly following diagnosis but tend to return to original level once treatment is over (Irwin et al., 2003; Irwin et al., 2004). Nevertheless, the majority of cancer survivors are inactive following treatment (Blanchard et al., 2003; Courneya, Katzmarzyk, & Bacon, 2008) despite evidence that a variety of cancer-related outcomes are enhanced by activity in this population ÿÿournÿÿa & Friedenreich, 1999; Pinto, Clark, Maruyama, & Feder, 2003). It is important to recognize that survivors exercise as much for psychological health as they do for physical health (Courneya & Friedenreich, 1999). Exercise benefits found in cancer populations include reduced bodily pain, improved weight control, improved body image, and enhanced mood (Courneya, 2003; Kendall, Mahue-Giangreco, Carpenter, Ganz, & Bernstein, 2005; Pinto et al., 2003).

In contrast to the negative impact that cancer-related characteristics may have on quality of life, physical activity level could have a positive influence on some of the stressful situations faced by survivors and produce numerous benefits for them (e.g., improved quality of life) (Courneya & Friedenreich, 1999; McDonough, Sabiston, & Crocker, 2008). However, the relationship between activity and stress is complex. Physical activity has the potential to both reduce and create stress for breast cancer survivors (Deimling, Bowman, Sterns, Wagner, & Kahana, 2006; Mullens, McCaul,

Erickson, & Sandgren, 2004). It can be a stressor at times by increasing physical and social demands. It can also help individuals manage distress and gain physiological capacity to adapt to their new lives (Deimling et al., 2006; Mullens et al., 2004). Moreover, physical activity can be perceived as stressful not only by inactive survivors but also by women who intend to re-engage in physical activity following treatment (McKenzie, 1998; Pinto, Trunzo, Cram, & Frierson, 2003). Such perceptions could be attributed to the lost of physical strength or aerobic capacity often experienced by women upon completion of treatment. This side effect could lead one to question their ability to be physically active. The physical activity context could also contribute to the apprehension often experienced by breast cancer survivors who intend to become active again. For example, engaging in physical activity in a public environment (e.g., where other people can see them or interact with them) may be problematic for some survivors who underwent mastectomy without reconstructive surgery as survivors may be afraid to feel judge by other individuals and could be more self-conscious about their body (Sabiston, McDonough, & Crocker, 2007). It could also be the impression that breast cancer survivors might feel out of place in an environment where fit people are often over-represented. These are only a few factors that could potentially render the physical activity experience stressful for inactive survivors who are contemplating becoming active. To date, the survivors' appraisals of the many challenging cancer-related experiences, including physical activity, and their impact on psychosocial variables such as quality of life are not well understood and are rarely studied using a stress and coping framework.

1.2. Stress

The study of stress has been clouded by the use of various conceptualizations across and within health and psychology fields. One conceptualization defines stress as any force that, when applied, causes some significant form modification usually known as deformation or distortion (Lazarus, 1999). This term encompasses physical, psychological and social forces and pressures. Research based on this approach emphasized how socio-cultural factors (e.g., social class, age, gender, racism, and life changes) or physical factors (e.g., exercise) produce stress reactions. In this definition, stress is perceived as the antecedent of some effect and common levels of stressors ranging from the death of a spouse to special holidays are identified. In the cancer literature, stressors such as fatigue, weight gain, and fear of recurrence have been identified (Deimling et al., 2006; Hadd, McDonough, Sabiston, & Crocker, in press).

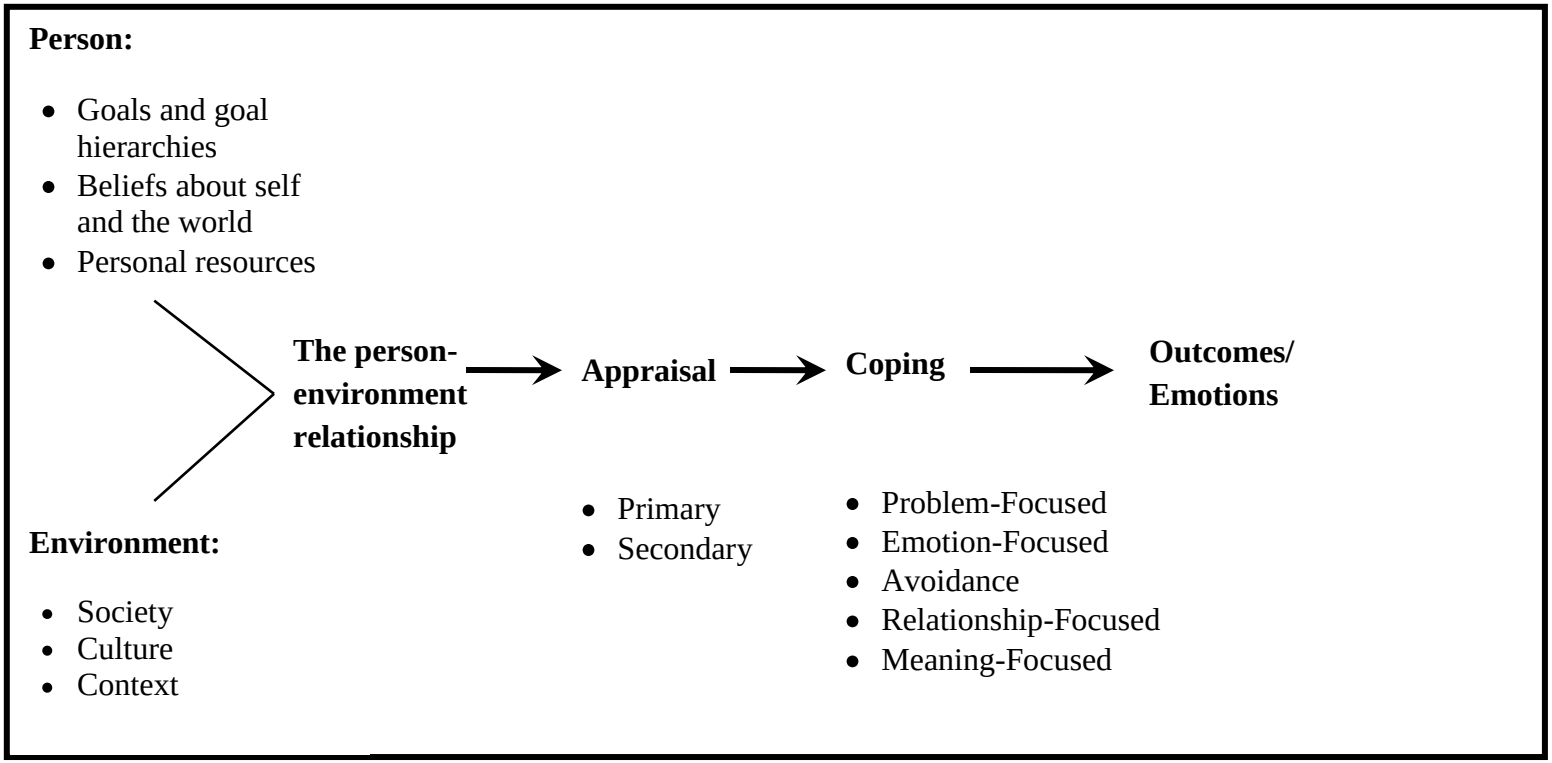
Stressor can also be conceptualized as the result of pressures or more specifically, the response or reaction to those pressures (Lazarus & Folkman, 1984). This response-oriented definition refers to a state of psychological tension produced by the physical, psychological, and social forces or pressures. This stress response includes physiological (e.g., increased plasma cortisol, epinephrine, increased metabolic activity, and neural excitability) and emotional reactions such as fear and anxiety (Lazarus & Folkman, 1984).

These two conceptualizations of stress have major limitations and do not adequately account for individual differences. According to these views, it is expected that individuals facing similar stressful events should 1) have similar perceptions of the events and 2) demonstrate similar physiological and emotional responses. To address the

limitations of the previous stress definitions, Lazarus (1984) suggested that stress was more accurately described as a dynamic transactional process.

1.3. Cognitive-Motivational-Relational Theory

Lazarus' (1991) stress, coping, and emotions model can be used to study stress related processes and coping in psycho-oncology research (Deimling et al., 2006; Mullens et al., 2004) (Figure 1.1). The Cognitive-Motivational-Relational model holds that stress processes are best understood by considering the transaction between a person and the environment and the meaning a person makes of the situation at hand. Environmental variables include demands, resources and constraints linked to a specific situation as well as the situation proximity, uncertainty, and duration. Internal personal variables, on the other hand, refer to a person's motives, skills, abilities, and beliefs about self and the world as well as goals importance and congruency. An appraisal of the transaction between these two types of variables will be made by each individual, which will dictate the different coping actions they will use, and their impact on coping outcomes (e.g., quality of life). Thus, Lazarus' model can help understand relevant stressors faced by breast cancer survivors, the appraisals of those stressors, and the subsequent impact on quality of life in breast cancer survivors.



Adapted from Lazarus, 1999

Figure 1.1: A revised model of stress and coping

1.3.1. Cognitive Appraisal

Lazarus' model has a strong cognitive-evaluative orientation where cognitive appraisal is a central concept in the stress-appraisal-coping paradigm (Lazarus & Folkman, 1984). Cognitive appraisal is defined as "the process of categorizing an encounter and its various facets with respect to its significance for well-being" (Lazarus & Folkman, 1984, p.31). Different levels of perceived stress might result from the appraisal process and may arise from transactions between a person and the environment - especially those transactions in which an individual's resources may not meet the perceived challenge or need (Aldwin, 1994).

Two types of appraisal occur while facing a stress encounter: primary and secondary appraisal. In primary appraisal, a person tries to determine whether the situation as it unfolds is relevant to his/her values, goal commitments, beliefs, and situational intentions. Secondary appraisal focuses on what can be done about the stressful person-environment relationship. An individual will assess his/her personal attributes (e.g., perceived control and coping efficacy) as well as coping resources available to alter the stressor(s). Even though Lazarus argues that situations are always changing, unsuccessful previous coping experiences in similar situations might affect the secondary appraisal by lowering perceived coping efficacy.

According to Lazarus, the two appraisals occur simultaneously and the ensuing decisions will directly influence the individual's actions. Demanding events can be appraised as harmful, threatening, or challenging (Lazarus, 1991). Perceptions of harm consists of damages that have already occurred (e.g., being diagnosed with breast cancer) while threat is perceived when there is the possibility that those damages may occur in the future (e.g., possibility of recurrence of the cancer). Finally, challenge, a more positive appraisal, occurs when individuals feel that they have the adequate resources to face the situations (e.g., a breast cancer survivor who decides to engage

in physical activity). Based on the type of appraisal made, the resulting coping actions can serve specific functions including withdrawing from the situation (avoidance coping), modifying and regulating emotions (emotion-focused coping), and changing the current situation (problem-focused coping) to modify any harm, threat or challenge originally perceived (Lazarus, 1991, 1999). Coping can also help making sense of the situation (meaning-focused coping) or manage interpersonal regulation function (relationship-focused coping) (Folkman, 2008; O'Brien & DeLongis, 1996).

1.3.2. Measurement of Appraisal

Despite the number of studies investigating stress and adaptation in various domains, Lazarus (1999) notes that the quantity of research on stress and coping is not matched by its quality. Furthermore, limited studies have tried to quantify the concept of cognitive appraisal. Several inventories used have measured appraisal as a response to cumulative total life stressors (Cohen, Kessler, & Underwood Gordon, 1995). Such methods may be problematic as people could focus on different types of stressor that occurred or may be occurring during the disease trajectory. Furthermore, these measures often provide limited information concerning the divergent appraisals (e.g., threat versus challenge, primary versus secondary) made by survivors. To address these limitations, coping researchers are now using specific items measuring primary and secondary appraisal (Bouchard, 2003; Chang, 1998). Items measuring the relevance of a stressor (e.g., how threatening is this situation for you?, how challenging is this situation?) and coping/personal resources (e.g., how confident are you that you can manage the situation?) have been used and showed adequate validity with different populations (Bouchard, 2003; Chang, 1998). Despite some of the advantages associated with using this method to quantify appraisal,

the majority of researchers are still asking people to appraise global situations rather than specific stressors occurring within the situation.

1.3.3. Coping

Coping occurs when individuals perceive stress relationships. Coping is defined as constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of a person (Lazarus & Folkman, 1984. p.141). According to some researchers (Crocker, Kowalski, & Graham, 1998; Lazarus & Folkman, 1984), coping is a deliberate process involving thoughts and actions. There are various taxonomies to classify coping (Folkman & Lazarus, 1980; Gaudreau, Blondin, & Lapierre, 2002); however, problem-focused, emotion-focused and avoidance coping are three broad coping functions considered by Lazarus (1991). Problem-focused coping refers to cognitive and behavioral efforts used to change the problem or challenge causing the distress whereas emotion-focused coping involves strategies that help control emotional arousal and distress (Lazarus, 1999). Avoidance coping consists of mentally and/or physically withdrawing from the stressful situation. More recently, relationship-focused and meaning-focused coping have also been considered as coping functions. Relationship-focus coping involves attending to other people's emotional needs while maintaining the integrity of a relationship, and managing one's stress without upsetting or creating problems for others (O'Brien & DeLongis, 1997). Meaning-focus coping, on the other hand, is appraisal-based coping in which a person draws on his/her own beliefs, values, and existential goals to motivate and sustain coping and well-being during difficult times (Folkman, 2008). People have been shown to use a combination of coping functions in a variety of situations (Skinner, Edge, Altman, & Sherwood, 2003).

1.4. Stress and Adaptation for Breast Cancer Survivors

1.4.1. Stressors

Stressors have not been explored extensively in cancer research or with breast cancer survivors specifically. Three approaches are currently used to assess stressors experienced by breast cancer survivors. First, general stress inventories have been used to examine stressors experienced by cancer survivors. The Daily Hassles scale (Kanner, Coyne, Schaefer, & Lazarus, 1981) or Perceived Stress Inventory (Cohen, Kamarck, & Mermelstein, 1983) have been used to determine whether survivors perceive more daily hassles/stressors than healthy participants. While the assumption that survivors are likely to report higher levels of anxiety or report more stressors is logical, this increase in perceived stress may not be due to general stressors but rather, specific cancer-related stressors that are not captured by general stress inventories.

The second approach to measure stress is cancer-specific. To date, most studies examining stressors associated with cancer have used this approach. It has been assumed by most researchers that cancer diagnosis is the main stressor faced by survivors during the cancer trajectory (Bowman, Deimling, Smerglia, Sage, & Kahana, 2003; Carver et al., 1993; Franks & Roesch, 2006). Hence, survivors are often asked to recall the level of anxiety they experienced following the announcement of the diagnosis or are asked to appraise the importance of such event. The assumption that cancer diagnosis is the most important stressor encountered by survivors is limiting when the purpose of a study is to try to understand the appraisal (or meaning) of the cancer experience and subsequent coping strategies used by survivors. Other unique events (e.g., difficulties of treatment, strain on family members, and fear of recurrence) could have also influenced anxiety levels experienced by survivors following the cancer diagnosis. Unfortunately, using cancer diagnosis as a common stressor does not allow one to

determine the importance of those other unique events in determining the severity of stress/anxiety experienced by survivors. Furthermore, while a cancer diagnosis has been shown to lead to severe levels of anxiety for most individuals, those levels tend to be reduced significantly upon completion of treatment and once survivors reach the five-year post-treatment milestone (Costanzo et al., 2007). This could be a limiting factor for researchers working with long term cancer survivors. Women who have been post-treatment for a significant number of years likely no longer experience the same intensity of stress following the diagnosis. Their memory of the amount of distress they experienced in the early stages of the cancer trajectory could be distorted by current state. Therefore, despite the cancer-related nature of this approach, several limitations can not be overlooked.

The final approach used to assess cancer-related stressors is also cancer specific and has received more attention in recent years. According to Lazarus (1993), understanding the stress and coping process associated with chronic diseases such as cancer requires identification and measurement of the unique stressors faced by survivors. Some researchers are now starting to identify unique cancer-related stressors experienced by survivors and measure different dimensions of those stressors (e.g., frequency and intensity) (Hadd et al., in press). The majority of the stressors that have already been identified have conceptual links to various domains of quality of life (e.g., side effect from treatment, financial difficulties). Fear of recurrence and cancer-related fatigue are often reported as the two most common stressors experienced by cancer survivors.

Consistent with this approach, our previous work tried to identify and quantify stressors faced by a physically active population of breast cancer survivors (Hadd et al., in press). This was done using a three-step process. First, common cancer-related stressors that had physical,

emotional, social, and spiritual underpinnings with quality of life were identified from the existing psychosocial oncology literature. Next, a focus group with ten women involved in the sport of dragon boating was conducted to examine the content validity of the stressors and identify any additional stressors that had been omitted from the initial literature search. These participants were recruited through advertisements to local dragon boat teams. In total, 33 post-treatment stressors were selected after the first two steps of this process. The frequency, intensity, and valence of those stressors were then evaluated during an international dragon boating event for breast cancer survivors held in Vancouver in 2005. The final sample included 470 breast cancer survivors post-treatment. An exploratory factor analysis using maximum likelihood with oblique rotation found a four factors solution and included physical, emotional, social, and exercise-related stressor categories. Exercise-related stressors were reported more frequently and intensely, but were appraised positively by most survivors. The physical, emotional, and social stressors were perceived predominantly as negative but were not reported as occurring very frequently and were not perceived as being felt intensely by survivors. Although theoretically driven, this study targeted a unique population of survivors involved in the sport of dragon boat and findings may not be generalizable to less active breast cancer patients. Furthermore, frequency of stressors was assessed by asking breast cancer survivors how often they had experienced specific stressors since completion of treatments, a period that ranged from a few months to 27 years ago. This methodology made conclusions about the importance of certain cancer-related stressors hard to draw as some stressors may be experienced more frequently soon after treatment has ended and may no longer be relevant issues to long term survivors.

Other studies have also used a similar approach with patients of chronic diseases. Devemy and colleagues (2006) identified four higher order levels of stressors (i.e., physical repercussions, social and relational consequences, decrease of the biopsychosocial resources, and fear and anxiety) commonly experienced by patients of chronic disease. The findings from their study are in line with our previous work. These authors also highlighted the need to replicate such findings with a broader variety of chronic diseases. Thus, the identification and classification of specific stressors associated with cancer diagnosis and treatments for breast cancer in a general population of survivors is necessary as cancer can be considered a chronic disease (Canadian-Cancer-Society's-Steering-Committee, April, 2009).

To date, most psychosocial oncology research using one of the three approaches to measure stressors has not been theory-based or has used quality of life models to investigate some of the stress relationships experienced by breast cancer survivors. To our knowledge, our previous work was one of the only studies using Lazarus' model of stress and coping to examine specific stressors associated with the recovery from breast cancer diagnosis and treatment. While the identification of specific stressors in a general population of breast cancer survivors is necessary, understanding relationships between stressors, other stress-related variables (e.g., cognitive appraisal and personal characteristics), and quality of life of cancer survivors would provide valuable information that could further the advancement of stress research in psychosocial oncology. Hence, theory-based research using Lazarus' model could be beneficial by allowing researchers to test relationships between specific cancer-related stressors and other stress-related constructs, in general populations of breast cancer survivors. Such research would facilitate the understanding of unique appraisals of stressors, may highlight potential individual

differences in the prevalence and perceptions of specific cancer-related stressors, and could shed light to the influence of cancer-related stressors on coping outcomes such as quality of life.

1.4.2. Cognitive Appraisal

Limited research has examined the concept of cognitive appraisal in psychosocial oncology. The few studies that have investigated this construct have generally measured the levels of threat or challenge associated with cancer diagnosis or other specific events of the cancer trajectory (Schou, Ekeberg, & Ruland, 2005), which are both measures of primary appraisal. In these studies, the relationships between primary appraisal variables (i.e., threat and/or challenge) and stress related variables such as coping strategies or coping outcomes were investigated. Schou and colleagues (Schou et al., 2005) showed that negative appraisals of cancer diagnosis were associated with negative coping outcomes. In their study, threat appraisal was negatively correlated with various domains of quality of life. When the cancer diagnosis was appraised as challenging, it was positively associated with emotional well-being of patients. In a review on cognitive appraisal and coping in cancer patients, Franks and Roesch (2006) suggested that enough evidence was available to conclude that appraisals of threat were significantly associated with the adoption of problem-focused coping whereas appraisals of challenge were associated with use of both emotion- and problem-focused coping. It is important to note that avoidance coping was not significantly associated with any primary appraisal constructs while coping effectiveness (i.e., how effective were the coping strategies used) was not discussed. Interestingly, these authors suggested that length of time since diagnosis and age were significant moderators in some of the relationships investigated. Potential mediating and moderator variables in stress relationships will be discussed in upcoming sections.

Consistent with this line of research, our previous work with breast cancer survivor dragon boaters mainly examined the primary appraisal of Lazarus' model by measuring the valence of each stressor (i.e., whether each stressor was perceived as positive or negative). On the other hand, other studies with general populations have tentatively quantified key variables of the secondary appraisal such as perception of control (Bouchard, Guillemete, & Landry-Leger, 2004) and coping efficacy (Chang, 1998). Findings from these studies have shown that both primary and secondary appraisals have significant roles in the coping process and seem to be associated with various coping actions and outcomes. These findings need to be replicated with populations of breast cancer survivors. Furthermore, integrating variables assessing both primary and secondary appraisals is necessary to understand the unique role of these two constructs in the stress process. This study examined two types of primary appraisal and two types of secondary appraisal, and examined potential relationships with other stress constructs.

1.4.3. Coping and Distress Relationship

Several studies have examined coping with breast cancer (Deimling et al., 2006; Mullens et al., 2004). Research focusing on cancer experiences suggests that emotion-focused coping is linked to higher levels of distress, while problem-focused coping is associated with experiencing less stress. Avoidance coping strategies used to deal with cancer-related stressors such as diagnosis or decisions concerning treatment have been linked to positive and negative outcomes (Deimling et al., 2006; Mullens et al., 2004). These findings lead to the assumption that using avoidance coping may be effective to deal with short-term stressors but can be maladaptive when facing prolonged stressors. The relationships between other coping functions (i.e., relationship- and meaning-focused coping) and psychological distress have received less attention. In general, breast cancer survivors using meaning-focused coping strategies have reported better

psychological adjustment during the years following treatment (Carver & Antoni, 2004) while the relationship between distress and relationship-focused coping has mostly been examined from the caregiver or partner's perspective.

Perceptions of control may be a key appraisal variable in the coping/distress relationship. Problem-focused coping strategies are more likely to be used when situations are appraised as being controllable whereas emotion-focused coping is more often relied upon when a situation can not be controlled (Aldwin, 1994). Therefore, the perception that something can be done to alter stressful situations can have a positive impact on the level of distress experienced by the survivors. Nevertheless, there have been inconsistent reports of the importance and implications associated with emotion- and problem-focused coping in the psychosocial oncology literature (Carver et al., 1993; McCaul et al., 1999; Ong et al., 1999). Limited research has tried to investigate these inconsistencies by exploring how cancer survivors appraise specific cancer-related stress transactions potentially tied to emotional and physical well-being.

While most of the research previously discussed has examined direct relationships between various stress constructs, it is likely that those relationships could be further influenced by unique characteristics or experiences of cancer patients (e.g., age, weight, socioeconomic status, personality, type of treatment, and stage of disease). In this case, moderation and/or mediation models may more accurately depict some of the underlying mechanisms of the stress process.

1.4.4. Potential Stress/Quality of Life Moderators/Mediators

While various stressors and the appraisal of these stressors have been shown to have direct relationships with coping outcomes such as quality of life (Bouchard, 2003; Chang, 1998; Masthoff et al., 2007), it can be hypothesized that cognitive appraisal could mediate the

relationships between stressors and coping outcomes. Individuals are likely to experience similar cancer-related stressors but the meanings given to those stressors may vary between individuals. Differences in meaning will, in turn, more accurately predict the copings strategies and outcomes experienced by survivors. Hence, the various stress relationships may be better represented by mediational or moderation models. This hypothesis is in line with Lazarus' model where cognitive appraisal is a key element of the stress process explaining individual differences in coping and coping outcomes. Nevertheless, the majority of the personal variables that could influence stress appraisals (i.e., age, BMI, personality, and physical activity) has received limited attention in the cancer literature and has rarely been studied using stress frameworks. Understanding the effects of personal and cancer-related variables on stressors experienced by breast cancer survivors and the meaning of those stressors is crucial in order to develop effective interventions that could alleviate the distress often reported by those women. A brief overview of previous findings concerning the links between some personal and cancer-related characteristics and the appraisal of stressful situations in cancer populations follows.

1.4.4.1. Age

Younger survivors appraise health-related issues associated with cancer diagnosis more negatively and report higher levels of distress compared to older survivors (Stava, Lopez, & Vassilopoulou-Sellin, 2006). Health problems such as changes in types and number of symptoms are often seen as being one of many negative outcomes associated with aging (Aldwin, Folkman, Shaefer, Coyne, & Lazarus, 1980). Being diagnosed with cancer is one illness that is more prevalent in older adults. Hence, when faced with cancer diagnosis, older adults may not appraise these issues as unexpected, as they often expect to experience similar age related health problems. Health issues often experienced by older individuals include weight gain, fatigue,

disruption of sleeping patterns, and memory loss (Spirduso et al., 2005). Middle-aged people faced with similar cancer-related issues are more likely to appraise these situations as posing major threats to their well-being and future expectancies.

1.4.4.2. Body mass index (BMI)

Severe weight gains have often been reported by post-treatment breast cancer survivors (Rock et al., 1999). This is likely to negatively impact certain areas of life by creating more stress for the survivors or by disrupting quality of life. Jen and colleagues (Jen et al., 2004) found that overweight and obese cancer survivors scored lower on physical and mental health, two potential coping outcomes. Furthermore, higher BMI values have previously been linked to increased chances of developing cancer or facing recurrence (Carmichael & Bates, 2004) and to higher levels of anxiety in social settings due to concerns that people may judge them based on their appearances (Rosmond & Bjorntorp, 1999). These are only two of the several cancer-related stressors that could affect survivors' lives. Hence, BMI is likely to have a significant effect on different stress variables.

1.4.4.3. Socio-economic status (SES)

Chronic adversity has consistently been linked to SES, with greater financial, work, and domestic strain in lower SES groups (Simon, Steptoe, & Wardle, 2005). Personal characteristics, such as sense of control and optimism, also vary among people of different SES and lead to greater vulnerability to stressors among people with lower SES (Taylor & Seeman, 1999). In psychosocial oncology, lower SES is linked to higher numbers of women who have never gone for mammogram screening or used health services in Canada and in the United States (Quan et al., 2006; Schootman, Jeffe, Reschke, & Aft, 2003), a program shown to reduce deaths from breast cancer and indirectly, improve early detection of the disease. Being diagnosed at later

stages of the disease is likely to be associated with more life-threatening stressors. In this case, chances of survival can be quite low and stressful events may be perceived more negatively if mortality is the expected outcome. The relationship between SES and stress could also be explained by the lack of a number of stress buffering factors such as social and financial support, detrimental health beliefs due to a lack of education, and engagement in health-related risk behaviors. All these factors could directly impact survivors of lower SES and may potentially influence the prevalence of stressors and their associated meanings.

1.4.4.4. Personality

Over the years, there have been various approaches to conceptualize personality (Carver & Scheier, 2000; McCrae & Costa Jr., 1999; Mischel, 1998), with many stress and coping researchers adopting a trait perspective. The trait approach to personality suggests that a number of specific traits can be found and that each individual varies in terms of the levels of the traits that they possess. Hence, each individual has a somewhat unique personality according to different patterns/levels of traits. In turns, traits should influence specific behaviours. From this point of view, traits can be defined as habitual patterns of behaviours, thoughts, and emotions across time and situations (Kassin, 2003). Researchers have identified a variety of different traits that are likely to influence one's behaviours. The dimensions of Neuroticism (N), Openness (O), Agreeableness (A), Extraversion (E), and Conscientiousness (C) have been identified and labeled the "big five" by Costa and McCrae (1985) while optimism and pessimism are other traits that have emerged from Scheier and Carver's work (Scheier, Carver, & Bridges, 1994) using a trait approach. Personality traits have been shown to play an important role in every aspect of the stress process (Bolger & Zuckerman, 1995; Gunthert & Armeli, 1999; O'Brien & DeLongis, 1997).

According to Carver (2005), people react to threats in differing ways, reflecting their personality differences. These differences are also likely to have an impact on individuals' perceptions of stress as it has been shown that personal dispositions (traits) interact with the situation and influence individuals' perception of stress (Watson, 1990). Hence, the way individuals appraise events and act in some situations is dependent on their personality and is context dependent.

Although many personality traits could have a meaningful influence on the stress process, neuroticism (N) has received more attention in the literature. Bolger and Zuckerman (1995) have shown that people higher on N tend to report being exposed to more stressful events and react to those events more negatively while higher scores of neuroticism have also been linked to perceived distress (Costa Jr. & McCrae, 1990). Furthermore, O'Brien and DeLongis (1996) have shown that individuals high in N seem to engage in more ineffective coping compared to people low on N. This might result in poorer levels of coping outcomes such as quality of life.

Other personality characteristics can also have positive influences on elements of the stress process. Research indicates that the personality dimension of optimism plays an important role in a wide range of behavioral and psychological outcomes when people are confronted with adversity (Scheier & Carver, 1992). According to these authors, optimism is defined as the tendency to believe that one will generally experience good versus bad outcomes in life (Scheier & Carver, 1985). Pessimism, or the lack of optimistic beliefs, is not to be confounded with neuroticism as research has shown that the positive relationships between optimism, coping, and psychological outcomes remained significant after controlling for neuroticism (Scheier et al., 1994). These findings suggest that optimism is a distinct personality dimension that may play a significant role in managing stressful situations faced by survivors.

Optimistic people have been shown to experience less distress and report better quality of life when confronted with difficult/stressful situations (Epping-Jordan et al., 1999; Raikkonen, Matthews, Flory, Owens, & Gump, 1999; Schou, Ekeberg, Ruland, Sandvik, & Karesen, 2003). These significant relationships were also validated with breast cancer survivors (Carver et al., 1993; Carver et al., 2006). In general, research has shown that optimism is related to both coping and coping outcome (i.e., distress). Nevertheless, Carver and colleagues (1993) argue that mediation models, where coping mediates the optimism/distress relationship, need to be further examined. These authors suggest that higher scores on the optimism scale have been associated with the adoption of more effective coping strategies to deal with stressful events. This resulted in lower levels of distress. Other constructs in the stress process could also act as mediators of this association.

While most authors have looked at distress as an outcome variable in the coping process, Carver and colleagues (Carver et al., 2006) have used this variable when trying to measure the impact of cancer diagnosis on people's lives. Used in this context, distress can be seen as a measure of stress or cognitive appraisal and optimism as a moderator of the relationships between these two constructs (i.e., stressors and appraisal) and coping outcomes. Hence, the appraisal one makes of a situation may be a potential mediator of the relationships between optimism and coping outcomes (e.g., quality of life) but has received limited attention in psychosocial oncology. Research with healthy populations has suggested that optimistic individuals tend to perceive having more control and more coping options than pessimistic people when appraising stressful events (Chang, 1998), which resulted in more positive coping outcome. However, in Chang's study, the mediating role of cognitive appraisal was not adequately tested using the four-step statistical procedure suggested by Baron and Kenny (1986).

This methodological limitation makes it hard to draw any valid conclusions. In the current study, the influence of optimism on cognitive appraisal and quality of life will be examined in populations of breast cancer survivors by testing for meditational models.

1.4.4.5. Cancer-related characteristics

Stressors experienced and cognitive appraisals of those stressors are likely to be influenced by several cancer-related variables (e.g., cancer stage, type(s) of treatment, and number of years since the end of treatment). These relationships could be explained by one of two hypotheses: 1) stress exposure or 2) stress perception. The first hypothesis suggests that different stressors will be reported by survivors depending on the specific cancer-related characteristics that they have/had to deal with while differences in perceptions of similar cancer-related stressors is associated with the stress perception hypothesis. Zeidner and Endler (1996) suggest that stressors faced by cancer patients vary according to the different disease stages, thus supporting the exposure hypothesis. Furthermore, quality of life research has shown that survivors undergoing different types of treatment are expected to experience disruption in diverse domains of quality of life (King et al., 2000). If some of those changes in quality of life are detrimental for the survivors, it is likely that they will experience more stress. Their heightened stress levels could be due to facing additional stressors or experiencing the existing ones more intensely. These sudden changes in types and/or intensity of stressors may also impact the appraisals made by survivors (e.g., increased perception of threat and low perception of control). Yet, limited research has examined the influence of several cancer-related variables on the frequency and intensity of specific cancer-related stressors and the appraisal of those stressors made by survivors. Furthermore, the impact of characteristics such as number of years since cancer diagnosis or since end of treatment has received limited attention. This study will

examine these relationships and will determine whether stressors and/or cognitive appraisal could be potential mediators or moderators of the relationships between cancer-related characteristics and quality of life.

1.4.4.6. Physical activity

Physical activity can produce numerous benefits for survivors. These benefits include enhanced quality of life, increased self-esteem, more favorable perceptions of body image, and positive affect (Baldwin & Courneya, 1997; Biddle, 2000; Courneya & Friedenreich, 1999; Pinto et al., 2003). Nevertheless, the influence of physical activity on stressors experienced and stress perceptions has received limited attention in the exercise psychology literature generally and in breast cancer survivors specifically.

Researchers have suggested that the way people respond to exercise may be influenced by the types of stressors experienced, or how these stressors are appraised (Rejeski, Gauvin, Hobson, & Norris, 1995). For example, physical stressors such as cancer-related fatigue may be perceived more positively by individuals as it can be associated with physical gains being made due to physical activity and is often expected in contexts where people need to produce physical movements. In this case, individuals may perceive the experience surrounding physical activity more positively. On the other hand, the affective states experienced by survivors in exercise contexts could be very different if they felt evaluated by other people, leading to social stressors. Research has shown that experiencing various negative emotions during a prolonged period of time while being physically active often leads to drop out. Moreover, research has shown that the positive associations between physical activity and positive affect remained significant when controlling for stress perception (i.e., cognitive appraisal) (Giacobbi, Tucitto, & Frye, 2007).

Nevertheless, these associations have received limited attention in populations of cancer survivors.

Despite the benefits associated with being physically active, it can also generate distress for some breast cancer survivors. The association between physical activity and emotional processes is complex, since physical activity can create stress for breast cancer by reminding them of their illness (e.g., experiencing difficulties performing some activities due to the disease) or creating additional physical and social demands (Parry, 2007; Sabiston et al., 2007). It can also be perceived as extremely stressful by the survivors (McKenzie, 1998; Pinto et al., 2003) who are contemplating becoming active. For a number of years, cancer survivors were not encouraged to engage in physical activity as it was thought that their body was too fragile to handle any additional demands associated with being physically active (McKenzie, 1998). In 1998, McKenzie argued that upper body exercises could lead to physical/physiological benefits for survivors who had already completed treatment. Our previous research identified psychological benefits of physical activity for breast cancer survivors involved in dragon boat (Hadd et al., in press). Despite this recent evidence, a number of people may still be misinformed about physical activity recommendations for cancer survivors and may think that physical activity is likely to negatively impair their recovery. Furthermore, it could also be that survivors' priorities may have shifted and contemplating becoming active could be a threat to those new priorities. While spending more time with family and friends is often important for someone who has been diagnosed with cancer, the thought of engaging in regular physical activity may be perceived as threatening or conflict with this social goal. Engaging in physical activity could be seen as necessary but also add more stress to the survivors' lives. Hence, physical activity may

play various roles for the survivors and could be a moderator of the stressors/quality of life relationship. These potential relationships will be investigated in the current study.

1.5. Summary

Research has consistently shown that a cancer diagnosis and its treatment have direct influence on quality of life (de Ridder et al., 1998; Ferrell et al., 1995). In general, it has been shown that more radical treatments such as chemotherapy and radiation therapy lower quality of life of cancer patients once treatment is completed (King et al., 2000) but that quality of life tends to go back to original levels overtime (Kornblith et al., 2003). While this initial evidence is essential to develop a general idea of the physical, psychological, and social effects of cancer on people's lives, other elements influencing the cancer trajectory need to be examined. Considering other factors that may be impacting quality of life would provide a better understanding of the cancer experience as changes in quality of life are unlikely attributable to only one distinct factor. Thus, research needs to look at integrating various factors into one model to have a better understanding of the complex relationships among factors affecting quality of life. This was done in the current study.

Various cancer-related experiences such as fatigue, weight gain, and sexual difficulties have been identified and linked to perceived distress and quality of life (Ferrell et al., 1995). However, these experiences have not consistently been studied using stress and coping frameworks where their influence may be moderated or mediated by constructs such as cognitive appraisal and personal or cancer-related characteristics. The understanding of relevant stressors faced by breast cancer survivors could significantly be enhanced by using Lazarus' model to investigate the notion of *stress* surrounding breast cancer survivors. Few studies have tried to identify unique stressors faced by breast cancer survivors and examine the appraisal of such

experiences and subsequent effects on quality of life using a stress framework (Hadd et al., in press). Our previous work identified four stressor factors (i.e., physical, emotional, social, and exercise-related) that were consistent with three of the four domains of quality of life as identified by Ferrell and colleagues (1995). Nevertheless, the sample used in this study was homogeneous, as survivors were dominantly Caucasian, self-classified as high SES, and were moderately physically active due to their involvement in the sport of dragon boating. Different stressors could be reported by less active survivors or the perception of those stressors could also differ. In turn, these constructs could have various effects on quality of life.

According to Lazarus' framework, individuals' appraisals of cancer-related stressors should be influenced by personal resources such as goals, perceived control, and coping efficacy. Other personal characteristics such as personality, SES, BMI, and age are also likely to have an influence on this process but have received limited attention in psycho-oncology research. The identification of key personal variables affecting stress-related constructs combined with a better understanding and quantification of unique stressors may be crucial to more accurately define cognitive appraisal and its relationship with quality of life.

The negative health effect resulting from the lack of physical activity is an important concern for cancer survivors as the majority of cancer survivors are inactive following treatment (Blanchard et al., 2003; Courneya et al., 2008). Results from physical activity interventions with cancer survivors have consistently shown that higher activity levels seem to be associated with better physical and psychological functioning (Courneya & Friedenreich, 1999; Emery, Yang, Frierson, Peterson, & Sooyeon, 2009; Pinto, Frierson, Rabin, Trunzo, & Marcus, 2005). Despite these general benefits and other more specific benefits (e.g., positive affect and increased VO_2 max) associated with physical activity, engaging in the recommended amount of physical

activity is a challenge often reported by breast cancer survivors and its influence on stress perception has not been extensively investigated using Lazarus' framework. According to this model, physical activity could influence the types of stressor encountered or act directly on the cardiovascular and muscular systems to help physical functioning. It has also been suggested that the way people respond to exercise or the perceived benefits they get from it may be influenced by how specific events (or stressors) are appraised (Rejeski et al., 1995). Future studies need to investigate the effect of physical activity on specific elements of the stress process (e.g., stressors, cognitive appraisal, and quality of life) in a population of breast cancer survivors. This was done in the current study.

Finally, most studies looking at physical activity in breast cancer survivors have used interventions to try to increase health benefits (Courneya et al., 2004; Rabin, Pinto, Trunzo, Frierson, & Bucknam, 2006). To date, limited research has used naturalistic approaches to look at the influence of physical activity on stress and well-being. Therefore, using a stress model to examine physical activity levels in breast cancer survivors might help further the understanding of possible positive outcomes induced by being involved in physical activity.

1.6. Purpose

The purpose of the current study was to investigate the influence of stress-related variables on quality of life (i.e., physical and mental health) of breast cancer survivors. More specifically, specific physical, emotional, and social cancer-related stressors as well as the appraisal of those stressors (i.e., primary and secondary appraisal) and their relationships with quality of life were examined. Moreover, the effects of individual differences, including physical activity, age, body mass index, SES, and personality, and cancer-related characteristics on stressors, cognitive appraisal, and quality of life were investigated. Finally, the potential

moderating and/or mediating effects of those variables on stress exposure, cognitive appraisal, and quality of life were explored.

1.7. Objectives

The hypothesized model depicted in Figure 1.2 was tested. To achieve the stated purpose, the objectives of this study were to:

1) examine specific physical, emotional, and social stressors experienced by a population of breast cancer survivors;
2) examine survivors' perceptions of these stressors by assessing components of the primary appraisal (e.g., perception of threat and challenge) and secondary appraisal (e.g., perceived control and coping efficacy);
3) determine the influence of specific personal (e.g., age, BMI, SES, and personality) and cancer-related (e.g., stage of disease, type(s) of treatment, years since diagnosis and end of treatment) characteristics on stressors and quality of life (i.e., physical and mental health), and the role of personal variables in cognitive appraisals;
4) examine the relationship between stress appraisal and quality of life among breast cancer survivors;
5) investigate the relationship between stressors and quality of life among breast cancer survivors;
6) examine the effect of personal characteristics on physical activity;
7) determine the relationships between physical activity and stress exposure (i.e., physical, emotional, and social stressors) and physical activity and quality of life;
8) test a hypothesized model.

Based on Lazarus' model and previous findings, several hypotheses were tested:

Ha1: Survivors report higher scores for emotional stressors (i.e., frequency and intensity) compared to physical and social stressors.

Ha2: Total scores for each stressor factor are the strongest predictor of cognitive appraisal constructs. High scores for stressor factors are significantly associated with high perception of threat but low perception of challenge, coping efficacy, and perceived control.

Ha3-a: Younger survivors, women of lower SES and higher BMI, and women who are less optimistic report more stressors. They also perceive stressors as more threatening, less challenging, less controllable and manageable. They report lower cancer-related quality of life (i.e., physical and mental health). The opposite is expected for neuroticism; lower scores on the neuroticism scale are expected to be significantly associated with better quality of life, fewer stressors and more positive appraisals.

Ha3-b: Survivors who undergo more radical treatments such as chemotherapy, mastectomy, and radiation, are diagnosed at later stages of the disease, and are less then five years post-treatment report more stressors and appraise them as more threatening, and less controllable. They also do not perceive having the ability to cope with them. Last, they report significantly lower levels of physical and mental health.

Ha4: Cognitive appraisal has a direct effect on quality of life. More specifically, primary appraisal constructs associated with physical, emotional, and social stressors are stronger predictors of quality of life compared to secondary appraisal variables.

Ha5: Higher scores on the physical, emotional, and social stressor factors are significantly associated with lower levels of quality of life after controlling for the effects of cognitive appraisal variables.

Ha6: Younger survivors and women who report higher activity level pre-diagnosis also report higher levels of physical activity.

Ha7: Physical activity is negatively associated with total scores of all three stressor factors but positively associated with quality of life.

Ha8: The data obtained supports the hypothesized model.

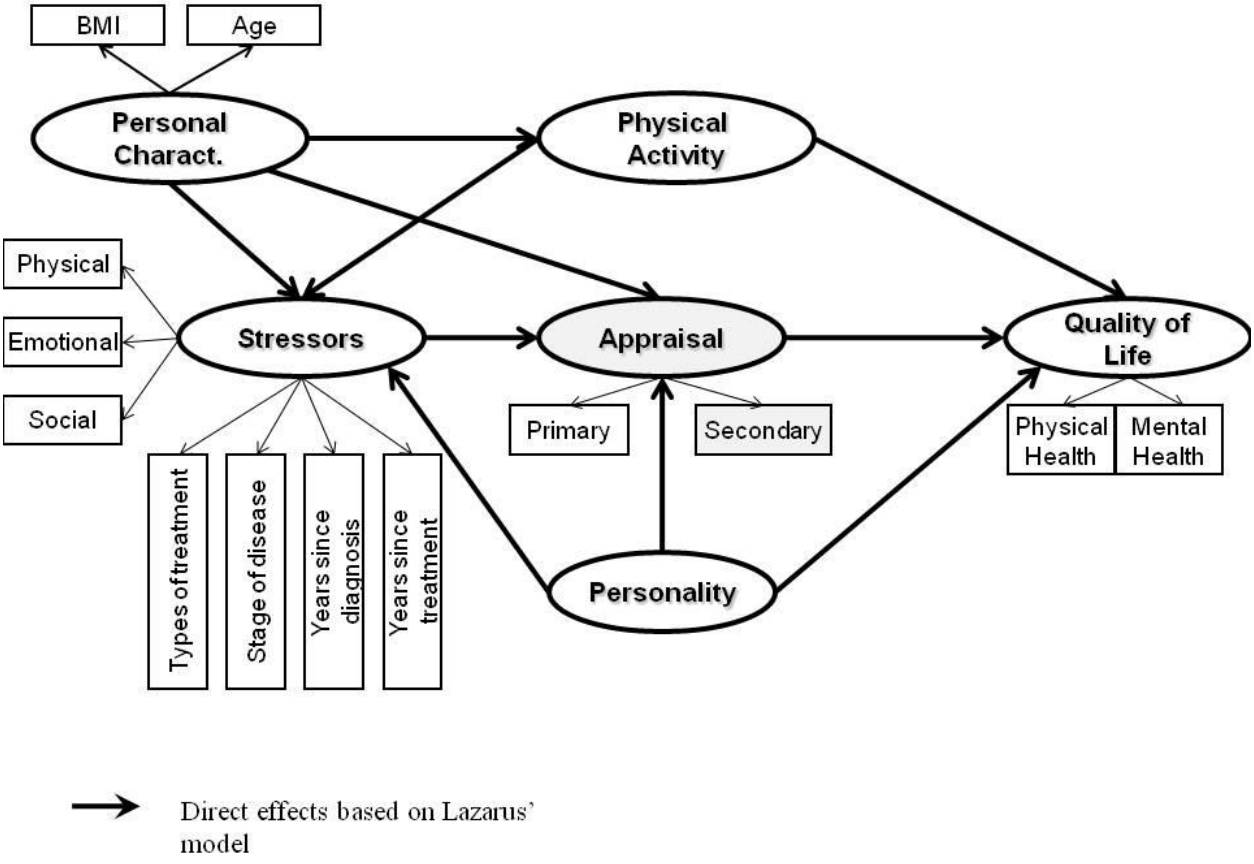


Figure 1.2: Conceptual Model

CHAPTER 2: METHODS

2.1. Participants

2.1.1. Describing the Participants

Three hundred and seventy-five breast cancer survivors post-treatment volunteered to fill out the questionnaire. Ten women were excluded from the study because they failed to answer a number of questions (e.g., missing data on an entire questionnaire). The final sample included 365 women who had been diagnosed with breast cancer and had completed treatment, between the age of 29 and 90 years (M_{age} = 61.58, *SD* = 11.36). BMI values ranged from 15.95 to 46.45 (M_{BMI} = 25.66, *SD* = 4.59) and more than 75% of the participants reported being post-menopausal. Women described themselves as primarily Caucasian (89.5%, *n* = 324) and Asian (7.5%, *n* = 27). Other ethnicities included First Nations/Aboriginal (1.7%, *n* = 6) and Hispanic (1.1%, *n* = 4). Over two thirds of the participants had at least some post-secondary education (71.9%, *n* = 259) and 40.2% reported being currently employed (*n* = 145). These values, with the exception of ethnicity, were comparable to the 2006 census data for this age group in Canada and more specifically, in British Columbia.

In terms of cancer-specific descriptives, most women had been diagnosed with breast cancer several years prior to the study (M_{diag} = 6.49, *SD* = 4.08) and had finished their treatment on average 4.94 years (*SD* = 3.59). More than half of the participants were diagnosed at stage 1 of the disease (52.4%, *n* = 177) while 161 women classified themselves in stage 2 (34.9%, *n* = 118) or 3 (12.7%, *n* = 43). Only 7.5% of the women had experienced recurrence.

Over 80% of the sample reported having undergone radiation treatment (80.8%, *n* = 295). Types of radiation included whole-breast (37.6%, *n* = 111), particulate (7.5%, *n* = 22), and partial-breast (6.4%, *n* = 19). Other types of treatment included lymph or axillary node dissection (61.1%, *n* = 223), lumpectomy (64.1%, *n* = 234), hormonal therapy (60.8%, *n* = 222),

chemotherapy (50.1%, *n* = 183), and mastectomy (45.5%, *n* = 166). Types of mastectomy included modified radical (33.7%, *n* = 56), radical (19.3%, *n* = 32), and double (19.3%, *n* = 32). Finally, just over 30% of the survivors who were subjected to mastectomy also reported undergoing reconstructive surgery (*n* = 53 out of 166). Several women could not recall the specific type of mastectomy or radiation they had undergone. Types of radiation and mastectomy were not differentiated in future analyses.

2.2. Procedures

Upon approval of this research project by the appropriate ethical behavioural boards (Appendix A), the BC Cancer Agency was contacted to obtain access to the cancer data. Participants were selected through the BC Cancer Registry using stratified random sampling (by age). Random sampling is used to ensure that every constituent in the population has an equal probability of being selected for the sample (Thomas, Nelson, & Silverman, 2005). In the case of breast cancer survivors, research has shown that women diagnosed with the disease are generally older. Hence, the BC Cancer Agency used stratified random sampling where strata were created based on age (e.g., 20-29, 30-39, 40-49) to maintain consistency with the appropriate representations of each age group of women with breast cancer in British Columbia. The names and contact information of 2500 survivors was made available. The registry is rarely updated with information concerning address of residence or whether the person is still alive. This resulted in many unopened packages that were returned to the researcher. Furthermore, provincial privacy laws had to be carefully followed. The researcher was instructed that the document containing the names and contact information of potential participants had to remain on the BC Cancer Agency (BCCA) premises. Hence, labels were printed at a BCCA location and packages were sent out by BCCA employees. Immediately following this process, the name and

contact information of those participants had to be deleted to prevent potential identification. For this reason, it was not possible to contact each participant to remind them about the questionnaire. Consent forms (Appendix B) and questionnaires (Appendix C) were sent via mail to 1200 participants who met the inclusion criteria (i.e., women diagnosed at cancer stages 1, 2, or 3, who were least 18 years of age, and had been diagnosed with their last breast cancer 12 years ago or less). Survivors were instructed not to put their names on the questionnaires to protect their anonymity. They were provided with a pre-stamped envelop to mail their consent form and questionnaire back to the investigator. Due to a low response rate, a second round of questionnaires was sent to 600 different survivors. In total, 1800 questionnaires were sent. Two hundred and sixty-one questionnaire packages were sent back un-opened (14.5%) and 38 survivors (2.1%) declined to fill out the survey for various reasons (Appendix D). Hence, three hundred and seventy-five questionnaires were completed and returned, representing a 24% response rate.

2.3. Measures

The questionnaire package contained questionnaires measuring cognitive appraisal, quality of life, optimism, neuroticism, physical activity behavior, and recent life events. The psychometric values of those questionnaires have previously been established. Demographics questions and levels of physical activity pre-diagnosis were also collected. In addition, a measure of stressors, which was developed in a sub-population of breast cancer survivors involved in dragon boating, was used.

2.3.1. Stressors

Twenty stressors that were characterized as having physical, emotional, and social underpinnings were examined (Hadd et al., in press). Our previous work used exploratory factor

analysis to determine whether each item belonged to the physical, emotional, or social stressor factors. In this study, eleven stressors belonged to the physical stressor factor, while four and five stressors belonged to the emotional and social stressor factors respectively. Survivors were asked how often they had experienced each stressor in the last month (i.e., frequency). Responses could range on a 5-point Likert scale from 1 (*never*) to 5 (*several times a week*). Intensity was assessed by asking: "On average, when you experienced this stressor, how intense was it?" Answers could range on a 5-point Likert scale from 1 (*not very intense*) to 5 (*extremely intense*). Total scores for each of these factors were determined by computing the product of frequency X intensity for each stressor and averaging the product term of the items comprising each factor.

2.3.2. Cognitive Appraisal

Survivors were asked to answer the cognitive appraisal measure three times as each dimension of stress (i.e., physical, emotional, and social) was assessed separately. For example, survivors were asked how they generally appraise the 11 physical stressors presented to them while answering the cognitive appraisal questionnaire. The same procedures were repeated with the emotional and social stressor factors (e.g., How do you generally think and feel when encountering the emotional/social stressors previously reported?).

Two constructs of primary appraisal were measured with two scales from the Stress Appraisal Measure (SAM; Peacock & Wong, 1990): perception of threat and perception of challenge. Each subscale was comprised of four items. Participants were asked how they generally thought and felt, in the last four weeks, when encountering the stressors reported on the stressor questionnaire. Answers could range from 1 (*not at all*) to 5 (*a great amount*). Total scores for perception of threat and perception of challenge were computed by summing all four items comprising each scale. Scores for these scales could vary from 4 to 20.

Two constructs of secondary appraisal were assessed: perceived control and coping efficacy. Perceived control was measured with one subscale of the SAM while one subscale of the Primary Appraisal Secondary Appraisal scale (PASA; Gaab, Rohleder, Nater, & Ehlert, 2005) was used to measured coping efficacy. Each subscale was comprised of four items. Participants were asked how they generally thought and felt, in the last four weeks, when encountering the stressors reported on the stressor questionnaire. Answers could range from 1 (*not at all*) to 5 (*a great amount*). Total scores for perceived control and coping efficacy were computed by summing all four items comprising each scale. Scores for these scales could vary from 4 to 20. The psychometric properties of the SAM and PASA have previously been established (Gaab et al., 2005; Peacock & Wong, 1990).

2.3.3. Quality of Life

Quality of life was assessed by the Medical Outcomes Study SF-36 (MOS SF-36; Ware, 1993). The MOS SF-36 is a multidimensional, self-administered questionnaire. It consists of 36 items which are divided into 8 scales: 1) physical functioning; 2) role limitations due to physical health problems; 3) role limitations due to emotional problems; 4) bodily pain; 5) general health; 6) vitality; 7) social functioning; and 8) mental health. Participants were asked to answer each question based on how they felt and how well they were able to do their usual activities. Total score for each subscale was computed according to the SF-36 Health Survey Manual and Interpretation Guide (Ware et al., 2000). Scores for each scale could range from 0 to 100. Higher scores on each of the subscales were associated with better quality of life. These scales were then grouped into two higher-order categories: mental health and physical health. Both the scales and higher order scales of the MOS SF-36 have shown acceptable internal consistency (α between .80-.92) and high test-retest reliability (Ware et al., 2000).

2.3.4. Personality

Optimism was measured using the Revised Life Orientation Test (LOT-R; Scheier et al., 1994). The LOT-R is a 10-item (including four filler items) scale measuring expectations about general positive outcomes. Participants were asked to answer each item based on how they felt. Responses could range on a 5-point Likert scale from 0 (*strongly disagree*) to 4 (*strongly agree*). Total score for this scale was computed by summing all six items. LOT-R scores could range from 0 to 24 with higher scores for people with high optimism. The scale has shown adequate test-retest reliability and internal consistency (Scheier et al., 1994).

Neuroticism was assessed by one subscale of the NEO Five-Factor Inventory (NEO-FFI; Costa Jr. & McCrae, 1992). Twelve items pertaining to anxiety, hostility, depression, self-consciousness, impulsiveness, and vulnerability were used. Participants were asked to select the response that best represented their opinion. Possible answers could range on a 5-point Likert scale from 0 *(strongly disagree)* to 4 *(strongly agree).* Total score for this scale was computed by summing all 12 items. Scores could range from 0 to 48 with higher scores for people with high neuroticism. This scale has demonstrated adequate convergent and divergent validity with other self-report measures of personality (Costa Jr. & McCrae, 1992).

2.3.5. Physical Activity Behavior

Physical activity was assessed using the Godin Leisure-Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985). For the first question (LTEQ1), participants were asked "during a typical 7-day period, how many times, on average, do you do the following kind of exercises for more than 15 minutes during your free time". Examples of strenuous, moderate and light activities were presented to the participants. A total score was calculated by multiplying the frequencies of strenuous, moderate, and light activities by nine, five, and three respectively.

For the second question on the inventory (LTEQ2), participants were asked to report on the frequency of regular activity in a typical week (7-day period) that resulted in a fast heartbeat and sweating. Responses could range from 1 *(often)* to 3 *(never/rarely)*. Although part of the questionnaire, LTEQ2 is not often used in statistical analyses as LTEQ1 has been found to best represent actually physical activity behavior (Sabiston & Crocker, 2008). Consistent with previous work, this study will only examine LTEQ1. The LTEQ has demonstrated adequate psychometric properties in adults (Jacobs, Ainsworth, Hartman, & Leon, 1993).

2.3.6. Recent Life Events

A modified version of the Recent Life Events (Brugha, Bebington, Tennant, & Hurry, 1985) assessed any major life events that had occurred in the last year. Participants were asked to read the eight statements and indicate whether they had happened to them. The importance of each event was given a score based on Miller and Rahe's (1997) stressful life events scoring scheme (see Appendix E for more details). Total score was computed by summing the score of each item. Higher scores were associated with more traumatic events. This score was used to account for stressors that were due to other major life events rather than cancer.

2.3.7. Physical Activity Prior to Diagnosis

History of physical activity pre-diagnosis was assessed by asking participants how many days a week, on average, they had exercised during the year prior to their cancer diagnosis. Possible answers could range from zero to seven with higher numbers associated with higher frequency of physical activity. While this measure had not previously been validated, it was used for exploratory purposes in the current study. More specifically, it was used to examine if being physically active prior to the cancer diagnosis could possible increase the likelihood of engaging in physical activity post treatment.

2.3.8. Demographic Information

Participants were asked to indicate their age, menopausal status, weight, height, marital status, higher level of education, household income, and complete a measure of ethnicity. Cancer-related variables were also assessed. Women were asked to indicate when they had been diagnosed with cancer, if they had experienced cancer recurrence, and the number of years since the end of the treatment. Stage of the cancer at diagnosis (i.e., Stage I, II or III) and treatment types were also recorded (Appendix C).

2.4. Data Analysis

2.4.1. Data Screening

First, data screening was conducted to examine patterns of missing data and to test the assumptions of multivariate analysis (normality, linearity, equality of variance, and independence) following the recommendations of Tabachnick & Fidell (2007). Scores were checked to ensure that they were not out of range. Suspicious numbers were immediately compared to original values on the questionnaire and corrected, if necessary. Next, the frequency of missing data was investigated for each item. Variables with ≤ 5% of missing data were not considered problematic when conducting analyses and the various methods to handle missing data were expected to yield similar results (Tabachnick & Fidell, 2007). Patterns of missing data was also investigated to determine whether missing data was related to any of the variables in the data set (missing at random; MAR) or whether they were uncorrelated (missing completely at random; MCAR; Kline, 2005). This was done by using dummy coded variables for missing and non-missing data. Missing data was given a value of 0 while non-missing data received a score of 1. Next, a series of ANOVAs were computed to look at potential relationships among different variables in the data set and cases that had missing values. In order to protect against

type I error following the computation of several ANOVAS, $p < .001$ was used to determine significant relationships. When the data was missing completely at random, a median substitution was done at the item level by considering a person's score on the other items comprising each scale. The median value for the whole sample was used when missing values were found for demographic and cancer-related characteristics. This was done as only one item was used to assess each of the personal and cancer-related characteristics. Hence, the person's median score on other items measuring the same characteristics could not be used.

Potential univariate outliers were examined. Standardized scores for each variable were saved and values above 3.29 (Tabachnick & Fidell, 2007) were considered outliers, as this value represents three standard deviations from the mean. Univariate outliers were identified but not removed from the data base. Next, potential multivariate outliers were investigated by computing the Mahalanobis distance for each value and comparing it to a critical χ^2 value for the Mahalanobis distance at $p < .001$. Individuals who showed values greater than the critical value were identified but not immediately deleted from the database. Having a few multivariate outliers is considered acceptable when variables are normally distributed as 2.5% of the data is expected to be more than three standard deviations away from the mean. Leverage values were examined to determine if multivariate outliers were also influential data points (leverage values >.5 were considered problematic, Tabachnick & Fidell, 2007). Problems can arise when cases of multivariate outliers are also identified as influential data points. Nevertheless, none of the multivariate outliers previously identified had leverage values above the cut off point (.5). For this reason, no data were deleted due to violation of normality.

The assumption of normality in univariate analysis was also tested by 1) examining the histogram of each variable and 2) looking at skewness and kurtosis values. Histograms were

used to provide a visual representation of the various distributions. As for the numerical values of skewness and kurtosis, variables with values above 2.0 were considered to depart from normality (Tabachnick & Fidell, 2007). Data transformation was used when variables violated this assumption. The type of transformation used was based on the direction and severity of the violation. Total score for social stressors was considered to depart from normality as values for skewness and kurtoris were above two. The square root for each of the score for this variable was computed which eliminated deviation from normality (skewness and kurtosis values were below two). Kurtosis value for physical activity was also higher than what is normally accepted. However, similar findings have also been reported in studies using the Godin Leisure-Time Exercise Questionnaire (Sabiston & Crocker, 2008). Furthermore, it has been reported that the underestimation associated with positive kurtosis disappears with sample of 100 or more cases (Tabachnick & Fidell, 2007). Hence, this variable was not transformed.

The assumptions of linearity and homoscedasticity were tested by examining biavariate scatterplots between pairs of variables. Only variables with severe skewness values were examined in bivariate scatterplots and were compared against normally distributed variables. Distributions resembling oval-shaped were expected for variables that did not violate these assumptions.

Last, correlations ($r > .70$) and collinearity diagnostics produced when conducting regressions were examined to test for multicollinearity. Condition indices around 30 combined with two variance proportion greater than .50 for a given dimension may signify problems (Miles & Shevlin, 2004). Also, Variance Inflation Factors (VIF) greater than 2.0 suggest that multicollinearity may be present (Miles & Shevlin, 2004; Tabachnick & Fidell, 2007). If multicollinearity was suspected, one of two approaches was used. Variables with high

correlations were either combined into one higher order factor, which was tested using confirmatory factor analysis, or were used in different models. This was done to ensure parsimonious models and reduce the size of error terms (Tabachnick & Fidell, 2007).

2.5. Preliminary Analysis Strategies

2.5.1. Descriptive Statistics

Descriptive statistics and scale reliabilities (Cronbach's α), when applicable, were computed for all variables.

2.5.2. Correlations

Pearson product-moment correlations were calculated for all continuous variables. Spearmen's Rho correlation coefficients were examined for nonparametric ordinal variables.

2.5.3. One-Way Multivariate Analysis of Variance

Several multivariate analyses of variance (MANOVAs) followed by univariate analyses of variance (ANOVAs) were used to address specific hypotheses. Results of the ANOVAs were only considered when the overall model was significant. Furthermore, partial eta-squared was calculated to quantify the magnitude of each significant effect. These analyses were used to determine the effect of SES, treatment types, and stages of disease on the prevalence of stressors, the perceptions of those stressors, and quality of life. SES and stages of diseases were categorical variables with six (i.e., less than $20,000 a year, $20,000-$39,999, $40,000-$59,999, $60,000-$79,999, $80,000-$99,999, over $100,000) and three levels respectively (i.e., stages I, II, or III). Treatment types were dichotomous variables (i.e., received or did not received treatment).

The MANOVAs analyses focusing on treatment characteristics were conducted on two samples - a complete sample including all participants and a sub-sample of women who had completed treatments within the last five years. It was important to consider the sub-sample,

given that cancer survivors typically experience extensive negative physical, emotional, and social outcomes during the first five years post-diagnosis, and are generally considered more at risk for a recurrence for the disease within the first five years (American-Cancer-Society, 2002). Probability values of less than .01 ($p < .01$) were determined statistically significant in all MANOVAs and follow up ANOVAs.

2.5.4. Linear Regression

Two hierarchical multiple regressions were used to identify significant predictors of physical activity. Frequency of physical activity pre-diagnosis was entered on the first step followed by personal variables (i.e., age and BMI). One personality trait was entered on the final step. R-squared (R^2) and change in R-squared (ΔR^2) were computed to assess the overall fit of the model and the statistical significance of each predictor ($p < .05$) was determined. In the two models, optimism and neuroticism were not entered simultaneously in the models as these two constructs were found to be highly correlated ($r \approx -.70$) and had a VIF score above 2.0.

2.5.5. Confirmatory Factor Analysis

Confirmatory factor analysis (CFA), with AMOS 14.0, was used to test the overall measurement models for the stressors, cognitive appraisal, neuroticism, optimism, and SF-36 inventories. In all models, the items were free to load exclusively on one latent variable. All error co-variances and one coefficient path were automatically constrained to 1.00 to allow estimation of the other parameters of the models. Error terms were uncorrelated in all models. Nevertheless, common variance biases have been identified as a potential problem in behavioral research. Common method variance can be defined as “the variance attributable to the measurement method rather than to the constructs the measures represent” (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003, p. 879). It can be caused by a variety of measurement factors including the

content of specific items, scale type, and response format. For this reason, some error terms were correlated when items were perceived as potentially contributing to enhancing common variance biases. In most cases, two error terms were correlated when the wordings for various items were somewhat similar, which could make the distinction between items hard to establish from the survivors' point of view. Furthermore, error terms were also correlated when different items were expected to measure the same underlying construct. Modification indices were also examined before correlating error terms. However, correlating paths were not added between terms solely based on values of the modification indices.

Correlations between error terms involved items belonging to similar latent constructs. However, two error terms in the SF-36 were correlated but were associated with different domains of quality of life. The decision to allow the error terms of general health and vitality to correlate was made because those two scales have been shown to share attributes of both domains of quality of life at the conceptual level. This was confirmed by a CFA model where those two items were significantly loading on physical and mental health (CR > 1.96). Allowing these two error terms to correlate could potentially reduce the discriminant validity of the two constructs. However, the domains of physical and mental health have been shown to be moderately to highly correlated in the literature (Ware et al., 2000).

Non-standardized critical ratios (CR > 1.96 was determined significant), standardized residuals, and fit indices were used to evaluate each model. Root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis fix index (TLI) were used as fit indices. RMSEA indicates how well the specified model would fit the population covariance matrix, tends to favor models with many parameters and does not normally penalize for model complexity (Browne, Cudeck, Bollen, & Long, 1993). Values < .05 indicate close fit

of the model in relation to degrees of freedom while values between .05 and .08 are considered reasonable fit, .08-.10 are considered a mediocre fit, and > .10 are classified as poor fit (Byrne, 2000). CFI is a measure of comparison between the hypothesized model and the baseline model and is a good index for smaller samples. Values ≥ .90 indicate a good fit. TLI is a non-statistical measure representing a comparative index between the model and the null model adjusted for degrees of freedom to decrease its dependence to sample size. TLI values ≥ .90 represent acceptable fit while TLI ≥ .95 shows great fit. CFI and TLI are both sensitive to model complexity. More complex models are likely to lower the values of these two indices. Due to the strengths and weaknesses of each model fit index, the use of RMSEA, CFI, and TLI was expected to provide a more robust representation of the different models. When the factor structure of a latent variable was satisfactory, it was used with other latent variables in evaluating the structural model shown in Figure 1.2.

2.5.6. Structural Equation Modeling

Structural equation modeling analyses using Amos 14.0 were used to test the proposed model (Figure 1.2). This model was tested in three steps. First, the measurement model was evaluated with latent variables allowed to freely correlate. Next, a mediation model, where paths between latent variables were specified, was tested based on theoretical and empirical evidences (Figure 1.2). Modification indices were examined to identify other significant relationships between latent factors that could improve the fit of the model. A variation of the first structural model was then examined. This three-step process was consistent with structural equation modeling techniques using an estimation and re-specification approach (Andersen & Gerbing, 1992) which was appropriate to test the current hypotheses (i.e., test the original model) and add to the literature by investigating other probable relationships that have not been examined using

structural equation model techniques. Overall measurement and structural model fit was assessed using the same three fit indices previously used for CFAs. Furthermore, standardized residuals were also examined for evidence of over- or under-estimation of fitted correlations in both measurement and structural models. In all models, the factor loading of one indicator (for each latent variable) and the error co-variances were set to 1.0 (Byrne, 2000).

2.5.7. Personality Variables

A moderate and negative (r = -.70) correlation between neuroticism and optimism was found. To avoid multicollinearity issues, these personality traits were entered separately in different models. The effects of neuroticism and optimism on stress-related variables and quality of life were comparable in terms of magnitude while the direction of the effects was reversed. For clarity purposes, the results section will only report models including optimism. Models including neuroticism as a predictor can be found in Appendix F.

2.5.8. Mediation

Potential mediating variables were tested using structural equation modeling and by looking at total, direct, and indirect effects (Preacher & Hayes, 2008). The direct effect is computed when there is no intervening variable involved in the relationship other than the predictor and outcome variables (Kline, 2005). Indirect effects are calculated by considering all intervening variables having an impact on the predicted variable (e.g., A $\rightarrow$ B $\rightarrow$ D and A $\rightarrow$ C $\rightarrow$ D) (Kline, 2005). Total effects are the sum of direct and indirect effects for each set of variables. Percentile bootstrap confidence intervals were examined to determine the significance of each indirect effect in a multiple mediator context (i.e., CIs that did not include 0 were significant). The magnitude, standard error, and significance of each mediator (when the effects of other mediators were removed) were manually computed. The indirect effect of each

mediating variable was calculated by multiplying the direct effect of the predictor/mediator relationship by the direct effect of the mediator/outcome relationship (i.e., A →M * M →B; where A is the predictor, B the outcome variable, and M the mediator). The standard error for this indirect effect was computed as follow:

$$\sigma_{\alpha\beta} = \sqrt{\alpha^2\sigma_\beta^2 + \beta^2\sigma_\alpha^2}$$

In this equation $\sigma_{\alpha\beta}$ is the standard error of the manually computed indirect effect, α is the direct effect of the predictor/mediator relationship while σ_α is the standard error of this relationship, β is the direct effect of the mediator/outcome relationship while σ_β is the standard error of the mediator/outcome relationship (Preacher & Hayes, 2008). Next, significance of the indirect effect was determined by calculating a critical ratio:

$$z = \frac{\alpha\beta}{\sigma_{\alpha\beta}}$$

In this equation, $\alpha\beta$ is the manually computed indirect effect and $\sigma_{\alpha\beta}$ is the standard error of this relationship. Values ≥ 1.96 were considered significant. Finally, an overall ratio was calculated to determine the contribution of each mediating variable to the relationship between independent and outcome variables (i.e., total effect). This was done by dividing the manually computed indirect effect by the total effect. Values ranged between 0 and 1 with higher scores associated with greater contribution to the overall relationship.

2.5.9. Moderation

Two methods were used to examine the potential moderating effects of personal (i.e., age, BMI, optimism, and physical activity), cancer-related (i.e., time since diagnosis and end of treatment), and stress-related variables (i.e., stressor, threat, and secondary appraisal). All

variables in the models were continuous but some of them were latent while others were observed. When analyzes involved interaction effects in which the independent and moderating variables were latent constructs, Marsh and colleagues' (2004) unconstrained approach was used. With this approach, indicators used to measure the latent constructs (independent and moderating variables) are first centered so that they have zero means. This was done by subtracting the sample's mean score (for each item) from each data point. Next, the product of one indicator from each of the latent constructs involved in the model (i.e., one indicator from the independent variable and one indicator from the moderating variable) is used to form one indicator measuring the latent interaction term. The same process was repeated with different indicators from the independent and moderating variables to create more indicators for the latent interaction term. The number of indicators representing the latent interaction term was always equal to the lowest number of indicators used to represent one of the two latent variables in the models (i.e., if the two latent variables were optimism (6 indicators) and perception of threat (4 indicators), the latent interaction term was constructed from four indicators). When the number of indicators differed between the two latent constructs, the following method was used to select which items would be utilized: for the factor with the larger number of indicators, items with the highest factor loadings were used to form matched-product indicators of the latent interaction term. Once product indicators were created, the latent interaction construct was entered in the structural model and the significance of the pathway to an endogenous variable was tested.

When the moderating variable was not latent (e.g., age, BMI, time since diagnosis and end of treatment), scores for latent variables were computed by using an exploratory factor analysis with varimax rotation and by saving the standardized factor scores. Manifest variables were first centered. An interaction term was computed by multiplying standardized factor score

X the centered moderating variable. Finally, the interaction term was entered in the structural model and treated as an observed variable. Moderation was found when the path from the interaction term to the exogenous variable was significant ($p < .01$). Model fit was also assessed. For interpretation purposes, significant moderating effects were plotted and slopes were examined (Aiken & West, 1991).

CHAPTER 3: RESULTS

3.1. Stressors

3.1.1. Preliminary Analyses

Descriptive statistics for the frequency, intensity, and total score for the three categories of stressor are shown in Table 3.1 and were used to examine hypothesis 1. Overall, total score for physical stressors was higher compared to score for emotional and social stressors. It appears that survivors rated the intensity of physical and emotional stressors similarly but perceived physical stressors as occurring somewhat more frequently compared to the other two types of stressor. Nevertheless, this hypothesis was not statistically tested. In order to do so, one would need to assume equivalence of measurement. The equivalence of measurement assumption stipulates that scores on separate scales, when Likert scale formats are consistent, may not be directly comparable as a certain value (e.g., two) on one scale may have a different meaning than the same value (e.g., two) on another scale (Labouvie, 1981). Furthermore, statistical analyses on different dependent variables can not be computed unless various groups are involved. Nevertheless, equivalence of measurement in this study was assumed for interpretative and comparative purposes but caution is needed when interpreting findings.

Table 3.1: *Scale Ranges, Means and Standard Deviations, and Distribution Statistics for Frequency, Intensity, and Total Score for the Three Categories of Stressor*.

	Actual Range	Possible Range	Mean	SD	Skew (SE)	Kurtosis (SE)
Physical stressors						
Frequency	1.00-4.82	1-5	2.31	.92	.52 (.13)	-.60 (.26)
Intensity	1.00-4.64	1-5	1.80	.78	.99 (.13)	.34 (.26)
Total	1.00-21.18	1-25	5.62	4.35	1.02 (.13)	.35 (.26)
Emotional stressors						
Frequency	1.00-5.00	1-5	2.15	1.05	1.11 (.13)	.37 (.26)
Intensity	1.00-5.00	1-5	1.80	.99	1.29 (.13)	.83 (.26)
Total	1.00-25.00	1-25	5.05	5.33	1.73 (.13)	2.39 (.26)
Social stressors						
Frequency	1.00-5.00	1-5	1.75	.84	1.64 (.13)	2.27 (.26)
Intensity	1.00-5.00	1-5	1.55	.80	1.84 (.13)	2.98 (.26)
Total	1.00-25.00	1-25	3.68	4.18	2.37 (.13)	5.74 (.26)

Note: SD = standard deviation; SE = standard error

The most frequent and intense stressors highlighted by the participants are shown in Table 3.2. The majority of the stressors showed in this table were classified as physical. Some women reported not experiencing any stressors in particular categories. Nineteen participants did not experience any physical stressors while 45 survivors reported not having faced any emotional stressors in the last four weeks. Finally, 63 women could not identify any social stressors. Univariate analyzes of variance showed that overall, women who did not experience physical ($F(1,357) = 6.62$, $p < .01$, partial $\eta^2 = .02$) and emotional ($F(1,357) = 4.72$, $p < .01$, partial $\eta^2 = .01$) stressors were older compared to the rest of the survivors, although effect sizes were small. This was not the case for social stressors. No other statistically significant difference was found when looking at BMI, socioeconomic status (SES), stage of disease, years since diagnosis, and years since end of treatment.

Table 3.2*: Most Frequent and Intense Stressors Reported by Survivors*

Stressors	Mean	SD	Skew	Kurtosis
By frequency:				
1. Disruption of sleep	3.07	1.60	.06	-1.62
2. Fatigue	2.80	1.41	.44	-1.17
3. Aches and pains	2.71	1.52	.46	-1.29
4. Memory loss	2.47	1.46	.72	-.90
5. Fear of recurrence*	2.44	1.25	.94	-.19
By intensity:				
1. Disruption of sleep	2.26	1.33	.65	-.88
2. Fatigue	2.08	1.14	.76	-.29
3. Aches and pains	1.98	1.29	1.08	-.06
4. Fear of recurrence*	1.93	1.20	1.14	.19
5. Feeling overweight	1.84	1.24	1.14	.67
6. Anxiety*	1.83	1.13	1.32	.77
7. Worried about family and friends getting breast cancer*	1.82	1.15	1.48	1.36

Note: * stressors that *did not* belong to the physical stressor category; SD = standard deviation

3.1.2. Correlations

Correlations among the categories of stressor can be seen in Table 3.3. All three stressor factors were moderately correlated, suggesting that stressors could potentially be grouped in a single stressor latent factor.

3.1.3. Multivariate and Univariate Analyses

Several multivariate analyses of variance (MANOVAs) followed by univariate analyses of variance (ANOVAs) examined whether total score (i.e., frequency X intensity) for stressor factor was a function of specific personal (SES) and cancer-related (stage of disease and treatment characteristics) characteristics (hypotheses 3a and 3b). It was hypothesized that women of lower SES would report higher total stressor factor scores. Contrary to the hypothesis, SES did not have a significant effect ($p > .01$) on total score for each of the stressor factor.

Cancer-related variables were also expected to affect perceived stressors. Women who were diagnosed at later stages of the disease and/or had undergone more radical treatment such as mastectomy, chemotherapy, and radiation therapy were expected to score higher on the different stressor factors. Consistent with the hypothesis, stage of disease had a significant effect on total stressor factor scores reported by survivors ($F(6,672) = 6.36$, $p < .01$, partial $\eta^2 = .05$). More specifically, survivors who were diagnosed at later stages (i.e., two and three) of the disease reported higher scores of physical stressors compared to women diagnosed at stage one ($F(2,337) = 13.89$, $p < .01$, partial $\eta^2 = .08$). No significant difference was found for total score of emotional and social stressor factors.

Table 3.3*: Pearson Correlations for the Three Stressor Factors*

	1.	2.	3.
1. Physical Stressors	-		
2. Emotional Stressors	.60**	-	
3. Social Stressors	.61**	.75**	-

Note: N = 365; * = $p < .05$; ** = $p < .01$

Finally, a significant effect for total scores for stressor factors for chemotherapy ($F(3,354) = 6.27$, $p < .01$, partial $\eta^2 = .05$) was found. More specifically, survivors who underwent chemotherapy ($F(1,356) = 11.65$, $p < .01$, partial $\eta^2 = .03$) reported higher scores on the physical stressor category. This relationship was not significant when conducting analyses with a sample including participants who had completed their treatment for breast cancer within the last five years. Contrary to the hypothesis, mastectomy and radiation treatment did not have a significant effect on the type of stressors experienced. These findings were also observed with the less than five year post-treatment subsample. Furthermore, lumpectomy, lymph or axillary node dissection, hormonal therapy, and reconstruction surgery did not have a significant effect on total scores for each category of stressor.

3.2. Cognitive Appraisal

3.2.1. Preliminary Analyses

Descriptive statistics for perception of threat, challenge, perceived control, and coping efficacy for the three categories of stressor are shown in Table 3.4. Overall, the patterns of scores for each of the four cognitive appraisal constructs were similar across all three stressor factors. In general, women reported lower scores for perception of threat and higher scores for the positive components of cognitive appraisal measured in this study (i.e., challenge, perceived control, and coping efficacy). More specifically, women generally perceived the stressors to be controllable and believed they had the necessary skills to cope effectively with them. Nevertheless, large individual differences are evident.

Table 3.4*: Scale Ranges, Means and Standard Deviations, Distribution Statistics for Perception of Threat, Challenge, Perceived Control, and Coping Efficacy for Physical, Emotional, and Social Stressors.*

	Actual range	**α***	**Mean**	**SD**	**Skew (SE)**	**Kurtosis (SE)**
Physical stressors (N = 346)**						
Threat	4.00-20.00	.84	7.93	3.57	1.06 (.13)	.87 (.26)
Challenge	4.00-20.00	.78	9.27	3.92	.45 (.13)	-.68 (.26)
Perceived Control	4.00-20.00	.73	13.06	4.22	-.26 (.13)	-.52 (.26)
Coping Efficacy	4.00-20.00	.90	13.04	3.50	-.13 (.13)	-.46 (.26)
Emotional stressors (N = 320)**						
Threat	4.00-20.00	.85	8.24	3.70	.86 (.14)	.28 (.27)
Challenge	4.00-19.00	.80	9.21	3.80	.39 (.14)	-.78 (.27)
Perceived Control	4.00-20.00	.76	12.74	4.12	-.24 (.14)	-.51 (.27)
Coping Efficacy	4.00-20.00	.92	12.81	3.48	-.03 (.14)	-.56 (.27)
Social stressors (N = 302)**						
Threat	4.00-20.00	.82	7.38	3.27	1.20 (.14)	1.55 (.28)
Challenge	4.00-20.00	.84	9.53	4.05	.39 (.14)	-.76 (.28)
Perceived Control	4.00-20.00	.78	12.99	4.19	-.23 (.14)	-.58 (.28)
Coping Efficacy	4.00-20.00	.92	13.02	3.60	.07 (.14)	-.72 (.28)

Note: * = Scale reliabilities are Cronbach's alpha coefficients; ** = N only includes participants who scored > 1 on the stressors factor total score; SD = standard deviation; SE = standard error.

3.2.2. Correlations

Correlations among the subscales for each category of stressors can be found in Table 3.5. The associations between stressor and perceived challenge were weak across all three categories of stressor while high correlations were found between stressor and perception of threat of physical, emotional, and social stressors. Furthermore, all the relationships between constructs of appraisal were significant across the three categories of stressor, with the exception of two associations involving perception of threat and challenge. Perceptions of threat of physical and emotional stressors were not significantly correlated to perception of challenge of those same stressors. On the other hand, the associations between challenge, perceived control, and coping efficacy were moderate to high (ranging from .53 to .84) within each stressor factor. More specifically, the relationships between the two constructs representing secondary appraisal (i.e., perceived control and coping efficacy) were consistently above .75. This could potentially lead to multicollinearity problems when conducting hierarchical linear regression and SEM analyses. This problem will be addressed in an upcoming section.

Lazarus (1999) suggested that the appraisals of different stressors should be measured separately. More specifically, variations in meanings (e.g., importance, significance, and relevance) could be associated with different events, regardless of the similarities between these events (e.g., all cancer-related events). Hence, relationships between constructs appraising different stressor factors (e.g., perception of threat of physical stressors, perception of threat of emotional stressors, and perception of threat of social stressors) were also examined separately to determine whether theses appraisals varied greatly. Results showed moderate to high correlations, ranging from .51 to .69 (R^2 = .26 to .48). These numbers suggest that appraisals of different stressor categories did not differ as much as originally speculated. This finding,

combined with the similar patterns of relationships for each stressor factor shown in Tables 3.11 & 3.12, provide justification for averaging the various appraisal constructs. This was done by combining scores for all three stressor factors. The new *averaged* values were used in confirmatory factor and structural equation modeling analyses.

Table 3.5: *Pearson Correlation Coefficients for each Stressor Factor and Cognitive Appraisal Constructs*

	Stressor	Threat	Challenge	Control	Efficacy
			N = 346		
PS	-				
Threat	.58**	-			
Challenge	.03	.00	-		
Control	-.19**	-.27**	.54**	-	
Efficacy	-.13*	-.18**	.58**	.78**	-
			N = 320		
ES	-				
Threat	.67**	-			
Challenge	-.03	-.08	-		
Control	-.30**	-.30**	.57**	-	
Efficacy	-.23**	-.24**	.61**	.80**	-
			N = 302		
SS	-				
Threat	.59**	-			
Challenge	-.14*	-.20**	-		
Control	-.32**	-.44**	.61**	-	
Efficacy	-.29**	-.34**	.63**	.84**	-

Notes: * = $p < .05$; ** = $p < .01$; PS = physical stressor; ES = emotional stressor; SS = Social stressor; Control = control expectancy; Efficacy = coping efficacy

3.2.3. Multivariate and Univariate Analyses

Several multivariate analyses of variance (MANOVAs) followed by univariate analyses of variance (ANOVAs) were used to examine the influence of SES, stage of disease, and treatment types on perceptions of stressor factors (hypotheses 3a and 3b). It was hypothesized that women of lower SES would appraise stressors as more threatening, less challenging and less controllable, and would perceive having fewer resources to cope successfully with them. The same hypothesis was used with survivors who had been diagnosed at later stages of cancer and who had received more radical treatments (e.g., chemotherapy, mastectomy, and radiation). All assumptions associated with MANOVA were met.

Contrary to the hypotheses, personal and cancer-related characteristics did not have significant effects ($p < .01$) on any of the appraisal constructs. Furthermore, no significant effect for SES, stage of disease, and types of treatment on cognitive appraisal of stressor factors was found when looking only at women who had finished their treatment within the last five years.

3.3. Quality of Life

3.3.1. Preliminary Analyses

Descriptive statistics for quality of life subscales are shown in Table 3.6. Overall, mean scores for most of the subscales were similar to the norms for women in the US between the ages of 55 and 64 (Ware et al., 2000). Survivors scored relatively high (i.e., > 65) on six of the eight subscales with the exception of role limitations due to physical health problems and vitality. The mean score for the former was notably lower than the norms for the general population, reported to be $M_{health\ \text{problem}} = 71.61$. The statistical significance of the differences between sample scores and norm values were calculated (one-sample t-tests). Survivors in the current study scored significantly lower on the subscale of role limitations due to physical health problems ($t = 3.53$, p

< .05) and scored higher on physical functioning ($t = 3.40$, $p < .05$), bodily pain ($t = 4.37$, $p < .05$), and general health ($t = 4.74$, $p < .05$). Nevertheless, the mean scores for each subscale were consistent with values reported in previous research with breast cancer survivors (Bowen et al., 2007).

3.3.2. Correlations

Correlations among the eight subscales can be seen in Table 3.7. Associations between the scales were moderate to high, ranging from .39 to .73. Consistent with expectations, stronger correlations were found between subscales belonging to the same higher-order construct (i.e., mental or physical health).

3.3.3. Multivariate and Univariate Analyses

MANOVA followed by ANOVAs were computed to investigate the effect of personal (i.e., SES) and cancer-related (i.e., disease stage and treatment history) characteristics on quality of life subscales (hypotheses 3a and 3b). Based on the existing literature, it was expected that women of lower SES, survivors diagnosed at later stages of the disease, and who had undergone more radical treatments (i.e., chemotherapy, radiation, and mastectomy) would report lower quality of life on all eight subscales. All possible two-way treatment interactions were also investigated (types of treatment included mastectomy, radiation, reconstructive surgery, chemotherapy, hormonal therapy, lumpectomy, and lymph or axillary node dissection). This was done to examine whether women who had undergone two types of treatment were more likely to report lower levels of quality of life as it is often common for breast cancer survivors to be prescribed more than one treatment (e.g., lumpectomy and chemotherapy). All the assumptions associated with MANOVA were met.

Table 3.6: *Scale Ranges, Means and Standard Distribution, and Distribution Statistics for Quality of Life Subscales*

Quality of Life Subscales	Actual Range	α*	Mean	SD	Skew (SE)	Kurtosis (SE)
PF	0-100	.92	77.47	24.68	-1.22 (.13)	.62 (.26)
RLPHP	0-100	.90	63.87	42.11	-.57 (.13)	-1.43 (.26)
RLEP	0-100	.92	79.69	26.72	-1.09 (.13)	.30 (.26)
VIT	0-100	.91	55.64	24.53	-.37 (.13)	-.75 (.26)
MH	0-100	.85	73.50	18.95	-.95 (.13)	.59 (.26)
SF	0-100	.89	78.66	25.03	-.95 (.13)	-.10 (.26)
BP	0-100	.87	72.32	24.87	-.65 (.13)	-.56 (.26)
GH	0-100	.83	68.37	22.07	-.52 (.13)	-.52 (.26)

Note: * = Scale reliabilities are Cronbach's alpha coefficients; PF: Physical Functioning; RLPHP: Role limitation due to Physical Health Problems; RLEP: Role Limitation due to Emotional Problems; VIT: Vitality; MH: Mental Health; SF: Social Functioning; BP: Bodily Pain; GH: General Health; SD = standard deviation; SE = standard error

Table 3.7*: Pearson Correlation Coefficients for Quality of Life Subscales*

	1.	2.	3.	4.	5.	6.	7.	8.
1. PF	-							
2. RLPHP	.65**	-						
3. RLEP	.49**	.60**	-					
4. VIT	.53**	.60**	.67**	-				
5. MH	.39**	.44**	.66**	.70**	-			
6. SF	.57**	.65**	.73**	.73**	.70**	-		
7. BP	.63**	.70**	.56**	.62**	.46**	.61**	-	
8. GH	.53**	.54**	.54**	.69**	.57**	.56**	.55**	-

Note: * = $p < .05$; ** = $p < .01$; PF = physical functioning; RLPHP = role limitations due to physical health problems; RLEP = role limitations due to emotional problems; VIT = vitality; MH = mental health; SF = social functioning; BP = bodily pain; GH = general health

A significant effect for SES on quality of life ($F(8,311) = 6.04$, $p < .01$, partial $\eta^2=.13$) was found. Consistent with the hypothesis, women of higher SES consistently scored higher on physical functioning ($F(5,314) = 7.86$, $p < .01$, partial $\eta^2=.11$), role limitations due to physical health problems ($F(5,314) = 4.14$, $p < .01$, partial $\eta^2=.06$), role limitations due to emotional problems ($F(5,314) = 3.47$, $p < .01$, partial $\eta^2=.05$), social functioning ($F(5,314) = 2.80$, $p < .05$, partial $\eta^2=.04$), and bodily pain ($F(5,314) = 6.07$, $p < .01$, partial $\eta^2=.09$) compared to women who earned less money per year. No significant difference was found for vitality, mental health, and general health.

Contrary to hypotheses, stage of disease and severity of cancer treatment did not have an effect on quality of life. Furthermore, no significant relationship ($p < .01$) was found between lymph or axillary node dissection, lumpectomy, hormonal therapy, and quality of life subscales. Similar results were found when considering only a subsample of survivors who had completed treatment within the last five years. No interaction between types of treatment was significant.

3.4. Personal Characteristics and Physical Activity

3.4.1. Preliminary analyses

Descriptive statistics for optimism, neuroticism, recent life events, physical activity pre-diagnosis and current physical activity are shown in Table 3.8. Physical activity (LTEQ1) data were not normally distributed as shown by kurtosis value > 2.0. It has been reported that the underestimation associated with positive kurtosis disappears with sample of 100 or more cases (Tabachnick & Fidell, 2007). Hence, the physical activity data were not transformed to improve normality. Overall, the mean for neuroticism was in the mid-range and was similar to previous data obtained from cancer survivors (Rhodes, Courneya, & Bobick, 2001). Optimism score was also consistent with data from another psychosocial oncology study (Carver et al., 2005). Finally,

the mean score for physical activity pre-diagnosis variable was moderately high (*M* = 4.16 out of possible score of 7.00). More specifically, a high number of women in the study reported exercising 4 days a week or more during the year before being diagnosed with cancer. This finding is somewhat contradictory to previous research showing that most post-menopausal and/or mid-age women report low levels of physical activity (Brown, Heesch, & Miller, 2009; Caspersen, Pereira, & Curran, 2000). Mean age at diagnosis was 54.99 years (*SD* = 10.99). The current instrument used to measure physical activity pre-diagnosis was not previously validated. Therefore, a more throughout investigation of this variable and validation of this instrument may be a good avenue for future studies. In the currently study, it was used in regression analyzes to explore potential relationships with current physical activity level. However, any result involving this indicator should be treated with caution.

Table 3.8: *Scale Ranges, Mean and Standard Deviation, and Distribution Statistics for Neuroticism, Optimism, Recent Life Events, and Physical Activity*

	Actual Range	α*	Mean	SD	Skew (SE)	Kurtosis (SE)
Neuroticism	0-47	.85	17.03	9.30	.50 (.13)	.05 (.26)
Optimism	1-24	.78	17.25	4.97	-.45 (.13)	-.62 (.26)
Recent Life Events**	0-412	--	96.20	83.10	.81 (.13)	.48 (.26)
Physical Activity (LTEQ1) ***	0-186	--	30.07	23.79	1.69 (.13)	5.98 (.26)
Physical Activity (LTEQ 2)	1-3	--	1.86	.72	.22 (.13)	-1.05 (.26)
Physical Activity Pre-Diagnosis****	0-7	--	4.16	1.98	-.24 (.13)	-.67 (.26)

Note: * = scale reliabilities are Cronbach's alpha coefficients; ** = values were adapted from Miller & Rahe (1997) paper; *** = units for physical activity is METS; **** = number of days per week; SD = standard deviation; SE = standard error

3.4.2. Correlations

Correlations among personality variables, recent life events, physical activity pre-diagnosis, and current physical activity (LTEQ 1 & 2) can be found in Table 3.9. These associations were all significant ($p < .01$) with the exception of the relationships between LTEQ 1 and recent life events and physical activity pre-diagnosis and recent life events. Furthermore, LTEQ 2 was not significantly linked to neuroticism. Due to the weaker associations between LTEQ 2 and personal variables and moderate associations with LTEQ 1 (.55), the decision was made to only use LTEQ 1 in future analyses. This was consistent with previous research (Sabiston & Crocker, 2008). All other significant associations among these variables were weak.

3.4.3. Regression

Two hierarchical linear regression models examined predictors of physical activity (hypothesis 6). Frequency of physical activity pre-diagnosis was entered on the first step followed by personal variables (i.e., age and BMI). One personality trait was entered on the final step. Two other regression models excluding physical activity pre-diagnosis as predictor of current physical activity levels were also examined and can be found in Appendix G.

The model including optimism explained 19% of the variance in physical activity (Table 3.10). Age and frequency of physical activity pre-diagnosis were the strongest predictors. Optimism and BMI also contributed significantly in predicting physical activity. Similar results were found when neuroticism was entered in the model ($R^2 = .18$).

Table 3.9: *Pearson Correlation Coefficients for Optimism, Neuroticism, Recent Life Events, Current Physical Activity, and Physical Activity Pre-Diagnosis*

	1.	2.	3.	4.	5.	6.
1. OPT	-					
2. NEU	-.69**	-				
3. RLE	-.15**	.27**	-			
4. LTEQ1	.19**	-.15**	-.02	-		
5. LTEQ2	.11*	-.08	.11*	.55**	-	
6. PAPD	.19**	-.12*	.03	.24**	.22**	-

Note: N=363 * = $p < .05$; ** = $p < .01$; OPT= optimism; NEU= neuroticism; RLE= recent life events; LTEQ1= current levels of physical activity in METS; LTEQ2 = frequency of current physical activity; PAPD= physical activity pre-diagnosis

Table 3.10: *Physical Activity Pre-Diagnosis, Age, BMI, and Personality as Predictors of Current Physical Activity*

Step	Variables	β	ΔR^2	R^2	t-value
	Current level of PA				
1	PA pre-diagnosis	.24	.06**	.06**	4.58**
2	PA pre-diagnosis	.26	.11**	.17**	5.16**
	Age	-.27			-5.38**
	BMI	-.18			-3.61**
3	PA pre-diagnosis	.24	.02**	.19**	4.66**
	Age	-.28			-5.57**
	BMI	-.16			-3.20**
	Optimism	.14			2.67**
	Current level of PA				
1	PA pre-diagnosis	.24	.06**	.06**	4.58**
2	PA pre-diagnosis	.26	.11**	.17**	5.16**
	Age	-.27			-5.38**
	BMI	-.18			-3.61**
3	PA pre-diagnosis	.25	.02**	.19**	4.93**
	Age	-.29			-5.76**
	BMI	-.16			-3.23**
	Neuroticism	-.14			-2.81**

Note: * = $p < .05$; ** = $p < .01$; PA = physical activity

3.5. Relationships Between Various Constructs

Pearson product coefficients for all variables included in this study can be found in Tables 3.11 and 3.12. To avoid multicollinearity, each stressor factor and associated constructs were examined separately. Participants were included in these analyses only if they had scores above one (> 1.0) for each of the stressor factors. The majority of the relationships among stressors, cognitive appraisal constructs, quality of life, physical activity, and personal characteristics were significant ($p < .05$) and moderate. Cancer-related characteristics (i.e., years since diagnosis and since the end of treatment) were only significantly correlated with age, physical and emotional stressor factors, and constructs associated with secondary appraisal (i.e., coping efficacy and perceived control) of social stressors.

Table 3.11: *Pearson Correlation Coefficients for all Variables Associated with Physical and Emotional Stressors*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.		**.58**	.03	**-.19**	**-.13**	**-.38**	**-.52**	**-.52**	**-.63**	**-.54**	**-.59**	**-.52**	**-.51**	**.44**	**-.33**
2.	**.67**		.00	**-.27**	**-.18**	**-.36**	**-.49**	**-.50**	**-.54**	**-.52**	**-.53**	**-.47**	**-.54**	**.51**	**-.42**
3.	-.03	-.08		**.54**	**.59**	-.05	-.05	.05	.11	.07	-.02	-.06	.10	-.14	**.16**
4.	**-.30**	**-.30**	**.57**		**.78**	**.18**	**.16**	**.33**	**.29**	**.37**	**.21**	**.16**	**.30**	**-.41**	**.40**
5.	**-.23**	**-.24**	**.61**	**.80**		**.14**	**.11**	**.27**	**.26**	**.30**	**.18**	**.11**	**.28**	**-.36**	**.35**
6.	**-.37**	**-.29**	-.02	**.22**	**.15**		**.65**	**.48**	**.53**	**.40**	**.57**	**.63**	**.54**	**-.31**	**.29**
7.	**-.37**	**-.39**	-.04	**.17**	**.13**	**.66**		**.59**	**.59**	**.44**	**.64**	**.69**	**.55**	**-.38**	**.29**
8.	**-.54**	**-.45**	.11	**.33**	**.28**	**.54**	**.61**		**.67**	**.67**	**.73**	**.55**	**.54**	**-.57**	**.44**
9.	**-.52**	**-.49**	**.14**	**.34**	**.30**	**.55**	**.59**	**.68**		**.70**	**.73**	**.60**	**.69**	**-.59**	**.47**
10.	**-.58**	**-.57**	**.14**	**.37**	**.33**	**.39**	**.42**	**.68**	**.70**		**.71**	**.46**	**.57**	**-.74**	**.58**
11.	**-.54**	**-.50**	.04	**.24**	**.22**	**.58**	**.64**	**.74**	**.74**	**.71**		**.59**	**.56**	**-.58**	**.44**
12.	**-.40**	**-.38**	-.05	**.21**	**.13**	**.64**	**.69**	**.57**	**.60**	**.44**	**.60**		**.54**	**-.35**	**.32**
13.	**-.50**	**-.45**	**.15**	**.33**	**.29**	**.55**	**.55**	**.55**	**.68**	**.56**	**.57**	**.56**		**-.53**	**.52**
14.	**.48**	**.52**	**-.22**	**-.44**	**-.42**	**-.29**	**-.35**	**-.57**	**-.57**	**-.74**	**-.57**	**-.33**	**-.52**		**-.68**
15.	**-.44**	**-.34**	**.19**	**.41**	**.38**	**.27**	**.26**	**-.42**	**.44**	**.57**	**.42**	**.30**	**.50**	**-.67**	
16.	**.27**	**.32**	.03	-.04	.00	-.12	**-.27**	**-.30**	**-.33**	**-.32**	**-.39**	**-.29**	**-.28**	**.26**	**-.13**
17.	-.11	-.11	.07	**.22**	**.18**	**.35**	**.22**	**.17**	**.27**	**.16**	**.18**	**.25**	**.31**	**-.18**	**.21**
18.	-.03	**-.13**	.07	.07	.08	-.01	.00	-.02	.09	.10	.02	-.01	**.16**	-.10	**.18**
19.	**-.15**	**-.13**	-.04	-.03	-.03	**-.23**	-.11	-.02	.06	.10	.06	**-.17**	-.01	-.13	.07
20.	**.21**	.05	.04	-.10	-.04	**-.27**	-.11	**-.24**	**-.20**	.13	**-.22**	**-.24**	**-.24**	.14	**-.15**
21.	**-.12**	-.08	-.01	.03	.01	.01	.06	.00	.09	.04	.01	-.05	.04	-.01	.03
22.	**-.12**	-.09	-.05	.06	-.02	.11	.09	.05	.10	.09	.08	.03	.07	-.07	.09

Note: Above diagonal = correlations between constructs associated with physical stressors; below diagonal = correlations between constructs associated with emotional stressors; **bold =** $p < .05$

	16.	17.	18.	19.	20.	21.	22.
1.	**.30**	-.02	-.01	**-.26**	**.23**	-.10	**-.15**
2.	**.30**	**-.15**	**-.13**	**-.18**	.12	-.06	-.10
3.	.09	.06	.01	-.11	.02	-.09	-.07
4.	-.01	**.17**	.09	-.07	-.04	-.03	.05
5.	.00	**.13**	.07	-.02	-.06	-.04	-.02
6.	-.12	**.35**	.03	**-.25**	**-.25**	-.02	.11
7.	**-.29**	**.19**	.00	-.10	-.11	.02	.08
8.	**-.30**	.14	-.01	-.01	**-.22**	.01	.06
9.	**-.31**	**.25**	.11	.04	**-.19**	.07	.10
10.	**-.31**	**.15**	.10	.09	-.13	.03	.08
11.	**-.38**	**.17**	.03	.06	**-.21**	-.01	.07
12.	**-.29**	**.23**	.00	-.16	**-.23**	-.06	.02
13.	-.14	**.28**	**.18**	-.01	**-.22**	.03	.07
14.	**.25**	**-.15**	**-.11**	-.13	.14	-.01	-.07
15.	-.14	**.18**	**.19**	.06	**-.17**	.02	.09
16.		-.03	.05	-.08	.06	.01	.01
17.	-.06		**.26**	**-.24**	**-.22**	-.04	.02
18.	.01	**.22**		**.18**	-.07	.06	-.04
19.	-.11	**-.23**	**.11**		.03	**.24**	**.20**
20.	.07	**-.23**	-.08	.03		.01	-.04
21.	.01	-.01	.03	**.26**	.01		**.74**
22.	-.01	.03	-.04	**.21**	-.04	**.78**	

1. = Stressors; 2. = threat; 3. = challenge; 4. = coping efficacy; 5. = perceived control; 6. = physical functioning subscale; 7. = role limitations due to physical health problems; 8. = role limitations due to emotional problems; 9. = vitality; 10. = mental health; 11. = social functioning; 12. = bodily pain; 13. = general health; 14. = neuroticism; 15. = optimism; 16. = recent life events; 17. = physical activity; 18. = physical activity pre-diagnosis; 19. = age; 20. = BMI; 21. = years since diagnosis; 22. = years since end of treatment

Table 3.12: *Pearson Correlation Coefficients for all Variables Associated with Social Stressors*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.															
2.	**.59**														
3.	**-.15**	**-.20**													
4.	**-.37**	**-.44**	**.61**												
5.	**-.29**	**-.34**	**.63**	**.84**											
6.	**-.41**	**-.35**	-.00	**.23**	**.15**										
7.	**-.42**	**-.35**	-.02	**.17**	.09	**.65**									
8.	**-.54**	**-.49**	**.16**	**.39**	**.31**	**.52**	**.59**								
9.	**-.49**	**-.43**	**.19**	**.36**	**.29**	**.53**	**.59**	**.68**							
10.	**-.55**	**-.53**	**.18**	**.43**	**.37**	**.39**	**.41**	**.67**	**.70**						
11.	**-.58**	**-.49**	.10	**.32**	**.25**	**.56**	**.62**	**.73**	**.73**	**.70**					
12.	**-.43**	**-.34**	.03	**.23**	**.17**	**.65**	**.67**	**.56**	**.60**	**.43**	**.58**				
13.	**-.47**	**-.45**	**.15**	**.33**	**.26**	**.53**	**.54**	**.54**	**.68**	**.58**	**.55**	**.56**			
14.	**.55**	**.52**	**-.23**	**-.49**	**-.44**	**-.29**	**-.35**	**-.57**	**-.57**	**-.74**	**-.57**	**-.33**	**-.53**		
15.	**-.45**	**-.40**	**.24**	**.46**	**.40**	**.28**	**.26**	**.43**	**.46**	**.58**	**.43**	**.31**	**.53**	**-.68**	
16.	**.30**	**.22**	.04	-.09	-.02	-.11	**-.27**	**-.28**	**-.32**	**-.31**	**-.37**	**-.30**	**-.27**	**.27**	**-.17**
17.	-.11	-.14	.03	**.19**	**.18**	**.31**	**.18**	.13	**.22**	.13	**.15**	**.23**	**.27**	**-.14**	**.18**
18.	.00	**-.13**	.03	.09	**.13**	-.01	-.04	-.02	.09	.11	-.01	-.02	**.16**	-.09	**.20**
19.	**-.13**	-.05	-.02	-.06	-.07	**-.20**	-.08	.01	.06	.11	.10	**-.15**	.01	-.14	.06
20.	**.19**	.08	.06	-.07	-.02	**-.25**	-.11	**-.25**	**-.21**	**-.14**	**-.23**	**-.23**	**-.23**	.14	**-.19**
21.	-.06	-.02	-.04	.03	.07	.06	.07	.02	.11	.06	.03	-.01	.06	-.02	.04
22.	-.09	-.06	-.02	**.13**	**.12**	.08	.11	.07	.11	.10	.08	.05	.11	-.09	.11

Note: **bold =** $p < .05$

	16.	17.	18.	19.	20.	21.
17.	-.01					
18.	.07	**.27**				
19.	-.12	**-.23**	**.16**			
20.	.09	**-.22**	-.08	.01		
21.	.00	-.04	.07	**.23**	-.01	
22.	.01	.02	-.05	**.16**	-.06	**.76**

1. = Stressors; 2. = threat; 3. = challenge; 4. = coping efficacy; 5. = perceived control; 6. = physical functioning; 7. = role limitations due to physical health problems; 8. = role limitations due to emotional problems; 9. = vitality; 10. = mental health; 11. = social functioning; 12. = bodily pain; 13. = general health; 14. = neuroticism; 15. = optimism; 16. = recent life events; 17. = physical activity; 18. = physical activity pre-diagnosis; 19. = age; 20. = BMI; 21. = years since diagnosis; 22. = years since end of treatment

3.6. Confirmatory Factor Analyses of Latent Variables Assessing Stressor Factor, Cognitive Appraisal, Optimism, and Quality of life

Confirmatory factor analyses using maximum likelihood estimation and bootstrap techniques (number of samples was set at 2000 and confidence intervals at 95%) were used to test the measurement models of each of the latent variable (i.e., each stressor factor, perception of threat, challenge, coping efficacy, perceived control, optimism, and mental and physical health) used in the hypothesized model (Figure 1.2) as well as potential higher order latent variables (i.e., overall stress and primary and secondary appraisal). While it is somewhat unusual to use CFA to test the factor structure of validated scales, this type of analysis was primarily used to test higher order models for stressor and primary (combination of perceived threat and challenge) and secondary (combination of coping efficacy and perceived control) appraisal. The higher order factor structure of these scales had not previously been tested and needed to be investigated if those latent constructs were going to be included in the hypothesized model (Figure 1.2). The factor structure of the SF-36 was also tested as inconsistencies in terms of model fit have been reported in the literature (Banks & Martin, 2009).

3.6.1. Stressor

The model fit for stressor factors was good for all three models (i.e., physical, emotional, and social stressors) (Table 3.13). The significance of item loadings associated with each stressor factor was tested separately (Figures 3.1, 3.2, 3.3). The resulting models included 11 items for physical stressors, four items for emotional stressors, and five items for social stressors. A higher order "stressor" latent variable was also tested (Figure 3.4). This model included total score for each of the three stressor factors. This model was "just identified" as only three indicators were used. Nevertheless, each indicator loaded significantly on the latent variable labeled stressor

(Figure 3.4). Because this was a “just identified” model, chi-square and fit indices could not be computed.

Table 3.13*: Fit Indices for Confirmatory Factor Analyses on Physical, Emotional, and Social Stressor Factors*

Model	χ^2	**df**	***p***	**CFI**	**TLI**	**RMSEA***
Physical Stressor Factor						
Measurement	122.79	42	.00	.93	.90	.08
Emotional Stressor Factor						
Measurement	.93	2	.63	1.00	1.00	.00
Social Stressor Factor						
Measurement	5.97	4	.20	.99	.99	.04

*: RMSEA = $\sqrt{\frac{\chi^2/_{df-1}}{(N-1)}}$; hence, if χ^2 is less than values for df, RMSEA = 0.

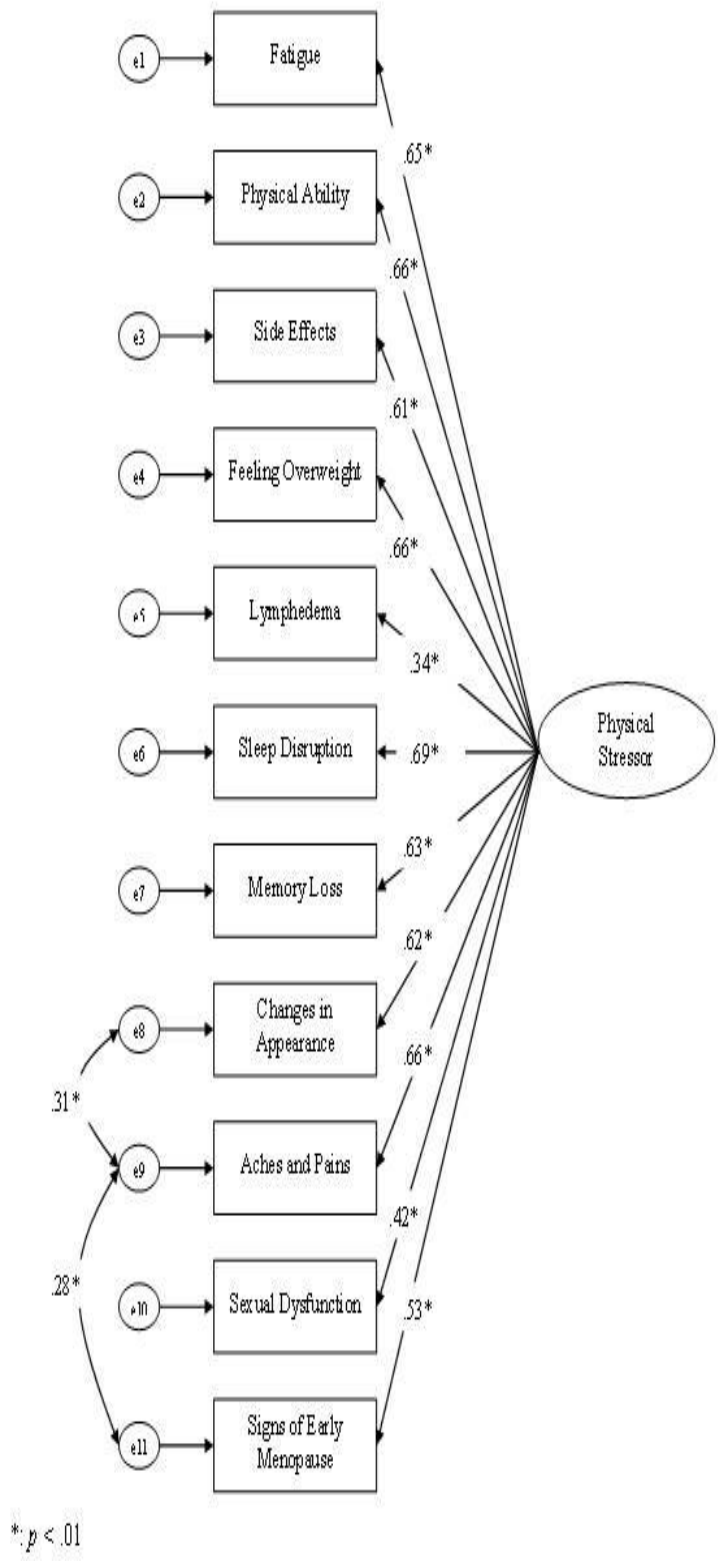
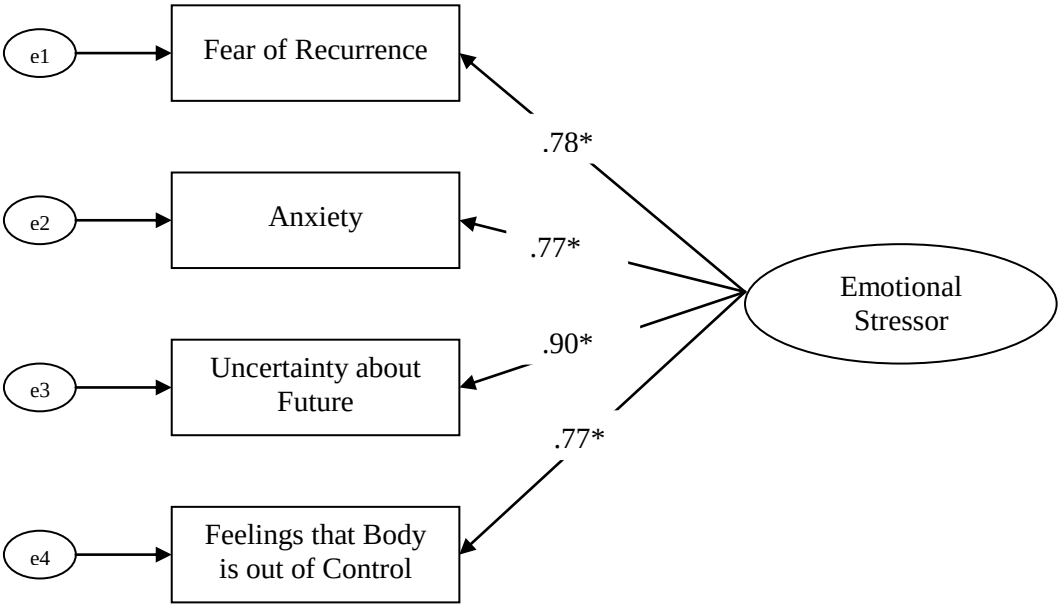
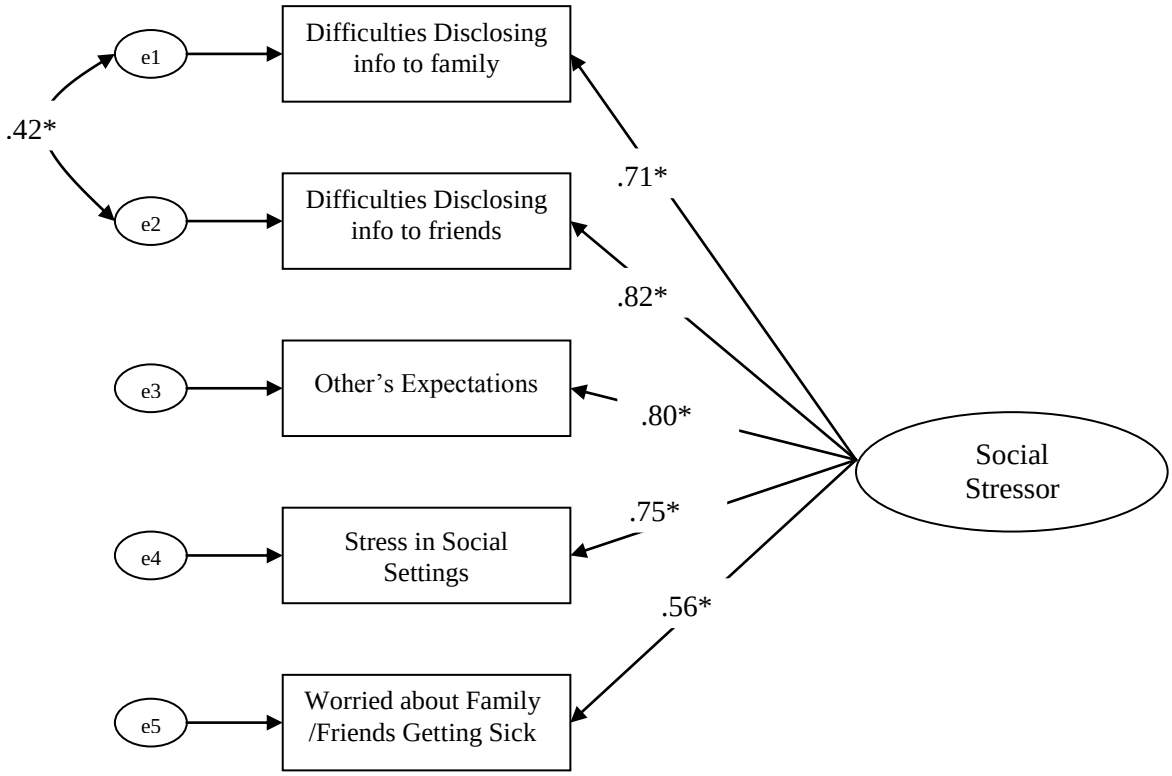


Figure 3.1: Confirmatory Factor Analysis for Physical Stressor Factor



*: $p < .01$

Figure 3.2: Confirmatory Factor Analysis for Emotional Stressor Factor



*: $p < .01$

Figure 3.3: Confirmatory Factor Analysis for Social Stressor Factor

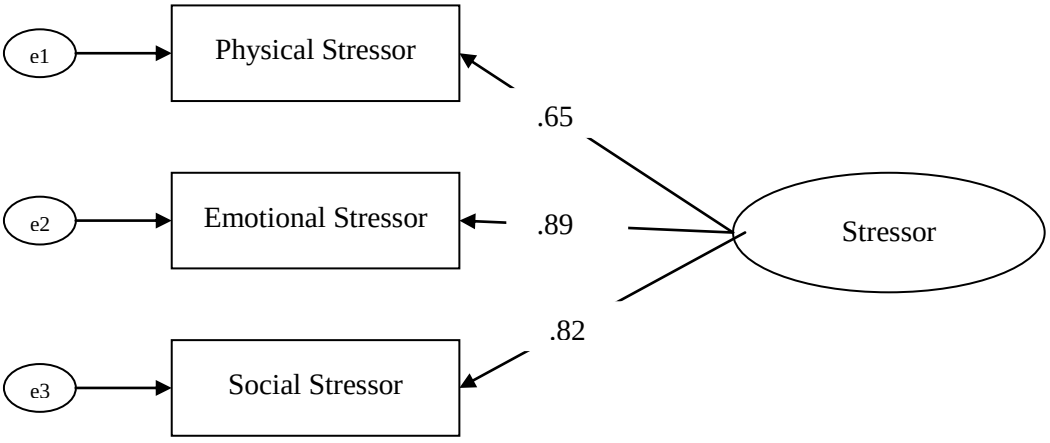
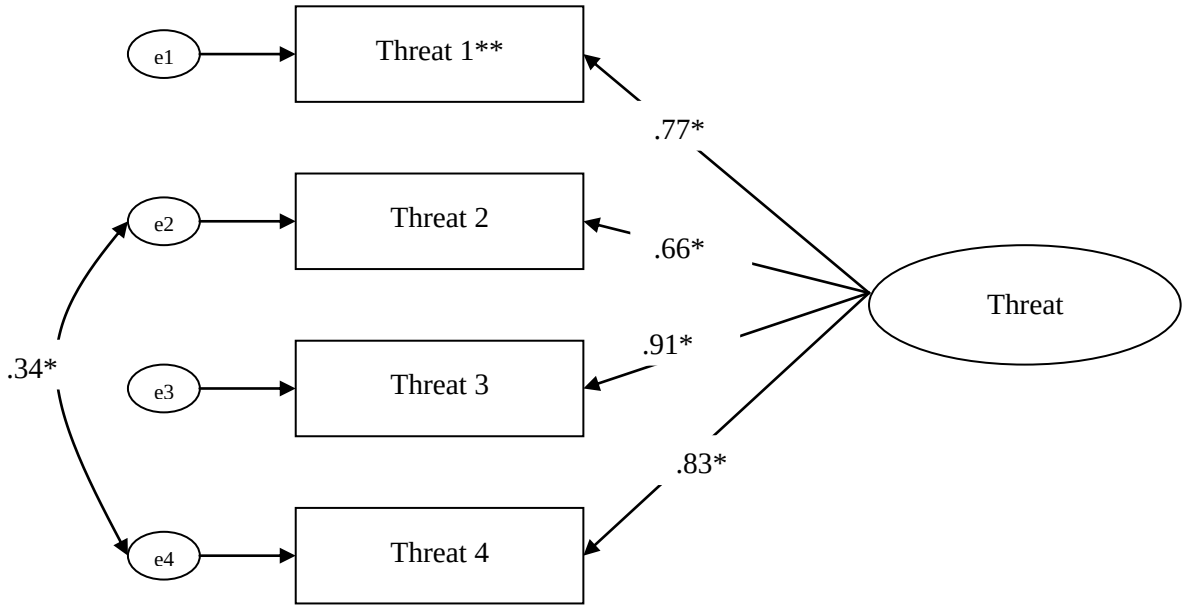


Figure 3.4: Confirmatory Factor Analysis for Higher Order Stressor.

3.6.2. Cognitive Appraisal

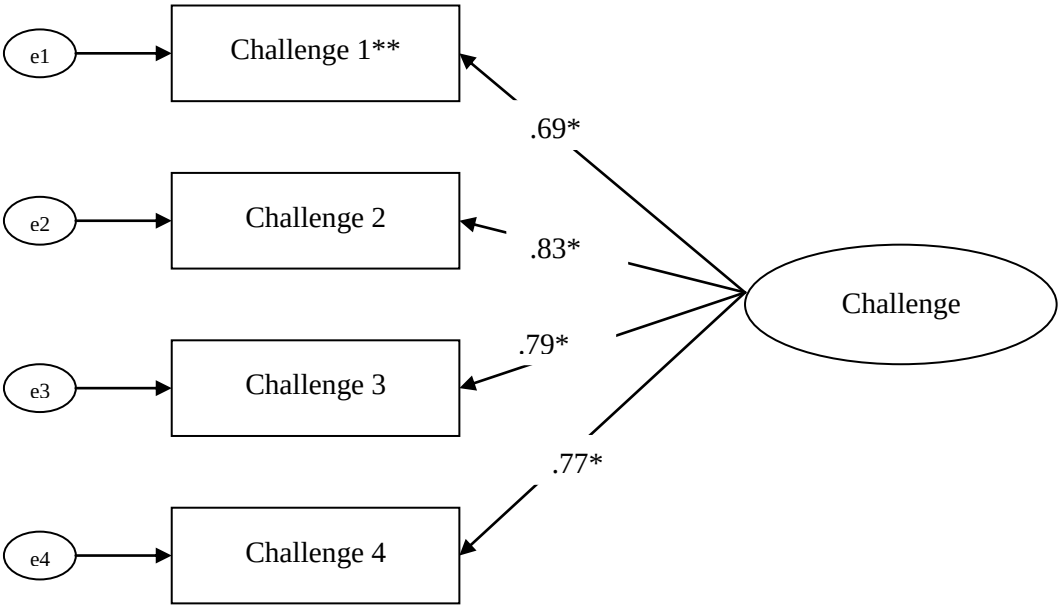
The averaged score for each appraisal construct was used in all CFAs. Each item measuring primary appraisal loaded significantly and accordingly under one of the two latent variables (i.e., perception of threat and challenge) (Figures 3.5 & 3.6). Furthermore, both models showed good statistical fit (Table 3.14). Perception of threat and challenge could not be combined under a higher order latent variable labeled primary appraisal (Table 3.14 and Figure 3.7) as the four items associated with either perception of threat or perception of challenge did not significantly load under the latent variable of primary appraisal (Appendix H for regression models). When perceived threat was entered in predictive models of quality of life domains with perceived challenge, it negated the effect of challenge in most models. More specifically, perceived challenge was only accounting for a small amount of variance in vitality, mental health, and general health. In all models, a largest amount of variance was explained by perceived threat. Hence, it was decided to only use items pertaining to threat in all structural models due to the stronger correlations between threat and quality of life domains. Furthermore, perception of threat is often used as a measure of cognitive appraisal in coping literature.



*: $p < .01$

**: the wording for each item associated with this latent construct can be found in Appendix C

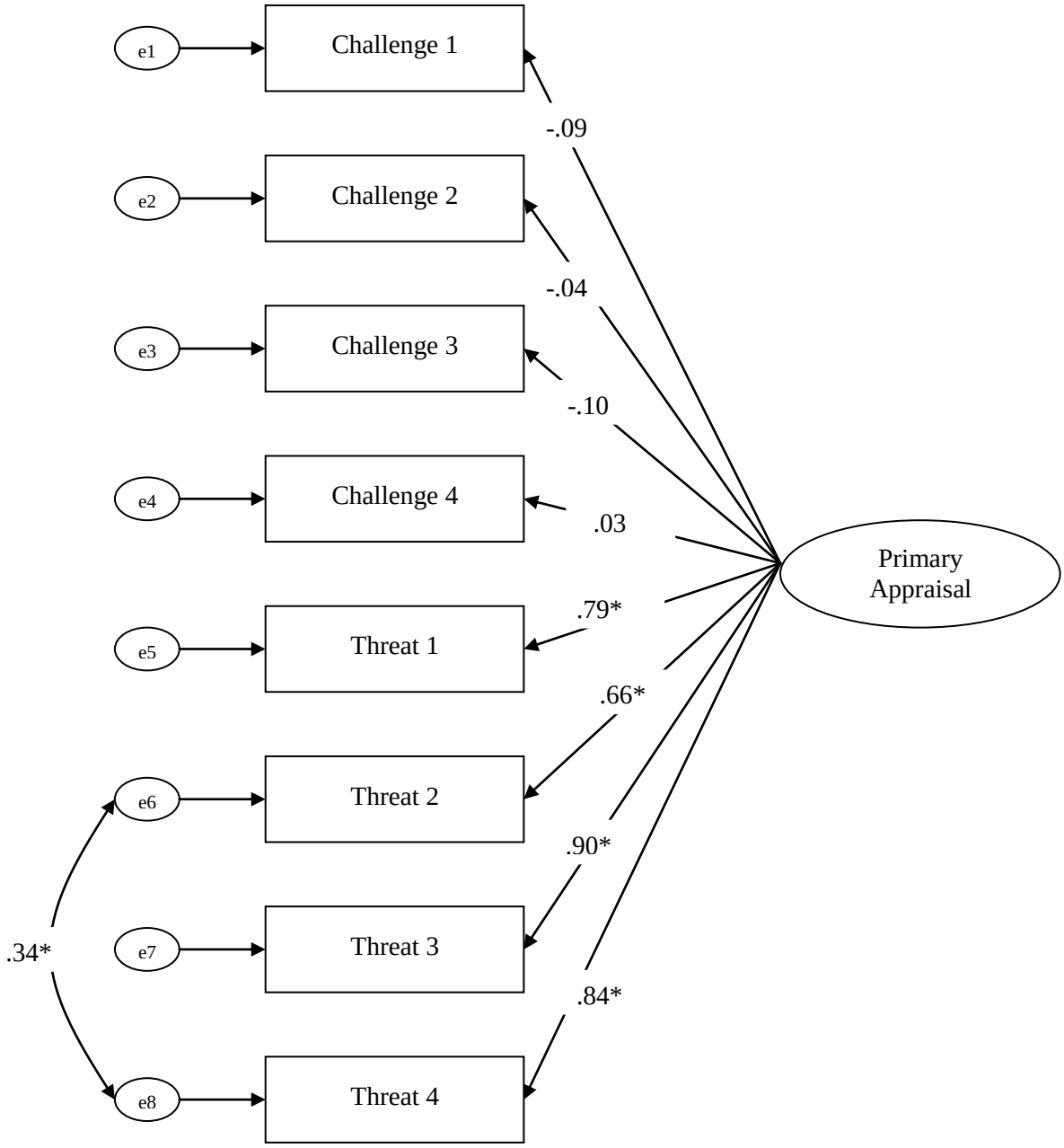
Figure 3.5: Confirmatory Factor Analysis for Perception of Threat



*: $p < .01$

**: the wording for each item associated with this latent construct can be found in Appendix C

Figure 3.6: Confirmatory Factor Analysis for Perception of Challenge



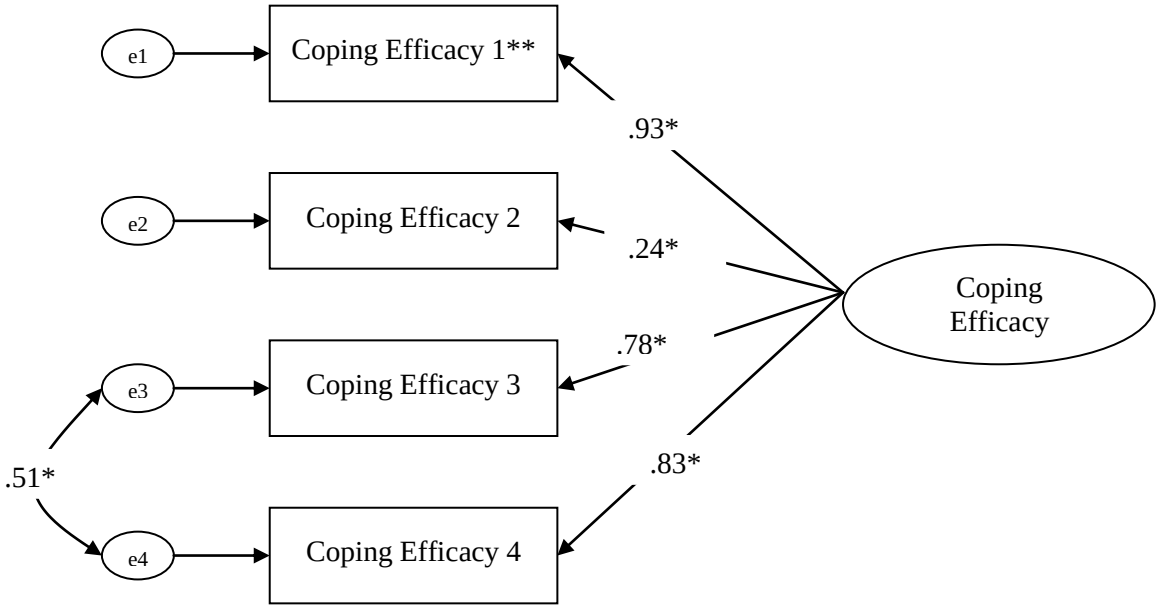
*: $p < .01$

Figure 3.7: Confirmatory Factor Analysis for Primary Appraisal

Table 3.14: *Fit Indices for Confirmatory Factor Analyses for Perception of Threat, Perception of Challenge, Primary Appraisal, Coping Efficacy, Perceived Control, and Secondary Appraisal*

Model	χ^2	**df**	***p***	**CFI**	**TLI**	**RMSEA**
Perception of Threat						
Measurement	.79	1	.78	1.00	1.00	.00
Perception of Challenge						
Measurement	11.74	2	.00	.98	.95	.12
Primary Appraisal						
Measurement	652.22	19	.00	.55	.34	.31
Coping Efficacy						
Measurement	.35	1	.46	1.00	1.00	.00
Perceived Control						
Measurement	.27	1	.60	1.00	1.00	.00
Secondary Appraisal						
Measurement	87.99	18	.00	.97	.96	.11

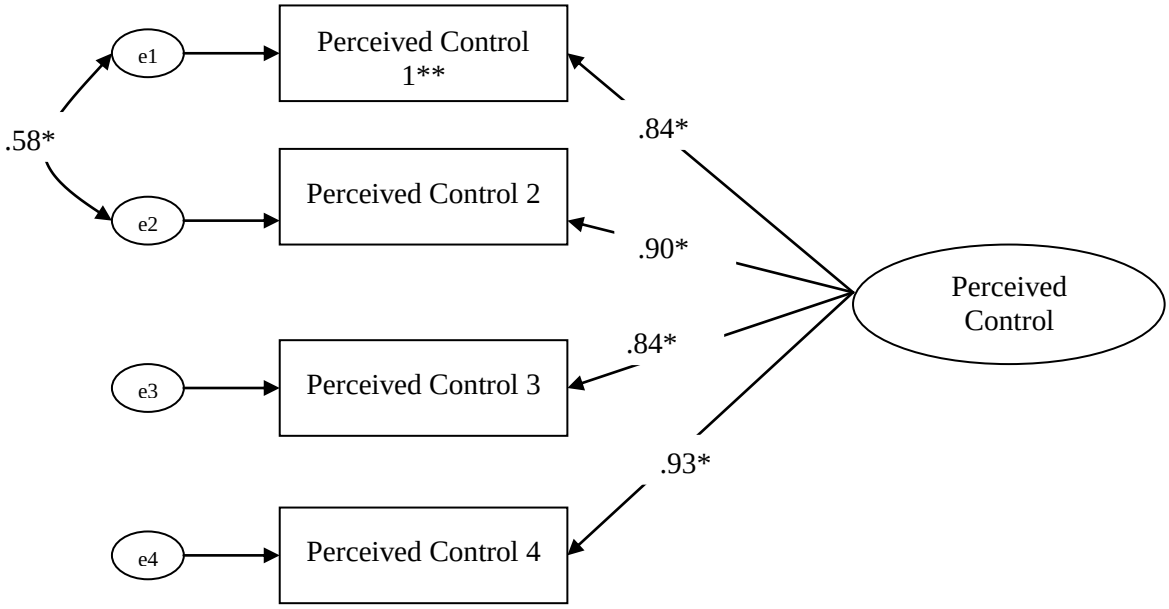
The measurement models of coping efficacy and perceived control were also tested. Overall, model fit was good and items significantly loaded under the proper latent variable (Figures 3.8 & 3.9 and Table 3.14). The items measuring these two constructs were combined into a higher order latent variable labeled secondary appraisal. Model fit for secondary appraisal was good (Figure 3.10 & Table 3.14) and each item significantly loaded on the latent construct of secondary appraisal. The final latent variable labeled "secondary appraisal" consisted of eight items. This result is consistent with Lazarus' framework.



*: $p < .01$

**: the wording for each item associated with this latent construct can be found in Appendix C

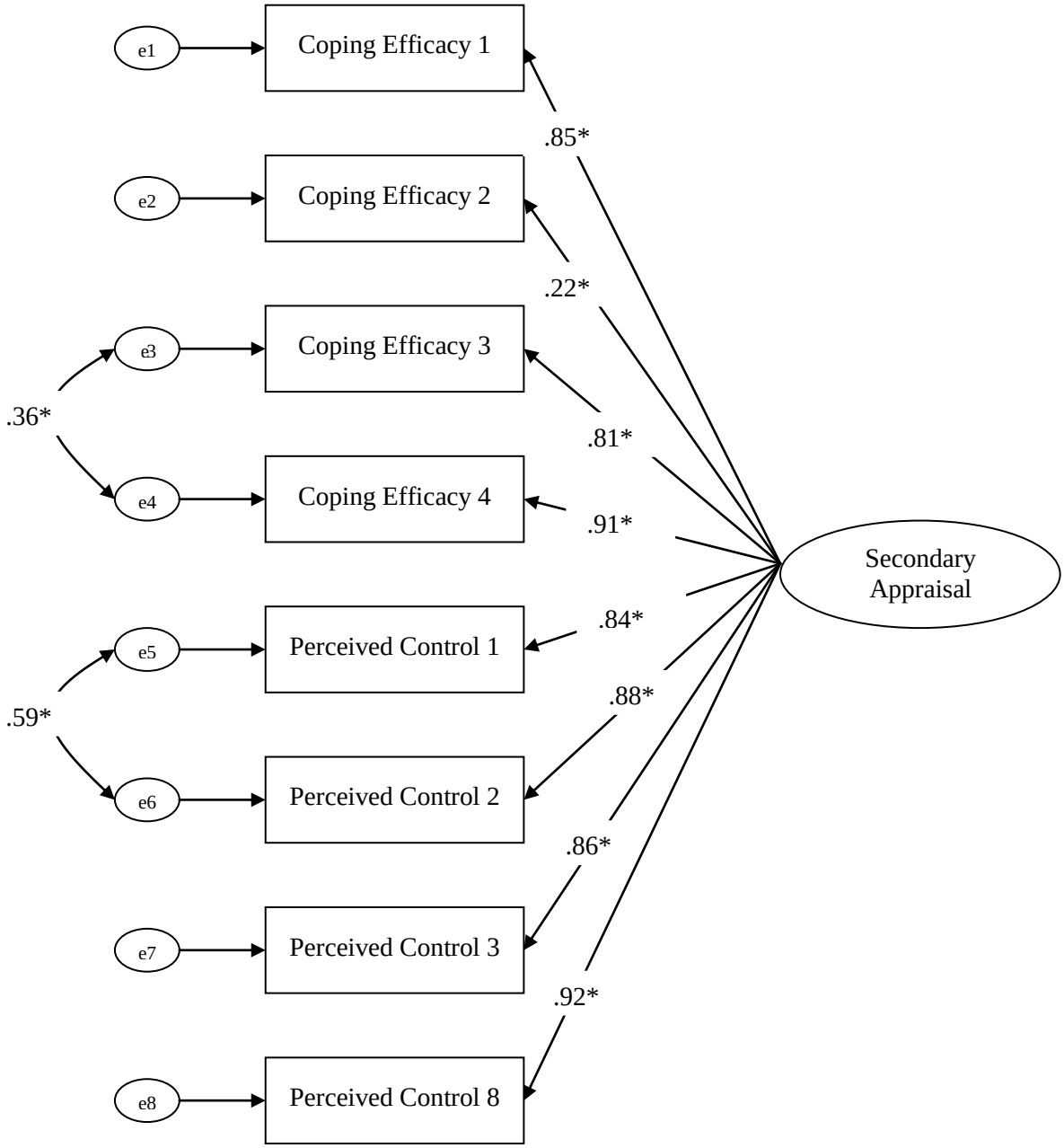
Figure 3.8: Confirmatory Factor Analysis for Coping Efficacy



*: $p < .01$

**: the wording for each item associated with this latent construct can be found in Appendix C

Figure 3.9: Confirmatory Factor Analysis for Perceived Control

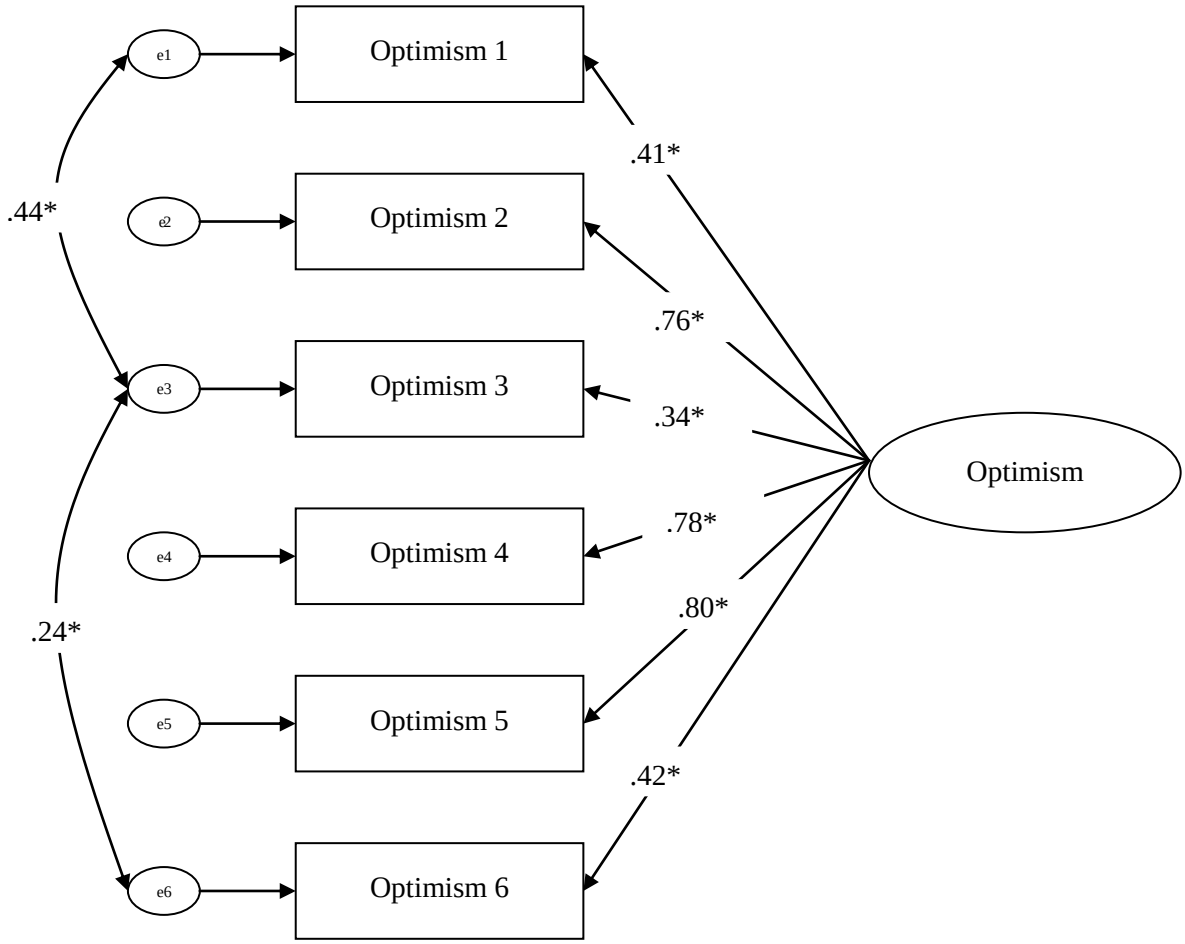


*: $p < .01$

Figure 3.10: Confirmatory Factor Analysis for Secondary Appraisal

3.6.3. Optimism and Quality of Life

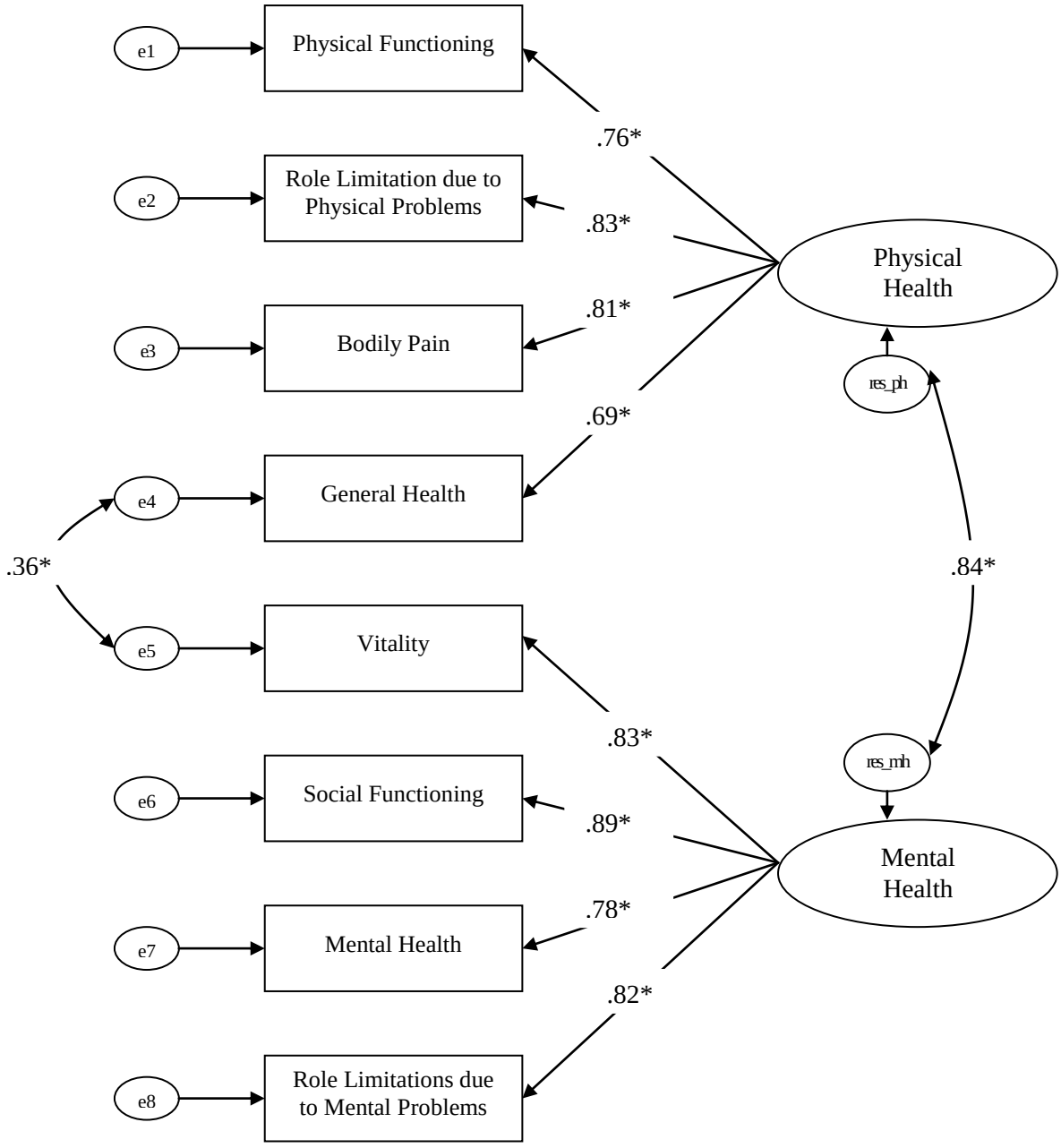
The factor structure of optimism (χ^2 = 21.76, df = 7, p < .01, RMSEA = .08; CFI = .98; TLI = .95) was good and all items loaded significantly on the latent variable (Figure 3.11). Furthermore, the structure of the model examining two higher order levels of quality of life (i.e., physical and mental health) was also good (χ^2 = 70.20, df = 18, p < .01, RMSEA = .09; CFI = .97; TLI = .96) (Figure 3.12). The two latent variables were highly correlated (r = .84). This high correlation was also consistent with what was suggested in the SF-36 Health Survey Guide (Ware et al., 2000).



*: $p < .01$

**: the wording for each item associated with this latent construct can be found in Appendix C

Figure 3.11: Confirmatory Factor Analysis for Optimism



*: $p < .01$

Figure 3.12: Confirmatory Factor Analysis for Physical and Mental Health (Quality of Life)

3.7. Testing the Overall Model

Structural equation modeling analyses was used to test hypotheses 4, 5, 7, 8.

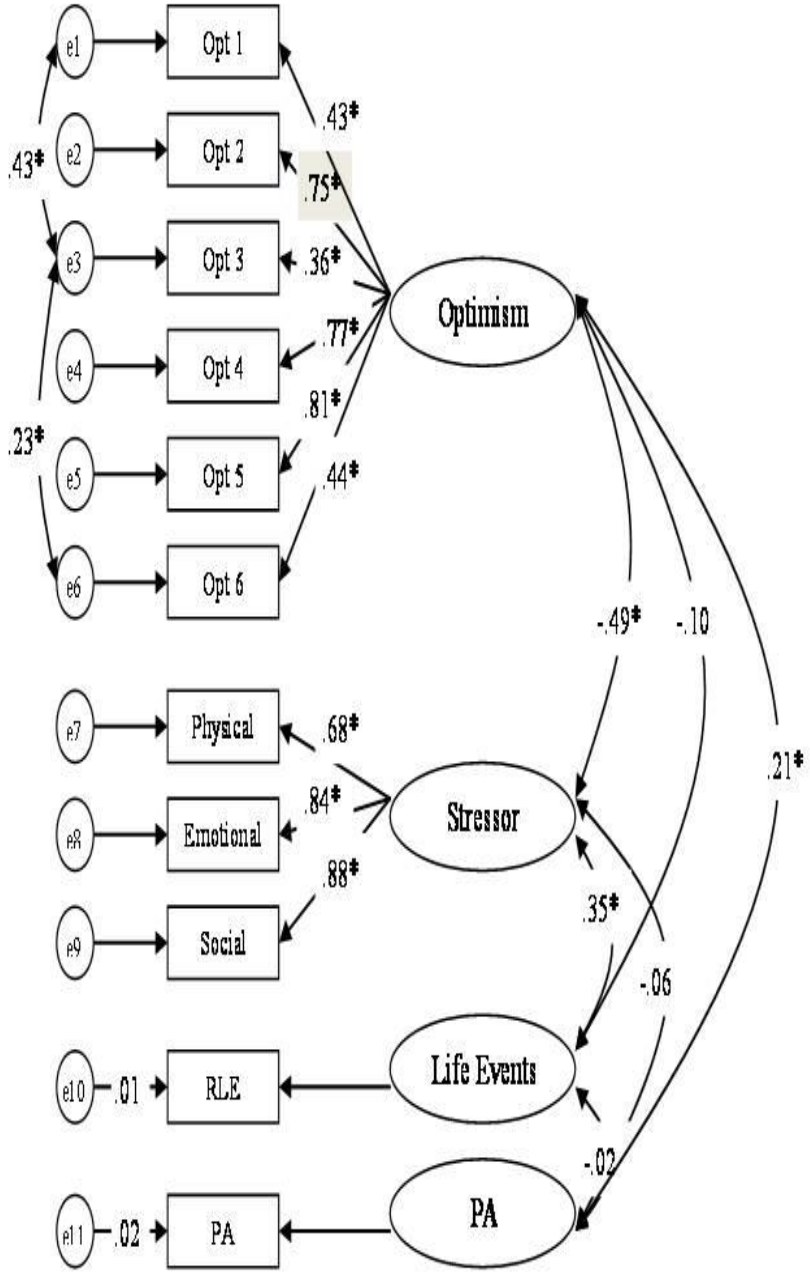
3.7.1. Predicting Stressor

Structural equation modeling analyses using maximum likelihood estimation and bootstrap techniques (number of samples was set at 2000 and confidence intervals set at 95%) were used to investigate potential predictors of cancer-related stressors. The model included two latent variables: stressor and optimism. However, physical activity (one indicator) and recent life events (one indicator) were manifest variables treated as latent variables (i.e., error terms were set to 1 - α and path coefficient to 1). This was done to investigate key relationships among those factors in the structural model. Age and BMI were also manifest variables included in the model. Cancer-related variables were not entered in the model as their relationships with stressors were not significant once entered in a model with other predictors (regression models in Appendix I).

The measurement model was first assessed to examine the relationships between indicators and factors. All indicators loaded uniquely on their respective latent factors (Figure 3.13) and model fit was good. Optimism was significantly correlated with two latent variables: stressor (r = -.49) and physical activity (r = .21). The stressor latent variable was also positively correlated with recent life events (r = .35). No other significant association was found in the measurement model. The examination of standardized residuals showed some misspecification of the model as seven residuals exceeded □2.58. Nevertheless, no specific indicator was judged problematic as this represents less than 2% of the data. Byrne (2000) also stipulates that standardized residuals are influenced by sample size. More specifically, a higher number of standardized residuals exceeding □2.58 is likely to be found in larger samples.

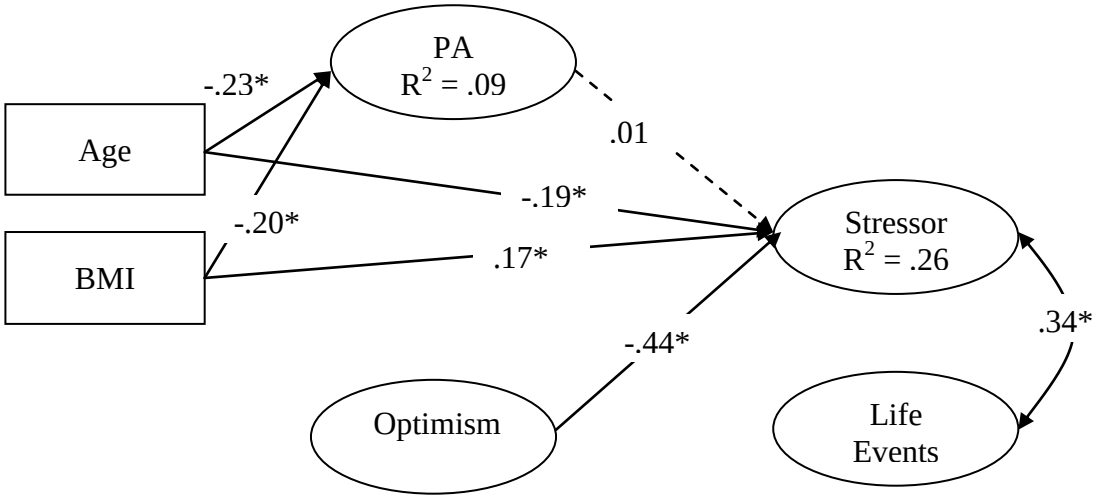
The structural model was then tested by adding direct paths between potential predictors and stressor (Figure 3.14). Furthermore, age and BMI were manifest variables included in the model. Direct paths between these two manifest variables and physical activity were also added to the model as it was previously shown (regression models) that these two indicators were significant predictors of physical activity. The overall fit for the model was good (χ^2 = 128.17, df = 60, p < .01, CFI = .95; TLI = .93; RMSEA = .06). The latent variables and manifest variables included in the model were all significant predictors of stressor with the exception of physical activity. The lack of significant association between stressor and physical activity was contradictory to our original hypothesis. Furthermore, women who scored higher on the optimism subscale reported significantly fewer stressors. This finding was consistent to hypothesis 3a. Based on modification indices, a direct path between optimism and physical activity was added and was significant (λ = .19, p < .01) (Figure 3.15). This addition significantly improved the model fit ($\Delta\chi^2$ = 10.57, df = 1, p < .01, χ^2 = 117.60, df = 59, p < .01,

CFI = .95; TLI = .94; RMSEA = .05). The predictors in the final model explained 26% of the variance in the latent construct of stressor.



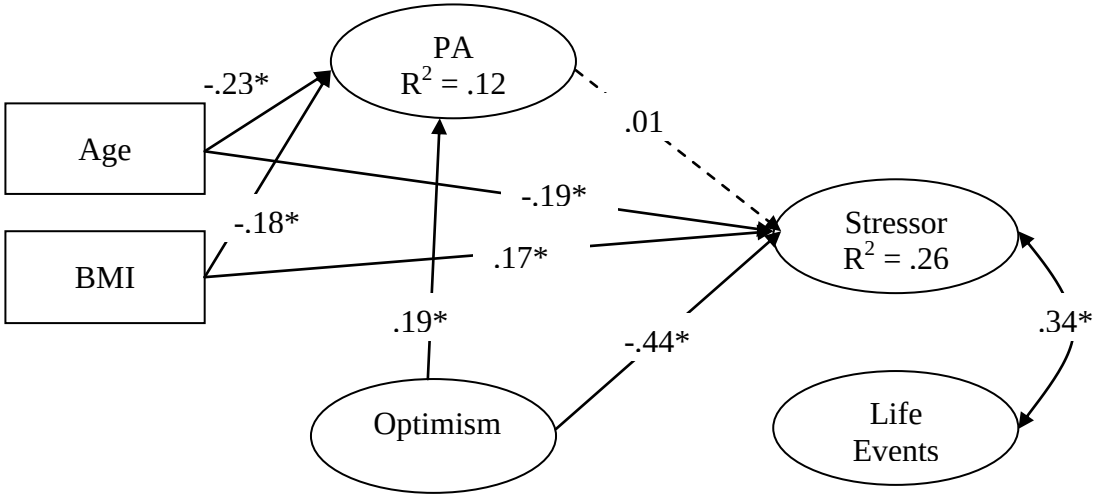
Note: *: significant at p < .01; χ^2 = 78.78, df = 38, p < .01, CFI = .97; TLI = .95; RMSEA = .06

Figure 3.13: Measurement Model including Stressor, Optimism, Life Events, and Physical Activity



Note: * = $p < .01$; Pathway coefficients are standardized estimates.

Figure 3.14: Structural Equation Modeling Predicting (M1) Stressor by Optimism, Physical Activity, Age, and BMI.



Note: * = $p < .01$; Pathway coefficients are standardized estimates.

Figure 3.15: Structural Equation Modeling Predicting (M2) Stressor by Optimism, Physical Activity, Age, and BMI.

3.7.2. Predicting Cognitive Appraisal

The two endogenous variables in this model were perception of threat and secondary appraisal. Four latent variables were used to predict these two cognitive appraisal variables: stressor, optimism, physical activity, and recent life events. Age and BMI were manifest variables also included in the model while number of years since cancer diagnosis and end of treatment were not included due to a lack of significant associations with the outcome variables.

In the measurement model, all indicators loaded uniquely on their respective latent factors (Figure 3.16 and Table 3.15) and model fit was good (Table 3.16). Stressor and optimism were correlated with perception of threat and secondary appraisal. Other significant relationships were found between recent life events and threat (r = .35) and between physical activity and secondary appraisal (r = .17). With the exception of the association between threat and stressor, all correlations were weak to moderate. The examination of standardized residuals showed some misspecification of the model as 14 residuals exceeded ±2.58 (Byrne, 2000). Closer examination revealed that one indicator of the secondary factor (i.e., item 2) was problematic and contributed to the largest residuals (11 residuals > 2.58). This item also showed the lowest factor loading (λ=.22). The decision was made to remove this item from further analyses. This decision significantly improved the fit of the model ($\Delta\chi^2$ = 128.02, Δdf = 21, p < .01; CFI = .96; TLI = .95; RMSEA = .06). Furthermore, associations among latent variables did not change significantly.

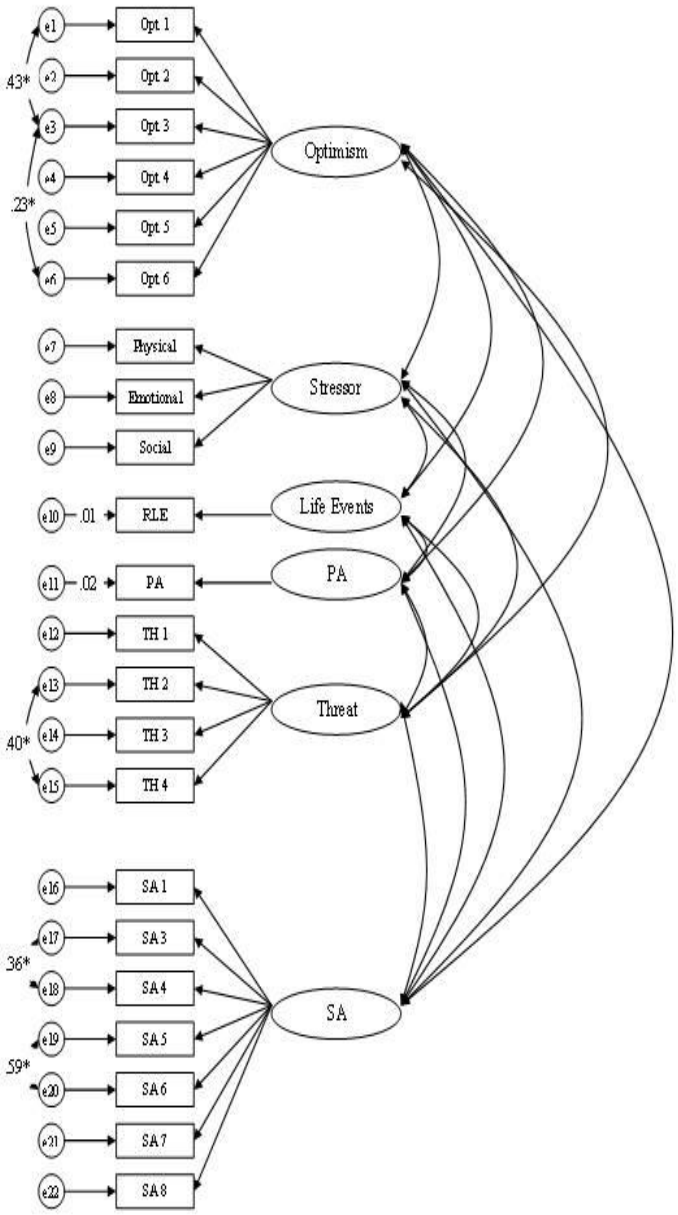


Figure 3.16: Measurement Model 2 with Stressor, Optimism, Physical Activity, Life Events, Threat, and Secondary Appraisal

Table 3.15: *Standardized Factor Loadings for the Latent Variables and Correlations among the Latent Variables in the Measurement Model including Stressor, Threat, Secondary Appraisal, Optimism, Physical Activity, and Life Events*

Latent variables and indicators	Factor loadings	Correlations					
		Stressor	**Threat**	**SA**	**Optimism**	**PA**	**Life Events**
Stressor		--	.87**	-.28**	-.49**	-.06	.35**
Physical	.68						
Emotional	.86						
Social	.85						
Threat			--	-.29**	-.45**	-.09	.35**
TH 1	.87						
TH 2	.63						
TH 3	.85						
TH 4	.81						
SA				--	.43**	.17**	-.04
SA1	.85						
SA3	.81						
SA4	.91						
SA5	.84						
SA6	.88						
SA7	.86						
SA8	.92						
Optimism					--	.21**	-.10
OPT1	.43						
OPT2	.75						
OPT3	.37						
OPT4	.77						
OPT5	.80						
OPT6	.45						

Latent variables and indicators	Factor loadings	Correlations					
		Stressor	Threat	SA	Optimism	PA	Life Events
Physical Activity						--	-.02
PA	1.00						
Life Events							
RLE	1.00						--

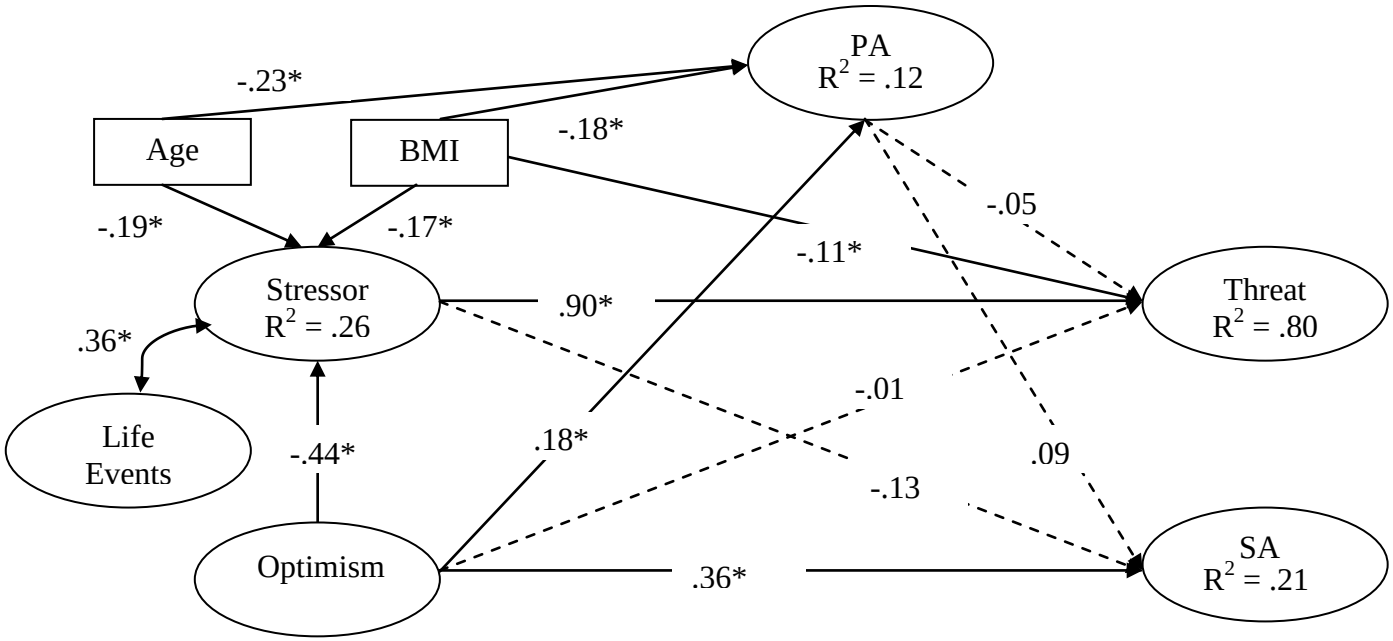
Note: * = $p < .05$; ** = $p < .01$; All standardized factor loadings are significant at $p < .01$. SA= secondary appraisal; PA = physical activity

Table 3.16*: Fit Indices for Measurement Model and Structural Models Predicting Cognitive Appraisal Constructs*

Model	χ^2	**df**	$\Delta\chi^2$	**Δdf**	***p***	**CFI**	**TLI**	**RMSEA**
Measurement 1	547.91	212	--	--	--	.94	.92	.07
Measurement 2	419.89	191	128.02	21	<.01	.96	.95	.06
M1	516.25	234	96.36	43	<.01	.95	.94	.06
M2	526.04	241	9.79	7	ns	.95	.94	.06

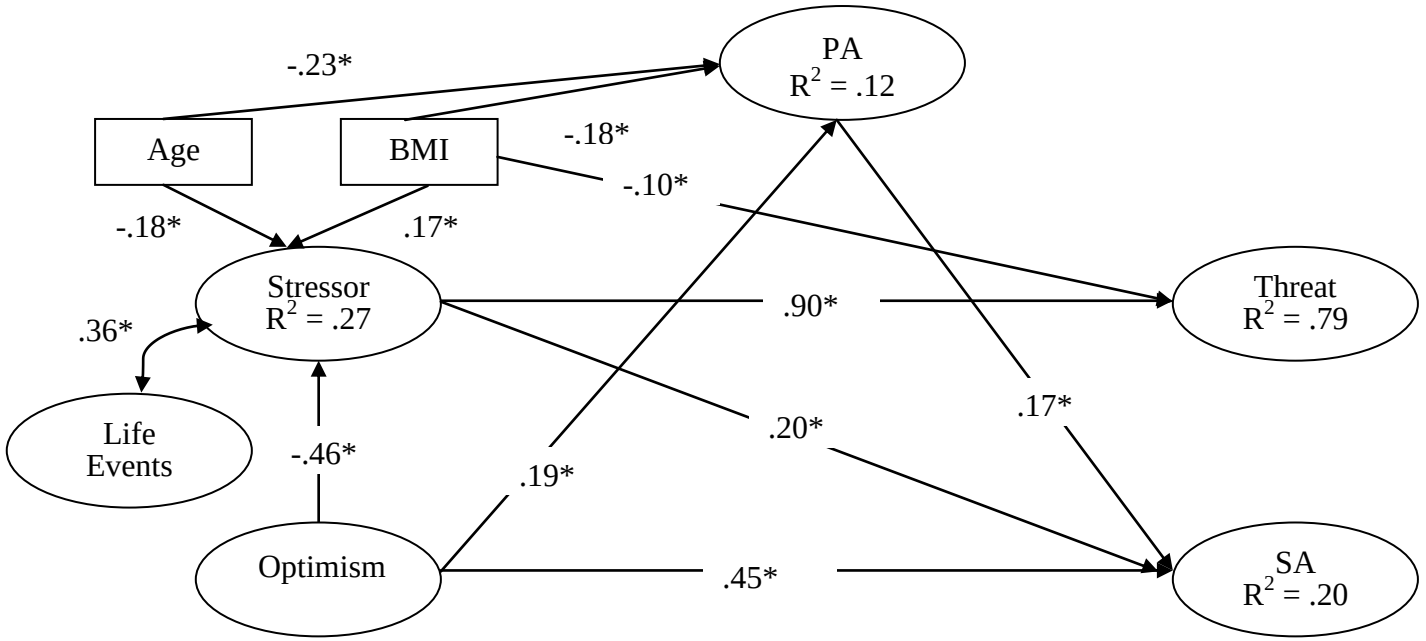
Note: χ^2 = chi-square; df = degree of freedom; $\Delta\chi^2$ = difference in chi-square; Δdf = difference of degree of freedom; CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA=root mean square error of approximation; Measurement 1: measurement model with all indicators; Measurement 2: measurement model with one indicator (item number 2) of secondary appraisal removed; M1: initial model based on theoretical concepts and hypotheses; M2: modified model where not significant paths between variables were removed

The structural model was then tested by adding direct paths between potential predictors and the two latent variables representing cognitive appraisal (Figure 3.17). The latent construct of recent life events was only used to partial out reported stressor that were not associated with cancer. Consistent with previous models, age and BMI were manifest variables included in the model. Furthermore, direct paths were added between these two manifest variables and the cognitive appraisal variables to test hypothesis 3a. The overall fit for the model was good ($\Delta\chi^2$ = 96.36, Δdf = 43, $p < .01$; χ^2 = 516.25, df = 234, CFI = .95; TLI = .94; RMSEA = .06) and was a significant improvement from the measurement model (Table 3.16 and Figure 3.17). Consistent with hypotheses 2 and 3a, stressor and BMI were significant correlates of threat and explained 80% of its variance. Overall, women who reported higher total stressor scores and had higher body mass index values reported perceiving those stressors as more threatening. ÿÿntradictory toÿÿriginal hypotheses, stressor was not a significant predictor of secondary appraisal while age was not associated with any of the appraisal construct. Nevertheless, 21% of the variance in secondary appraisal was predicted but optimism was the sole significant predictor. More optimistic women were likely to report higher scores for secondary appraisal. Finally, removing the paths between manifest and latent variables included in the model that were not significant did not affect the overall fit of the model (Table 3.16 and Figure 3.18). It is important to note that the structural pathways between latent variables in these models were somewhat different than the latent variable correlations found in Table 15 (obtained from the measurement model). In the structural models, associations between latent variables were enhanced or reduced as the effects of all other latent constructs associated with a specific endogenous variable were taken into account (i.e., shared variance).



Note: * = $p < .01$; Pathway coefficients are standardized estimates; Age was not a significant predictor of Threat ($\beta = .02$) and SA ($\beta = -.06$); BMI was not a significant predictor of SA ($\beta = .07$).

Figure 3.17: Structural Equation Modeling Predicting (M1) Cognitive Appraisal with Stressor, Optimism, and Physical Activity.



Note: * = $p < .01$; Pathway coefficients are standardized estimates.

Figure 3.18: Structural Equation Modeling Predicting (M2) Cognitive Appraisal from Stressor, Optimism, and Physical Activity.

3.7.3. Predicting Quality of Life

In the measurement model, all indicators loaded uniquely on their respective latent factors (Figure 3.21 and Table 3.17) and model fit was good (see Table 3.18). Mental and physical health were significantly correlated with all variables in the model. Mental health was highly correlated with stressor (r = -.78) and perception of threat (r = -.70) while physical health was moderately correlated to those two variables (r = -.65 and -.60 respectively). Other moderate relationships were found between the two domains of quality of life and optimism as well as with secondary appraisal. Physical and mental health were highly correlated (r = .84). The examination of standardized residuals showed some misspecification of the model as 11 residuals exceeded ±2.58 (Byrne, 2000). Nevertheless, no specific indicator was judged problematic as this represents less than 2% of the data.

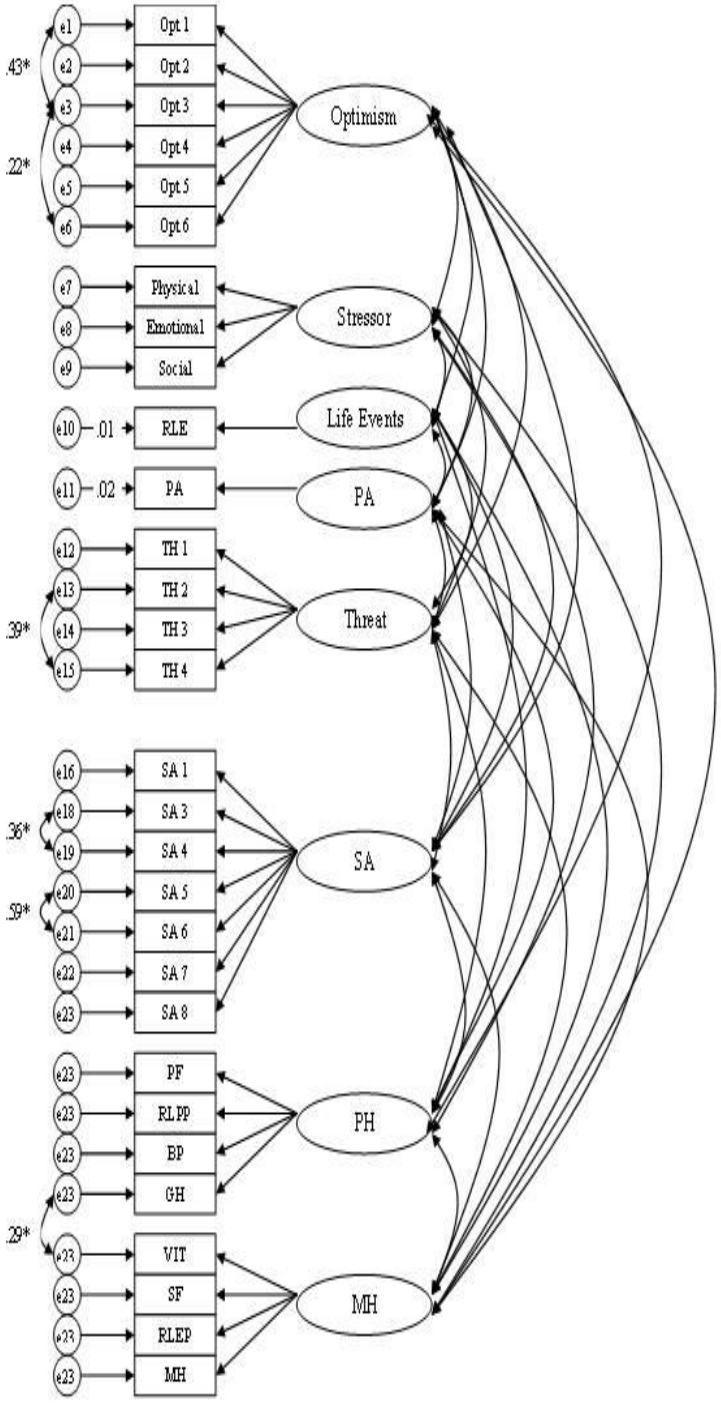


Figure 3.19: Measurement Model with Stressor, Optimism, Physical Activity, Life Events, Threat, Secondary Appraisal, Physical Health, and Mental Health

Table 3.17: *Standardized Factor Loadings for the Latent Variables and Correlations among the Latent Variables in the Measurement Model including Stressor, Threat, Secondary Appraisal, Optimism, Physical Health, Mental Health, Physical Activity, and Life Events*

Latent variables and indicators	**Factor loadings**	**Correlations**							
		Stressor	**Threat**	**SA**	**Optimism**	**Physical Health**	**Mental Health**	**PA**	**Life Events**
Stressor		--	.88**	-.28**	-.49**	-.68**	-.78**	-.06	.35**
Physical	.71								
Emotional	.85								
Social	.85								
Threat			--	-.29**	-.45**	-.60**	-.70**	-.09	.35**
TH 1	.87								
TH 2	.64								
TH 3	.85								
TH 4	.81								
SA				--	.43**	.22**	.36**	.17**	-.04
SA1	.85								
SA3	.81								
SA4	.91								
SA5	.84								
SA6	.88								
SA7	.86								
SA8	.92								
Optimism					--	.46**	.55**	.21**	-.10
OPT1	.43								
OPT2	.75								
OPT3	.39								
OPT4	.78								
OPT5	.79								
OPT6	.45								

Latent variables and indicators	Factor loadings	Correlations							
		Stressor	Threat	SA	Optimism	Physical Health	Mental Health	PA	Life Events
Physical Health						--	.84**	.31**	-.31**
PF	.77								
RLPP	.82								
BP	.81								
GH	.70								
Mental Health							--	.20**	-.39**
VIT	.83								
SF	.88								
MH	.80								
RLEP	.82								
Physical Activity								--	-.02
PA	1.00								
Life Events									
RLE	1.00								--

Note: * = $p < .05$; ** = $p < .01$; All standardized factor loadings are significant at $p < .01$. SA= secondary appraisal; PA = physical activity

Table 3.18*: Fit Indices for Measurement Model and Structural Models Predicting Quality of Life*

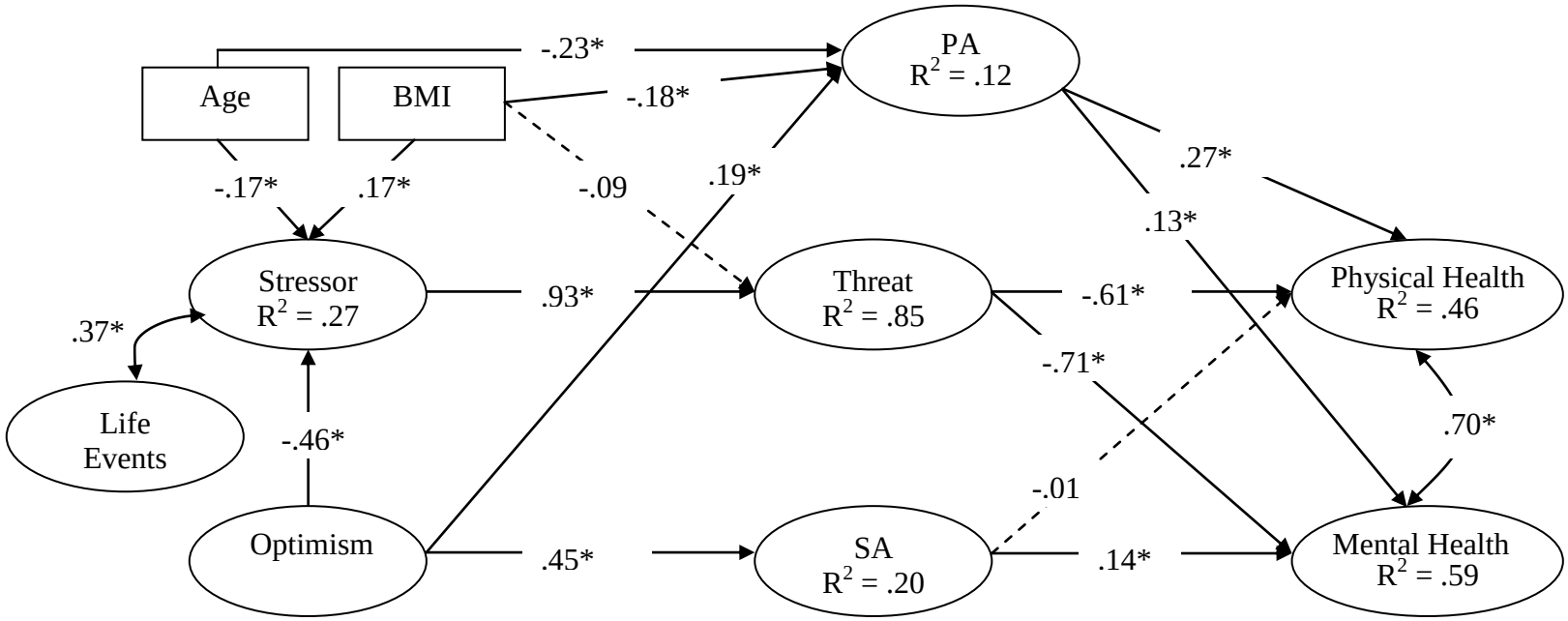
Model	χ^2	**df**	$\Delta\chi^2$	**Δdf**	***p***	**CFI**	**TLI**	**RMSEA**
Measurement	874.76	373	--	--	--	.93	.92	.06
M1	1121.20	445	246.44	72	<.01	.91	.90	.07
M2	1072.48	442	48.72	3	<.01	.92	.91	.07
M3	1092.20	444	19.72	4	ns	.91	.91	.07
M4	1008.26	442	35.20	2	<.01	.93	.92	.06
Measurement 2	403.47	136	--	--	--	.92	.90	.08
M5	507.60	175	104.13	39	<.01	.91	.89	.07

Note: χ^2 = chi-square; df = degree of freedom; $\Delta\chi^2$ = difference in chi-square; Δdf = difference of degree of freedom; CFI = confirmatory fit index; TLI = Tucker-Lewis index; RMSEA=root mean square error of approximation; M1: initial model based on theoretical concepts and hypotheses; M2: modified model consistent with theoretical framework and based on other relationships suggested in the literature (relationships between optimism and quality of life and age and physical health); M3: modified model where not significant paths between latent variables were removed; M4: modified model were direct paths between stressor and quality of life domains were added to test hypothesis 5; Measurement 2: measurement model of the model without cognitive appraisal; M5: structural model were perception of threat and secondary appraisal were removed to test a more parsimonious model.

In the structural model, the paths between latent variables were examined in the hypothesized model (Figures 1.2 & 3.20). Somewhat consistent with hypothesis 4a, threat was a significant predictor of physical and mental health. Secondary appraisal, on the other hand, was not significantly associated with physical health but was a correlate of mental health. This was somewhat contradictory with the original hypothesis as it was hypothesized that secondary appraisal would also be a significant correlate of physical health. Physical activity was also significantly correlated with both mental and physical health, indicating that more active people reported higher levels of physical and mental health. Hence, hypothesis 7a was accepted. Furthermore, mental and physical health were significantly correlated at .70. Finally, all the significant structural paths between latent variables as well as paths between manifest (i.e., age and BMI) and latent variables previously found remained significant, with the exception of the direct path between BMI and threat (-.09). The overall fit for this model (Table 3.18) was good (χ^2 = 1121.20, df = 445, $p < .01$; CFI = .91; TLI = .90; RMSEA = .07).

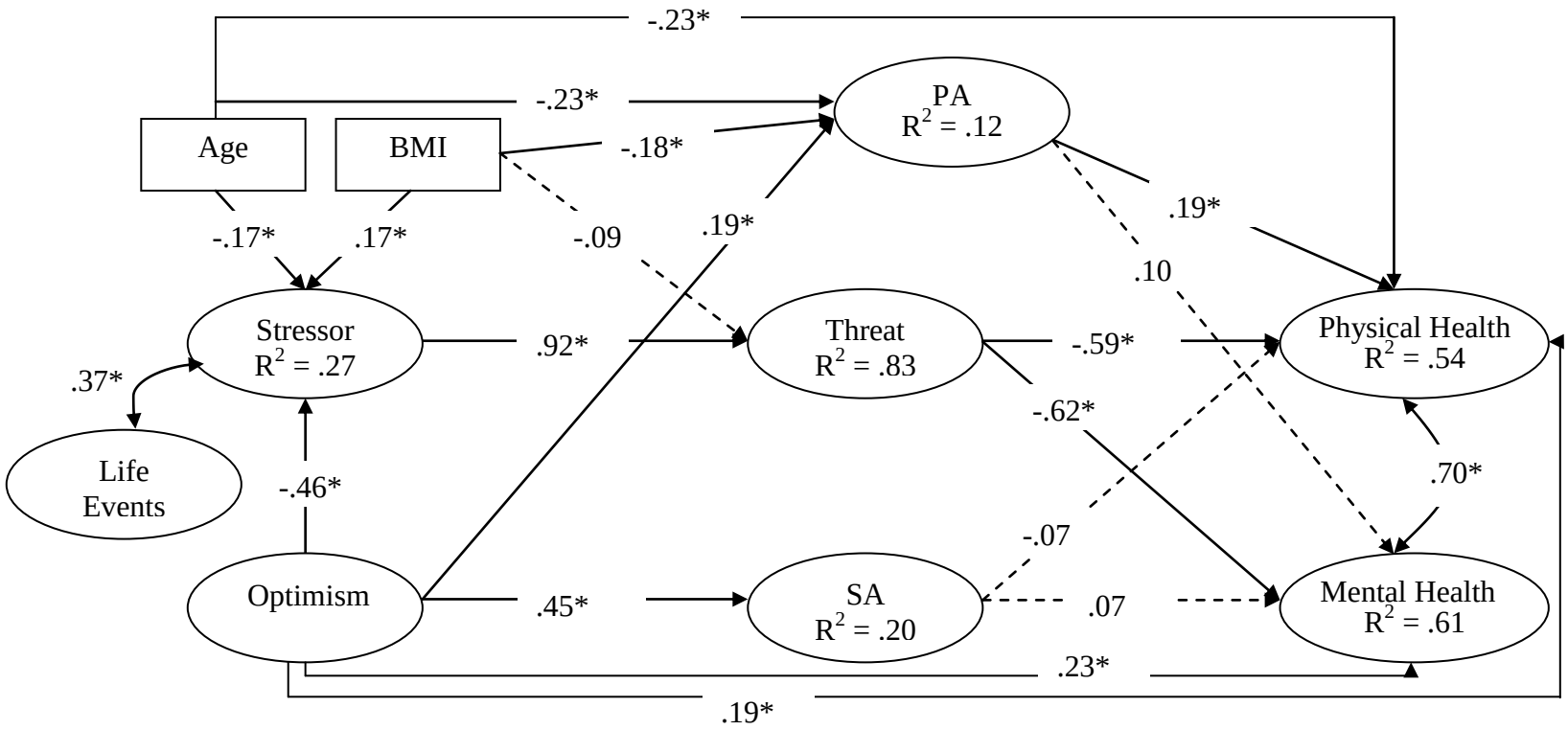
Variations of this model were also examined to test hypothesis 3a. Furthermore, modification indices suggested that the model could be significantly improved by adding several paths between latent variables. Only the modifications that made theoretical sense based on Lazarus' propositions were made. Specifically, direct paths between optimism and both quality of life domains were added as well as between age and physical health (Figure 3.21). The fit indices for the modified model (M2) ($\Delta\chi^2$ = 48.72, df = 3, $p < .01$; χ^2 = 1072.48, df = 442; CFI = .92; TLI = .91; RMSEA = .07) were acceptable. The direct paths between optimism and the two higher order levels of quality of life were significant. Higher levels of optimism were associated with greater mental and physical health. Age was also found as a significant predictor of physical health. This was consistent with hypothesis 3a. Nevertheless, two pathways were not longer

significant due to shared variance between optimism and physical activity. First, physical activity was no longer linked to mental health. Also, the effect of secondary appraisal on mental was no longer seen.



Note: * = $p < .01$; Pathway coefficients are standardized estimates

Figure 3.20: Structural Equation Modeling Predicting (M1) Quality of Life by Cognitive Appraisal, Stressor, Optimism, and Physical Activity.

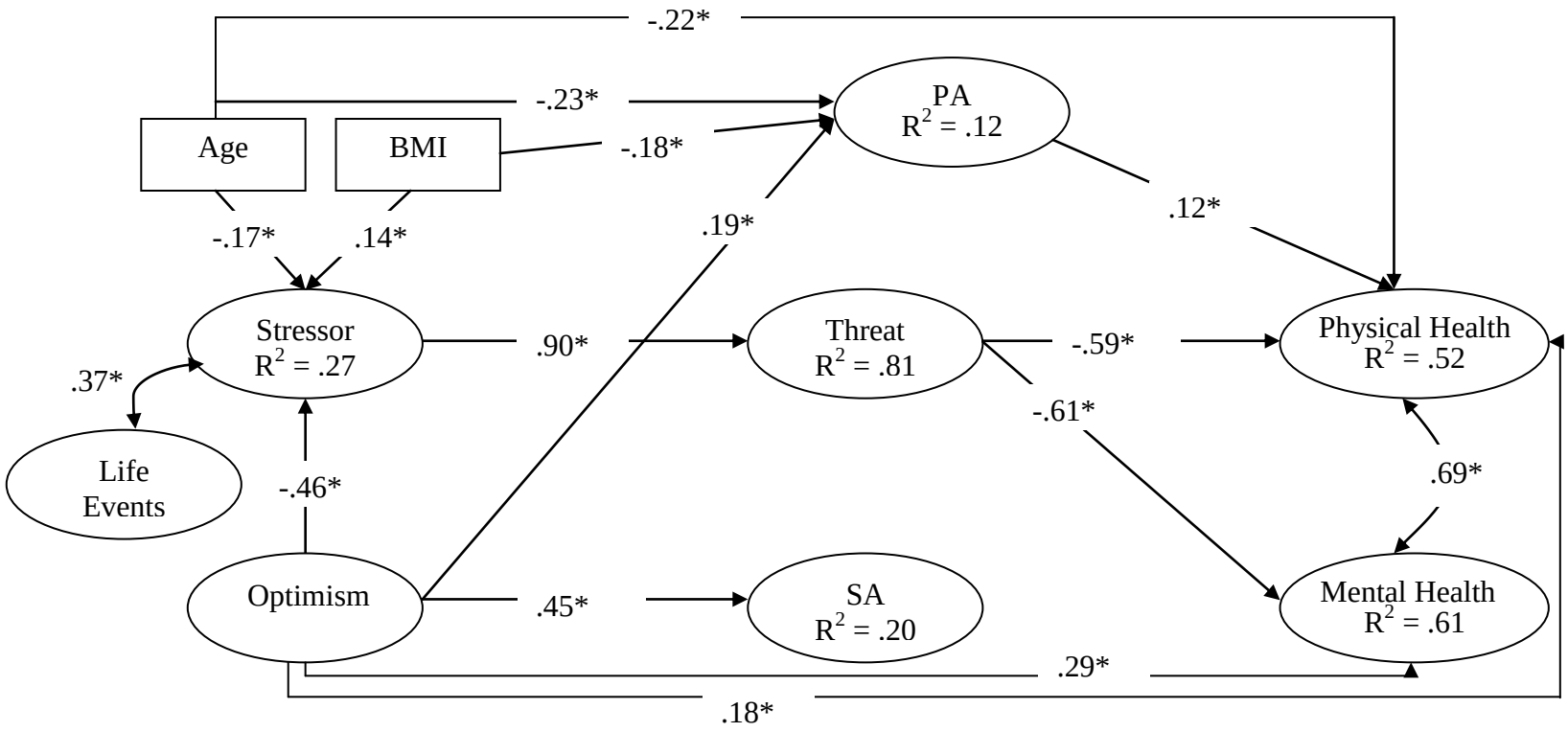


Note: * = $p < .01$; Pathway coefficients are standardized estimates

Figure 3.21: Structural Equation Modeling Predicting (M2) Quality of Life by Cognitive Appraisal, Stressor, Optimism, and Physical Activity.

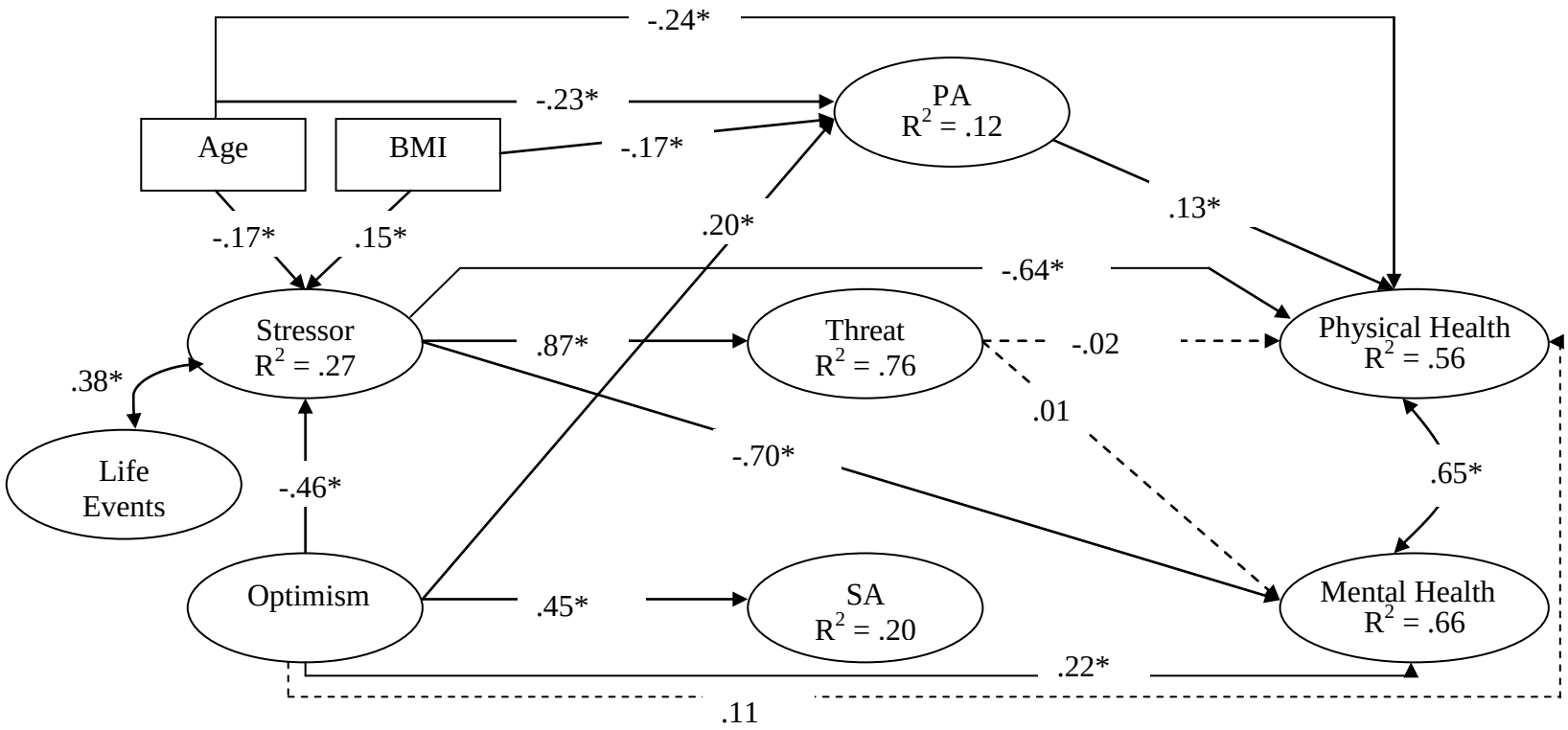
In the third structural model (M3), the paths that were not significant were removed (Figure 3.22). Model fit remained unchanged ($\Delta\chi^2$ = 19.72, df = 4, p = ns; χ^2 = 1092.20, df = 446; CFI = .91; TLI = .91; RMSEA = .07). Sixty-one percent of the variance in mental health was explained by the model while the combination of latent and manifest variables explained 52% of the variance in physical health. Finally, age was a significant correlate of physical health. More specifically, older women reported lower levels of physical health.

One variation of the structural model was tested (M4) where direct paths between stressor and the two higher-order quality of life domains were added (Figure 3.23). This model was tested to address hypothesis 5. These paths emerged as significant and the fit for this alternative model was good (χ^2 = 1063.21, df = 444, $p < .01$, RMSEA = .06; CFI = .93; TLI = .92). It also represented an improvement from the previous model (M3) ($\Delta\chi^2$ = 28.99, df = 2, $p < .01$). Overall, women who reported higher stressor scores experienced lower levels of quality of life. In this model, 56% and 66% of the variance in physical and mental health were predicted respectively. This was consistent with our original hypothesis. However, threat was no longer a significant predictor of physical and mental health. This alternative model was judged inconsistent with Lazarus' appraisal-based model where cognitive appraisal is a pivotal construct.



Note: * = $p < .01$; Pathway coefficients are standardized estimates

Figure 3.22: Structural Equation Modeling Predicting (M3) Quality of Life by Cognitive Appraisal, Stressor, Optimism, and Physical Activity.



Note: * = $p < .01$; Pathway coefficients are standardized estimates

Figure 3.23: Structural Equation Modeling Predicting (M4) Quality of Life by Cognitive Appraisal, Stressor, Optimism, and Physical Activity.

3.7.4. Parsimonious Model

A final model was tested where perception of threat and secondary appraisal were removed (Figures 3.24-3.25 and Table 3.19 for measurement and structural models). While this model was not entirely in line with Lazarus' model, it was expected to be the most parsimonious model as the data suggested that perception of threat may be redundant to the model (i.e., high correlation between stressor and threat). Furthermore, secondary appraisal was not a significant correlate of any of the two higher dimensions of quality of life. This model explained a greater percentage of variance in physical (61%) and mental (70%) health. Model fit, however, was not ideal as one of the three indices was below acceptable value. Nevertheless, most of the paths were significant, with the exception of the relationship between optimism and physical health. Also, a direct path between age and mental was added and was significant. In the current model, age was a significant correlate of both higher orders of quality of life. More specifically, older survivors reported lower levels of physical and mental health.

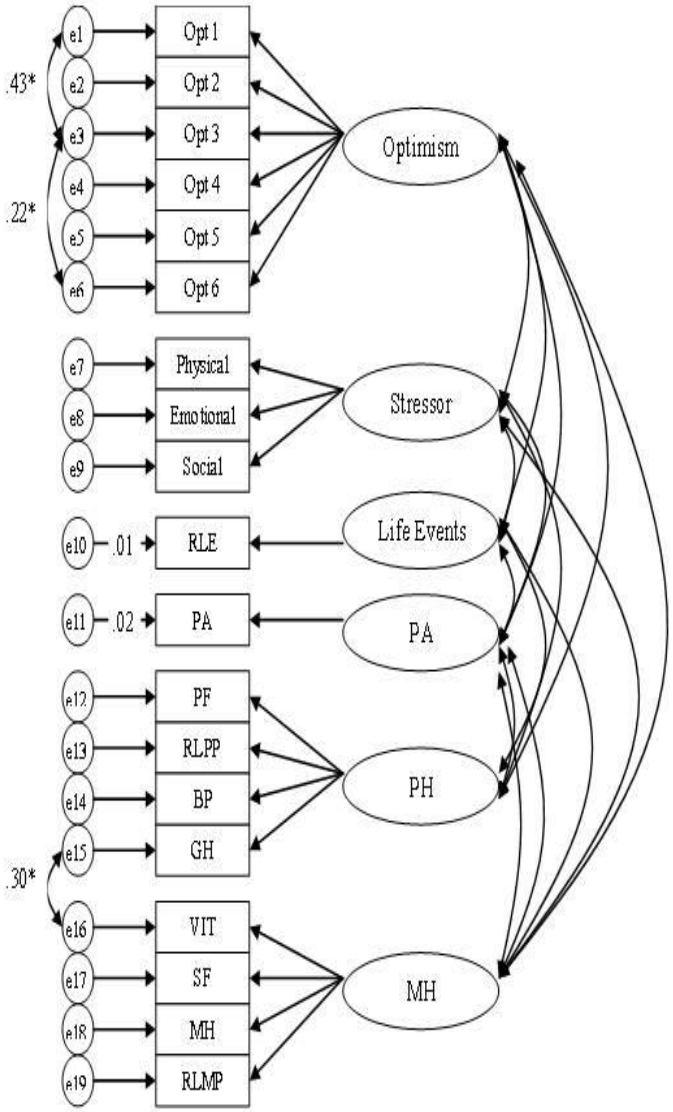
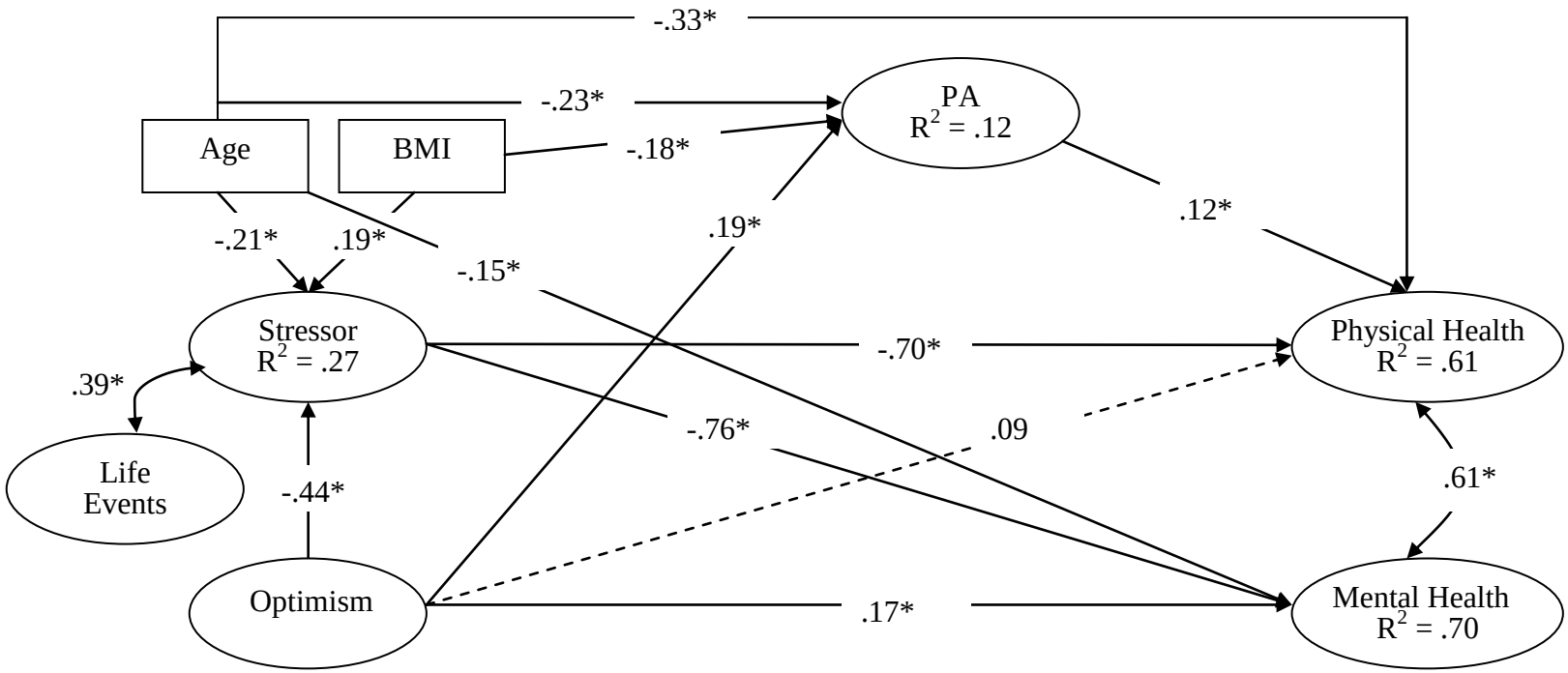


Figure 3.24: Measurement Model 2 with Stressor, Optimism, Physical Activity, Life Events, Physical Health, and Mental Health

Table 3.19*: Standardized Factor Loadings for the Latent Variables and Correlations among the Latent Variables in the Measurement Model including Stressor, Optimism, Physical Health, Mental Health, Physical Activity, and Life Events*

Latent variables and indicators	Factor loadings	Correlations					
		Stressor	**Opt**	**Physical Health**	**Mental Health**	**PA**	**Life Events**
Stressor			-.49**	-.66**	-.79**	-.06	.36**
Physical	.73						
Emotional	.83						
Social	.85						
Optimism			--	.46**	.55**	.21**	-.10
OPT1	.43						
OPT2	.75						
OPT3	.37						
OPT4	.78						
OPT5	.80						
OPT6	.44						
Physical Health				--	.84**	.31**	-.31**
PF	.77						
RLPP	.82						
BP	.81						
GH	.70						
Mental Health					--	.20**	-.39**
VIT	.83						
SF	.88						
MH	.80						
RLEP	.82						
Physical Activity						--	-.02
PA	1.00						
Life Events							
RLE	1.00						--

Note: * = $p < .05$; ** = $p < .01$; All standardized factor loadings are significant at $p < .01$. Opt= optimism; PA = physical activity



Note: * = $p < .01$; Pathway coefficients are standardized estimates

Figure 3.25: Structural Equation Modeling Predicting (M5) Quality of Life by Stressor, Optimism, and Physical Activity.

3.7.5. Examining Mediating Variables

The mediating role of stressor, threat, secondary appraisal, and physical activity was investigated by looking at total and indirect effects in relationships involving those three latent variables. According to Baron and Kenny's (1986) recommendations, four steps need to be considered when testing meditational models and significance should be reached at all four steps. First, the relationship between the independent variable (IV) and dependent variable needs to be examined. Next, the association between IV and the mediating variable (MV) needs to be determined and well as the correlation between MV and DV. Finally, a partial or complete reduction of the effect of IV on DV while controlling for MV needs to be seen. Structural model M4 was used to test potential mediators. Based on this model, threat, secondary appraisal, and physical activity could not be considered potential mediators as each of those mediating variable violated one (or more) of the conditions identified by Baron & Kenny (1986).

Due to the complexity of the structural model, the values for the indirect effects between independent and dependent variables were influenced by many variables in the models other than the mediating variables. Hence, the relative contribution of the mediating variables was computed when examining this relationship and a critical ratio was computed to determine the significance of this effect ($z \geq 1.96$ were significant).

Stressor partially mediated the relationships involving optimism and mental health (Table 3.20). The mediating effect of stressor accounted for 60% of the total effect between optimism and mental health. Overall, this result showed that while optimism had a direct effect on mental health, being optimistic was also linked to one's exposure to stressors. The type of stressor experienced, in turn, had a positive influence on mental health.

Table 3.20*: Testing for Mediation in the Structural Model predicting Quality of Life*

Indirect relationships	Indirect effects (total) [a]	CI	Indirect effect [b]	SE	Z	Total effect	CI	Ratio (IE/TE) [c]
Mediator: Stressor								
OPT → MH	9.91*	[6.65,14.92]	9.91*	3.77	2.62	16.71*	[11.76,23.93]	.60
OPT → Stressor						-.28*	[-.40,-.20]	

Note: * = $p < .05$; all values are unstandardized parameter estimates; [a]= Indirect effect including all mediating variables; [b]= Relative contribution of one mediating variable (keeping the other mediating variables constant); [c]= Ratio = indirect effect (relative contribution)/total effects; OPT= optimism; MH= mental health; CI=confidence interval

3.7.6. Examining Moderating Variables

The potential moderating effects of personal (i.e., age, BMI, optimism, and physical activity), cancer-related variables (i.e., time since diagnosis and end of treatment), and stress-related variables (i.e., stressor, threat, and secondary appraisal) were investigated using structural equation modeling. All variables in the model were continuous. No significant ($p < .01$) moderating effect was found when looking at all possible interaction terms including the variables identified above.

CHAPTER 4: DISCUSSION

4.1. Discussion

Cancer is considered one of the most prevalent chronic diseases in Canada, with breast cancer emerging as the most common type of cancer diagnosed in Canadian women (Canadian-Cancer-Society, 2009). While the immediate, and predominantly negative impact of cancer diagnosis and treatment on survivors' lives, has consistently been reported (Deimling et al., 2002), research examining quality of life of long term survivors also suggests that new stressful events are likely to arise and can pose serious challenges to adaptation. Nevertheless, few studies have examined the specific nature and meanings of different stressful events to survivors and their effect on quality of life using stress and coping frameworks. To address this limitation, the current study investigated the influence of stress-related variables on quality of life of breast cancer survivors post-treatment using Lazarus' stress framework. Moreover, the direct and indirect effects of individual characteristics, including physical activity and personality trait, and cancer-related characteristics on stress-related variables were investigated.

Overall, the findings highlight the important effects of stressors, personality, and physical activity on quality of life. Together, these constructs explained 61% and 70% of the variance in physical and mental health respectively. Experiencing more stressors was associated with reporting lower levels of quality of life. This was consistent with previous research showing the negative relationship between various cancer-related experiences and perceived distress and quality of life (Bloom et al., 2004; Carver et al., 2006; Ferrell et al., 1995). Noteworthy to this study is the use of a unique approach to understand stress relationships by examining specific cancer-related stressors previously identified by breast cancer survivors. The frequency and intensity of each stressor were measured. While most of the stressors were perceived to occur, on average, only a few times a month and were seen as somewhat intense, they still had a significant

effect on quality of life. Furthermore, the current findings suggest that the effect of cancer-related stressors on quality of life remained significant regardless of the meaning given to those stressors as perception of threat was not shown to mediate the relationship between stressor and quality of life in the parsimonious model (Figure 3.27). This was somewhat contradictory to Lazarus' model where cognitive appraisal is depicted as a pivotal construct mediating relationships between stressful situations, coping, and coping outcomes. While Lazarus suggests that stress transactions are dynamic in nature and need to be reassessed regularly to capture changes in meaning, cancer-related stressors seemed to be occurring chronically (i.e., stressor experienced a few times a month but of moderate intensity) in the current study. This finding is of interest for health-care practitioners working with breast cancer survivors post-treatment as it provides evidence that interventions designed around eliminating specific cancer-related stressors could prove effective at improving quality of life - an outcome variable of interest in many psychosocial oncology studies.

Quality of life has repeatedly been an outcome variable in many intervention studies where cancer survivors were subjected to different physical activity regimens (Blanchard, Courneya, & Stein, 2008; Courneya, 2003; Culos-Reed, Shields, & Brawley, 2005; Pinto et al., 2005). The purpose of such interventions was often to try to minimize the negative consequences resulting from a lack of physical activity. Insufficient physical activity levels in cancer survivors post-treatment is often an important concern for health care practitioners as most survivors have been shown to fall short from meeting the minimal physical activity requirements (Blanchard et al., 2003; Courneya et al., 2008). Our study adds to the literature on physical activity by highlighting the benefits of physical activity for physical health of breast cancer survivors. A positive relationship between active behaviours and physical health was seen for our survivors,

who were self-selecting various types of physical activity as opposed to being instructed on specific physical activity mode, frequency, duration, and intensity. From our findings, it can be inferred that survivors can experience a number health-related benefits when they decide to become physically active, even if they do not quite meet the complete requirements for physical activity. Despite the positive relationship between physical activity and physical health, being physically active did not have a positive influence on any other elements of the stress process. While this was contrary to some of the original hypotheses, this finding can be seen as positive. It suggests that engaging in physical activity does not create more stress for the survivors. This is something beneficial for this population as it is well documented that survivors have faced many challenges throughout the disease trajectory which have, directly and indirectly, impacted their quality of life (Ferrell et al., 1995).

This study also highlights the importance of considering personality and age when looking at potential long-term challenges faced by survivors, and their influence on quality of life. Optimism was shown to have a direct impact on mental health of cancer survivors. More specifically, optimistic survivors were more likely to report higher levels of mental health. Knowing someone's predisposition to experience higher levels of emotional well-being could prove useful when designing interventions specific to each survivor as the focus of the intervention could be shifted to different dimensions of well-being (e.g., physical health). Strategies that would complement (or counteract) the known effects of certain personality traits could also be integrated to the intervention package. For example, survivors scoring high on the neuroticism scale are more likely to experience lower levels of mental health. Inasmuch, specific strategies, such has counseling or reframing, that are focused on improving mental health should be included in the intervention package to make sure that survivors can experience enhanced

quality of life at more than one level. While physical health was not directly influenced by optimism, it was significantly predicted by age. Furthermore, age was also a correlate of mental health. In both cases, younger survivors were found to report higher levels of quality of life. This was unexpected as younger survivors often seem to manifest greater quality of life disruptions compared to their older counterparts once treatment is completed (Wenzel et al., 1999). This finding highlights the need to provide enough support (physical and emotional) to all survivors regardless of their age. While the lower levels of quality of life seen in older survivors could be attributed to the decline often seen as a result of aging, younger survivors were more likely to report higher levels of stress associated with survivorship. Taken together, these findings suggest that maximizing the effectiveness of interventions for breast cancer survivors could be achieved by considering the personality and age of the women and adapting the focus of interventions accordingly.

Overall, large amounts of variance in physical and mental health were predicted by a small number of stress-related variables as well as physical activity, and personal characteristics. This study represents an initial step towards understanding key stress-related relationships and factors influencing quality of life of breast cancer survivors. The following sections will discuss specific relationships examined in this study but first, the original hypotheses will be revisited.

4.2. Examining the Hypotheses

Due to the large number of hypotheses that were tested in the current study, the following section will highlight whether each hypothesis was supported or rejected.

Ha1: survivors did not report higher scores for emotional stressors (i.e., frequency and intensity) compared to physical and social stressors.

Ha2: this hypothesis was partly supported. Total score for each stressor factor was the strongest predictor of perception of threat but not of challenge, coping efficacy, and perceived control.

Ha3-a: this hypothesis was partly supported. Younger survivors, women of higher BMI, and women who were less optimistic reported more stressors while women of lower SES did not report more stressors. Furthermore, these survivors did not report higher levels of perceived threat and lower scores for perceived challenge, coping efficacy, and perceived control. Finally, these women reported lower levels of quality of life on five of the seven subscales (i.e., physical functioning, role limitation due to physical health problems, role limitation due to emotional problem, social functioning, and bodily pain).

Ha3-b: survivors who underwent more radical treatments (e.g., chemotherapy, mastectomy, and radiation), were diagnosed at later stages of disease, and were less than five years post-treatment did not appraise stressors as more threatening and less controllable. Furthermore, they did not perceive not having the ability to cope with the stressors and did not report lower levels of physical and mental health. However, women who were diagnosed at stage two or three of the disease and/or had undergone chemotherapy treatments were more likely to report higher scores on the physical stressor factor.

Ha4: this hypothesis was partly supported. Some constructs of cognitive appraisal were found to have a direct effect on quality of life. More specifically, perception of threat had a significant effect on physical and mental health and secondary appraisal was significantly correlated to quality of life. Nevertheless, perceived challenge did not predict quality of life.

Ha5: higher scores on the physical, emotional, and social stressor factors were significantly associated with lower levels of quality of life after controlling for the effects of cognitive appraisal variables.

Ha6: younger survivors and women who reported higher physical activity level pre-diagnosis reported higher levels of physical activity.

Ha7: this hypothesis was partly supported. Physical activity was positively associated with quality of life but was not negatively associated with total scores of all three stressor factors.

Ha8: the data collected partly supported the hypothesized model (see Figure 1.2).

The following sections will address keys findings relating to stressors, cognitive appraisal, and quality of life.

4.3. Stressors

There are several reasons why breast cancer survivors in the present study reported higher physical stressor factor scores than originally hypothesized. First, survivors were, on average, 62 years. While women were asked to focus solely on cancer-related stressors when completing the questionnaire, the nature of some items within the physical stressor factor could have also been experienced as a result of aging. Fatigue, disruption of sleep, aches and pains, and memory loss have consistently been linked to aging (Deimling, Bowman, & Wagner, 2007; Schroevers, Ranchor, & Sanderman, 2006) and were items belonging to the physical stressor factor. Furthermore, identifying the exact source(s) or nature of stress (e.g., cancer survivorship) may be extremely challenging for individuals as the contextual nature of stress involves, by definition, a transaction between many factors (i.e., personal and environmental). Factors not related to or caused by cancer diagnosis/treatment could possibly lead someone to experience

stressful situations that are similar to the ones associated with cancer survivorship but that originated for sources other than the disease itself. For example, fatigue could be a consequence of undergoing cancer-related treatment but might be occurring in combination with other events such as worries about finances, stress at work or lack of sleep, which are not necessarily consequences of having had cancer. The exact source of some of these health issues/stressors may have been hard to identify for survivors and may have directly influenced the findings that emerged from the current study.

It is also possible that having been diagnosed with cancer leads to the misinterpretation of physical symptoms that are not associated with this disease. Our previous work had found that survivors are more likely to give serious meanings to physical symptoms that they used to experience before being diagnosed with cancer (e.g., headache can be thought of as brain cancer (Hadd et al., in press). Consistent with this argument, it is possible that survivors seek to gain control over their body and the disease by overanalyzing and giving different meanings to minor or unusual feelings that are not necessarily related to cancer. By trying to detect early signs of cancer, survivors may believe that they could avoid facing recurrence and having to go through additional rounds of treatment.

Finally, the inconsistency between the findings from this study and our previous work could be attributed to the type of population taking part in the current study. Our previous work looked at occurrence of stressors in an active population of breast cancer survivors. Being active is often associated with numerous physical benefits for the survivors (Courneya, 2003; Kendall et al., 2005; Pinto et al., 2003). Physiological benefits include improved VO_2 max, reduction in body fat, bodily pain, and improved body image. In the current sample, most of the survivors reported low to moderate levels of physical activity. Hence, the lack of physical activity of some

survivors could have explained the nature of the stressors reported by the current population (i.e., more physical rather than emotional or social).

4.3.1. Optimism

Optimistic individuals usually believe that they will experience good versus bad outcomes in life. This predisposition has been negatively linked to perceived distress in cancer survivors (Epping-Jordan et al., 1999; Raikkonen et al., 1999; Schou et al., 2003), which is closely linked to the concept of stressors. Our results supported this claim as optimism was significantly associated with all three categories of stressors and the latent construct of stressor. More specifically, women who scored higher on the optimism scale reported experiencing fewer stressors. Being optimistic may not prevent someone from experiencing a number of stressors but rather, could influence the perceived level of intensity or frequency of occurrence. For example, optimistic survivors may be facing similar stressors compared to women who score lower on the optimism scale but their positive outlook may reduce how severe (i.e., intensity) and often (i.e., frequency) those stressors are perceived to occur. This, in turn, would lead to lower total scores for each of the stressor factors. Being optimistic may also help individuals focus on the situation as a whole (e.g., survival prognostic, recovery from treatment, and support from social network) rather than on specific cancer-related stressors or the negative meaning of such stressors. Optimism is often identified as a key trait leading to positive growth following traumatic events (Tallman, Altmaier, & Garcia, 2007). Hence, more optimistic people are likely to make meaning of the events following cancer diagnosis and treatment in a positive manner.

4.3.2. Physical Activity

Physical activity can produce numerous benefits for survivors but has also been shown to generate distress by reminding them of their illness or creating additional physical and social

demands (Parry, 2007, 2008; Sabiston et al., 2007). Current findings did not support previous research with breast cancer survivors and healthy individuals (Sabiston et al., 2007; Salmon, 2001) as physical activity was not significantly correlated with any stressor categories or the latent construct of stressors. The lack of association between categories of stressor and physical activity could be due to the type of physical activity survivors generally engaged in. While participants were not asked to report their current types of physical activity, exercise types/preferences before diagnosis were recorded. Results showed that almost 60% of the participants reported walking as one of their main activity. This is consistent with research showing that walking is often used by cancer survivors as a way to exercise (Rogers, Courneya, Shah, Dunnington, & Hopkins-Price, 2007). Walking can be categorized as a light intensity activity and may not be extremely physically and/or emotionally taxing for survivors. For this reason, survivors might not have experienced specific cancer-related stressors that would have been likely to occur when performing more demanding physical activities or perceived the already occurring stressors more intensely.

4.3.3. Other Personal Characteristics

The effect of personal characteristics such as age, BMI, and SES on stressful situations faced by survivors has previously been shown (Carmichael & Bates, 2004; Rosmond & Bjorntorp, 1999; Simon et al., 2005; Stava et al., 2006). Consistent with this line of research, younger survivors were found to report more cancer-related stressors, indicating that younger individuals tend to be more disrupted by cancer diagnosis, treatment, and side-effects of treatment compared to older women (Baider. et al., 2003; Wenzel et al., 1999). Young individuals do not usually expect to be faced with issues such as memory loss, fatigue, and reduced physical ability on a daily basis. When faced with such issues, they may tend to attribute

them to cancer rather than to the aging process. On the other hand, an increased number of health problems is often seen as being one of many negative outcomes associated with aging (Aldwin et al., 1980). When faced with cancer diagnosis, older adults may not tend to associate some of those stressors to cancer but rather, are aware that they are part of becoming older.

The relationships between BMI and stressors found in this study were consistent with previous research and various explanations for such finding can be suggested. First, most stressors included in this study were body-related (e.g., feeling overweight, side effects from medication, and changes in appearance resulting from treatment) and were classified as physical stressors. Hence, it was likely that issues around the body would be more severely impacted for individuals reporting higher body weights. Furthermore, it is not surprising that a negative association between BMI and emotional stressors was found as one stressor was directly linked to body issues (i.e., feelings that my body is out of control). Furthermore, two other emotional stressors were associated with uncertainties about future (including fear of recurrence). It has been shown that higher BMI values are linked to increased chances of developing a second cancer or facing recurrence (Carmichael & Bates, 2004). Hence, the awareness of one's body being overweight or obese could lead survivors to worry about recurrence or uncertainties about future more frequently or intensely. Finally, the significant association between BMI and social stressors was also expected as individuals of higher BMI have been shown to report higher levels of anxiety in social setting due to concerns that people may judge them based on their appearances (Rosmond & Bjorntorp, 1999).

Socio-economic status was one personal characteristic in the current study that did not significantly predict stressors but this could be attributed to the type of health care system available to women in British Columbia. Inexpensive and accessible health care services make it

easy for women of different social status to receive the cares they need to minimize the experience of stressors. Furthermore, a wide variety of services are offered by the BC Cancer Agency to survivors around the province. These services include support group, patient and family counseling, nutrition information, pain and symptoms management workshop, and stress reduction programs (e.g., relaxation and meditation). At these centers, women of different SES can receive the support they need and this might reduce the number of stressors (i.e., physical, emotional, and social) experienced by the survivors. Hence, the current status of the British Columbian health care system is likely to benefit women of lower SES status by reducing the frequency and intensity of cancer-related stressors they might otherwise be facing.

4.3.4. Cancer-related Characteristics

Stressors experienced by survivors were significantly influenced by stage of the disease and type(s) of treatment but not by other cancer-related characteristics such as number of years since diagnosis and end of treatment. This last finding was contradictory to original hypotheses and could be attributed to a number of reasons. First, the status of survivorship could have influenced the significance of the relationships between stressors and number of years since diagnosis and treatment. More specifically, the survivors in the current study were somewhat old (M_{age} = 61.53, SD = 11.25) and were, on average, almost five years post treatment (M_{diag} = 6.49, SD = 4.08 and M_{treat} = 4.94, SD = 3.59). Furthermore, a positive association was found between age, years since diagnosis, and years since end of treatment. As mentioned previously, older women are more likely to experience health related issues that may not be attributed to cancer (Aldwim, Park, & Spiro III, 2004). Since older women in the current study were also more likely to have received their cancer diagnosis and completed treatment a number of years ago, it is likely that those survivors reported age-related stressors that were not due to cancer diagnosis

and treatment. Furthermore, cancer survivors often experience extensive negative physical and emotional outcomes during the first five years post-treatment but the number of stressful situations often decreases and stabilizes once the survivors believe that they are cancer-free (American-Cancer-Society, 2002). A more recent study has shown that the degree of stress associated with specific cancer-related situations seems to level off around 11 months post-treatment (Lebel, Rosberger, Edgar, & Devins, 2007). In our sample, just under 95% of the participants had completed their treatment more than 11 months ago. Hence, lack of association found between the two cancer-related characteristics and stressors may be due to the fact that the majority of survivors were classified as cancer-free according to the American Cancer Society.

The positive association between stage of disease and stressor factor scores was expected as later cancer diagnosis stages are normally associated with the spreading of the tumor to other organs in the body. As a result, this could lead to more serious physical symptoms experienced by the survivors. Furthermore, being diagnosed at later cancer stages often necessitates that survivors go through more radical treatment such as chemotherapy, radiation treatment or mastectomy. These treatments are more likely to result in numerous side-effects impacting one's body (Wilmoth, Coleman, Smith, & Davis, 2004). These side-effects may also become chronic physical stressors for some survivors.

Women who had received chemotherapy treatment were more likely to report higher scores on the physical stressor factor. Overall, research has shown that undergoing chemotherapy treatment can lead to several physical side effects including higher levels of fatigue, memory problems, and menopausal symptoms such as weight gain and lack of sexual desire (Tchen et al., 2003). In the current study, all these side effects were identified as cancer-related stressors belonging to the physical stressor factor. These findings illustrate the extended impact of

chemotherapy on survivors' lives and are in line with research showing that the relationship between chemotherapy and stress remained significant regardless of time since diagnosis and treatment (Carver et al., 2006).

No other significant associations were found between types of treatment and stressors. While the findings that more radical treatments do not negatively influence the occurrence of emotional and social stressors and that none of the other treatment, beside chemotherapy, influences the experience of physical stressors are surprising, it can be seen as encouraging for survivors. Decisions concerning treatment types have often been reported as extremely stressful for the survivors and their immediate surroundings (Balneaves & Long, 1999). Physical and physiological side effects from chemotherapy, mastectomy, and radiation treatment are well documented in the literature (Phillips & Balducci, 1996; Tchen et al., 2003) and women are often made aware of those side effects before deciding on their course of treatment. However, current findings suggest that women could also be told that such treatment might not create more emotional or social distress in the long term, which might cause the decisional process to be less stressful. Women who underwent more radical treatment may not experience emotional stressors because they might have been better prepared emotionally by all the information that was provided to them before treatment started. More aggressive treatment such as mastectomy and radiotherapy have been linked to a decreased chance of cancer recurrence (Phillips & Balducci, 1996) which could, in turn, positively influence anxiety and fears experienced by survivors. Furthermore, research has shown that mastectomy, radiation, and surgery treatments are used by many survivors (who are either pre or postmenopausal status, hormone-receptor positive or negative, and/or young) (Phillips & Balducci, 1996). The high usage rate of these treatments is likely to have increased awareness, sensitivity, and understanding from the public as more

survivors display some visible side effects of those treatments (e.g., weight, hair, and breast loss). This more favorable public perception might help to reduce some of the social cancer-related stressors previously reported by breast cancer survivors.

4.4. Cognitive Appraisal

Cognitive appraisal is central to Lazarus' stress and coping model and can be defined as "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 this definition, the meanings one gives to specific stressful situations will be determined by potential consequences on his/her quality of life. The construct of cognitive appraisal as advocated by Lazarus is multidimensional so four appraisal constructs were measured in the current study. While mean scores for perception of threat and challenge for all three stressor factors were rather low, mean scores for perceived control and coping efficacy were in the mid-range (around 12.00-13.00 out of 20.00). These results suggest that some of the survivors' goals were not perceived to be in jeopardy as the notion of primary appraisal is conceptualized in terms of meaning and significance to one's goal. The low values for perceived threat reported in the current study are contradictory to previous findings showing that high perceptions of threat often prevail in samples of breast cancer survivors post-treatment (Bowman et al., 2003; Gallagher, Parle, & Cairns, 2002). Nonetheless, perceived threat was significantly associated with quality of life. On the other hand, beliefs of what could be done to alter the stressful person-environment transaction (i.e., secondary appraisal) were not a predictor of quality of life in the structural model.

4.4.1. Primary Appraisal

According to Lazarus, perception of threat and challenge are key components of primary appraisal which will help determine the coping actions that may be undertaken, and

subsequently, the resulting quality of life. Most researchers in psychosocial oncology have examined these separately and studies have yielded mixed results. The next two sections will discuss relationships involving each construct of primary appraisal separately as they could not be combined into a higher order latent variable.

4.4.1.1. Perception of threat

As reported in other studies, stressor was a significant correlate of perceptions of threat. This suggests that survivors who reported facing more stressors also perceived those stressors as more threatening. Limited work has tried to examine the association between *specific* stressors and perception of threat in a population of cancer survivors. Most studies generally identified major or global stressful events (e.g., breast cancer diagnosis) and asked the participant how threatening they perceived these events to be (Bowman et al., 2003; Schou et al., 2005). Overall, these studies showed that cancer diagnosis (or any other major events) is mostly perceived negatively by individuals (Schou et al., 2005). Furthermore, results are somewhat consistent with our previous work with physically active breast cancer survivors. While perception of threat was not assessed directly (i.e., no cognitive appraisal questionnaire was used), the 20 stressors used in our study were identified as important and seen as negative by a sample of breast cancer survivors involved in dragon boating.

4.4.1.2. Perception of challenge

Appraisals of challenge can be defined as "the sensibility that, although difficulties stand in the way of gain, they can be overcome with verve, persistence, and self-confidence" (Lazarus, 1999, p. 33). Hence, perceiving cancer-related stressful situations as challenging should result in more positive emotions, adaptive coping, and positive stress-related outcomes. This was partially supported by our data as perception of challenge was inconsistently correlated with stressors.

The only significant correlation was found with social stressors and was weak (r = -.15). More specifically, women who reported experiencing more social stressors reported lower scores of perceived challenge. Few studies in psychosocial oncology have measured perception of challenge and linked this construct to other stress-related variables. While these findings are somewhat contradictory to the original hypotheses, two explanations could be given to explain the absence of stronger relationships involving this construct. First, perception of challenge may, in general, have a stronger influence on the evaluation of one's coping resources or more specifically, secondary appraisal. This argument is consistent with Lazarus' definition of secondary appraisal as it is closely linked to confidence in coping abilities and beliefs that one will overcome the stressful situations. This is supported by our data as high correlations were found between challenge, coping efficacy, and perceived control. Also, perception of challenge may be a good predictor of certain coping strategies such as hope. Hope has often been identified as a useful coping strategy used by cancer survivors (Snyder, 2002) and could be benefiting survivors who seek remission. Future research should still examine the main role of challenge in the stress process by looking at associations with secondary appraisal constructs and/or coping strategies such as hope.

4.4.2. Secondary Appraisal

Perceptions of control and coping efficacy are two constructs associated with secondary appraisal that have been examined and linked to coping and various outcomes in several studies (e.g., psychosocial oncology and healthy populations) (Franks & Roesch, 2006). Nevertheless, limited research has investigated their relationships with specific stressors. In the current study, perceived control and coping efficacy were moderately correlated (between .54 and .61) and these associations are consistent with Lazarus' framework. For this reason, they were combined

into a higher order variable labeled secondary appraisal. This latent variable was significantly correlated with stressor. This was consistent with previous studies showing that stress was negatively associated with perceptions of coping resources (Luria & Turjman, 2009; Manning-Walsh, 2005). Nevertheless, stressor failed to be a correlate of secondary appraisal in the final structural model. These inconsistencies could be explained by the addition of other predictors to the model. In the structural model, direct paths were added between stressor, optimism, and secondary. Optimism was a predictor of both stressor and secondary appraisal, suggesting that some of the variance in secondary appraisal explained by stressor should be shared with optimism. A stronger correlation between secondary appraisal and optimism (as opposed to stressor and secondary appraisal) resulted in a pathway between stressor and secondary appraisal that was not significant. Future research could examine other constructs of secondary appraisal such as social support to determine if direct associations in structural models remained significant despite the strong effect of one's personality. The next two sections will focus on each construct of secondary appraisal separately to address original hypotheses.

4.4.2.1. Coping efficacy

Coping efficacy has been identified as a key variable associated with secondary appraisal (Benight et al., 1997; Jex, Bliese, Buzzell, & Primeau, 2001). In the current study, women reported that they had the necessary coping abilities to successfully alter the person-environment transaction. Consistent with hypothesis, higher stressor scores were associated with lower scores of coping efficacy. This is consistent with previous research with various populations (Benight et al., 1997; Chang, 1998; Jex et al., 2001). Nevertheless, this finding was somewhat unique as no research has tried to link this construct of secondary appraisal to specific stressors faced by cancer survivors.

4.4.2.2. Perceived control

The relationships between perceived control, coping, and coping outcome have often been examined in psychosocial oncology (Roesch & Weiner, 2001) but limited research has examined the association between specific stressors and perception of control. In the current study, survivors reported mid-range scores of perceived control. Consistent with our hypothesis, women who perceived having more control over cancer-related stressors reported fewer physical, emotional, and social stressors. This is somewhat consistent with previous research showing that perception of control seems to have a positive influence on coping strategies and coping outcome such as health-related quality of life, anxiety, and psychological distress in many populations (Bárez, Blasco, Fernández-Castro, & Viladrich, 2008; Préau et al., 2005).

4.4.3. Personal Characteristics

Various personal characteristics such as SES, age, and optimism had been shown or hypothesized to impact cognitive appraisal in different ways. Socio-economic status could influence one's perception of stress indirectly as it has been linked to an increased rate of women who have never gone for mammography (Quan et al., 2006). This, in turn, could lead to late cancer diagnosis and the realization that certain situations are more life threatening. In the current study, no significant relationship was found between SES and constructs of cognitive appraisal. This was contrary to the hypothesis. Nevertheless, the lack of association between SES and constructs of cognitive appraisal was somewhat expected as it could be argued that SES should primarily impact the types of stressor experienced rather than the meanings of those stressors. However, this argument was not supported by the current findings as SES was also not significantly linked to any stressor factor.

Age could also influence cognitive appraisal. It is possible that older survivors may not perceived cancer-related stressors as very threatening as they often experience similar age-related health problems. Our results were not consistent with this argument and were also contrary to our hypothesis as age did not have a significant association with most constructs of secondary appraisal. The only significant correlations found were between age and perception of threat of physical and emotional stressors. Those associations were no longer significant in the structural model. Overall, younger survivors perceived these two stressor factors as more threatening than older survivors. This finding is, to some extent, inconsistent with current literature showing that younger survivors tend to appraise health-related issues associated with cancer diagnosis and treatment more negatively (Stava et al., 2006). This could suggest that a severe illness such as cancer, may threaten the achievement of personally important goals and result in the lost of important sources of purpose in life (e.g., early onset of menopause can threaten the ability to become a mother or possibility of death can threaten the ability to be around grand kids while they are growing up) (Pinquart, Fröhlich, & Silbereisen, 2007) for any women, regardless of their ages.

Optimism could be closely linked to the concept of cognitive appraisal as it revolves around perceiving that something good will come out of specific situations (appraisal of a situation). Hence, optimism was expected to be negatively correlated with perception of threat but positively associated with perception of challenge, coping efficacy, and perceived control Findings partially supported this hypothesis. More specifically, women who scored higher on the optimism scale appraised stressors less negatively, perceived them as being more challenging, and reported having the proper resources to manage them effectively. The opposite effects were found for neuroticism. These findings are consistent with previous research showing that

optimistic people tend to perceive having more control and coping options compared to pessimistic people, when appraising stressful events (Chang, 1998). Optimism is often identified as a key trait leading to positive growth following traumatic events (Tallman et al., 2007). More optimistic people are likely to make meaning of the disease and look at the situation in a positive manner.

While the associations between personality traits and secondary appraisal remained significant in the structural model, optimism and neuroticism were no longer significant correlates of perception of threat. The lack of association between threat and optimism in the structural model could be attributed to shared variance between stressor, threat, and optimism. Methodological and conceptual issues associated with the similarities between the constructs of stressor and perception of threat will be discussed in a different section.

Researchers have suggested that the way people respond to physical activity may be influenced by how stressors are appraised (Rejeski et al., 1995). A reciprocal effect could also be seen where physical activity could influence the meaning given to certain stressors. Findings partially supported those two hypotheses as physical activity had a weak but significant relationship with secondary appraisal but not with perceived threat. Nevertheless, the link between physical activity and secondary appraisal was no longer significant in the final model. While physical activity did not have a direct effect on stressors or cognitive appraisal in the structural model, physical activity could potentially play a more adaptive role and be used as a coping strategy by survivors. This has been shown in various studies (Salmon, 2001). This strategy could be used regardless of the type of appraisal made by survivors.

4.4.4. Cancer-related Characteristics

The appraisal of cancer-related stressors could be directly influenced by cancer-related characteristics such as stage of disease and cancer treatment. For example, being diagnosed at a later stage of the disease could lead to greater appraisal of threat as women are now facing a more life threatening disease. Nevertheless, this hypothesis was not support. Stages of disease did not significantly affect the appraisal of stressors. One could argue that the effect of stage of disease should be primarily seen on stressors as later cancer diagnosis stages are normally associated with the spreading of the tumor to other organs in the body, which might results in facing more stressors.

Research has also shown that survivors undergoing different types of treatment are expected to experience disruption in diverse quality of life (King et al., 2000) which could, in turn, affect the appraisals made by survivors. Contrary to this explanation, no association was found between cognitive appraisal and types of treatment. It could be that survivors might have already been educated on the severity of certain treatments and their expected side-effects but were also told that chances of recurrence sharply decreased following the treatment period. Hence, survivors might have been experiencing stressors but not appraising them as threatening since they were expected to occur and were perceived as increasing their chances of survival.

4.4.5. Moderating Variables

According to Lazarus' model, the transactional nature of stress is best understood by examining environmental and personal characteristics simultaneously. To our knowledge, no other study has tried to examine the moderating effect of personal characteristics on cognitive appraisal. Findings from this study were contradictory to our hypotheses as personal and cancer-related characteristics were not significant moderators of relationships predicting constructs of

cognitive appraisal. Most research investigating potential moderating variables using Lazarus' model as a framework has looked at the influence of personal variable (e.g., personality) on the relationship between coping and coping outcomes (Kershaw, Northouse, Kritpracha, Schafenacker, & Mood, 2004; Yang, Brothers, & Andersen, 2008). The lack of significant moderating effects found in this study could be explained by the existing relationships between key stress-related constructs. The path coefficient for the relationship between stressor and perception of threat was extremely high ($\lambda = .90$), explaining 80% of the variance in perceived threat. The strong association between these two latent constructs makes it hard to identify other variables contributing to explaining significant amount of variance in perception of threat. Regardless of the lack of significant findings, future research should further investigate the role of potential moderating variables on the relationship between stressor and cognitive appraisal using a more contextual approach (e.g., not averaging stressors or cognitive appraisal scores or using daily processes to do so). Such approach could yield different results.

4.5. Quality of Life

4.5.1. Stressor and Cognitive Appraisal

Previous studies have shown that most stressors are detrimental to well-being (Ferrell et al., 1995; Masthoff et al., 2007). Ferrell and colleagues (1995) showed that the majority of stress experiences reported by breast cancer survivors had a negative impact on the psychological aspects of quality of life. Consistent with this research, higher stressor scores were negatively and strongly associated with quality of life. These associations were significant when looking at bivariate correlations as well as pathways in the structural model. Interestingly, stressors seemed to have a greater effect on quality of life compared to the appraisal of those stressors as highlighted in the more parsimonious model. While this finding is contradictory to Lazarus'

model, it could be explained by looking at the nature of the stressors encountered. Stressors associated with survivorship could possibly be classified as chronic stressors, which can be defined as harmful or threatening, but stable conditions in life (Lazarus, 1999). In this study, between 25 and 50% of the participants experienced stressors at least a few times during the month prior to the study. Being faced with the same stressors repeatedly over a short period of time may lead survivors to appraise the situations in similar ways, if no major personal changes have occurred or if the context is very similar. Survivors experiencing the same stressors on a regular basis may overlook specific aspects of the situations that differ each time the stressor occurs, and rely on a more general appraisal of the encounters. In such case, the stressors themselves might have a greater influence on quality of life.

The effect of stressors on quality of life could also be due to the nature of this quality of life, which can be considered a delayed outcome of the stress process. Experiencing chronic stressors is more likely to influence stable constructs such as physical and mental health contrary to a relationship between quality of life and a transactional concept such as cognitive appraisal. Hence, the direct influence of stressors on quality of life could be more dependent on the frequency of occurrence of stressors (i.e., chronic stressor) rather then the appraisal of those stressors.

The strong associations between stressor and quality of life were consistent with the original hypothesis but somewhat contradictory to Lazarus' model where cognitive appraisal is a central construct. Current findings involving cognitive appraisal and quality of life partially supported the original hypotheses. When looking at correlations among latent variables, threat and secondary appraisal were significantly correlated with quality of life. Furthermore, threat was a significant correlate of both higher order levels of quality of life in the structural model

while secondary appraisal was not. The impact of threat appraisal on coping outcomes such as subjective health status, distress, and psychological well-being has been well documented (Hamama-Raz, Solomon, Schachter, & Azizi, 2007; Masthoff et al., 2007; Pakenham & Rinaldis, 2001). In general, research has shown that higher perception of threat tends to be associated with lower levels of quality of life. Findings from the current study were also consistent with other psychosocial oncology research (Bowman, Smerglia, & Deimling, 2004; Northouse et al., 1999).

Limited research has examined the impact of secondary appraisal on quality of life but some studies have found a direct link between secondary appraisal and various outcomes such as life satisfaction, perceived efficacy, and depression (Felsten, 2004; Hudek-Kneževic & Kardum, 2000). Findings from this study were somewhat contradictory to previous research as secondary appraisal did not contribute to explaining additional variance in quality of life in the final structural model. However, significant latent correlations were found between secondary appraisal and quality of life. In general, higher values for secondary appraisal were associated with better quality of life. The lack of significance in the structural model could be due to the large amount of variance already predicted by perception of threat and optimism. Nevertheless, some authors have argued that the types of outcomes considered will have a direct effect on the significance of the relationships between secondary appraisal and outcomes and this can apply to the current study. First, quality of life is a broad construct which is known to be quite stable overtime and includes several sub-domains (Chamberlain & Zika, 1992). Cancer-related stressors and the perception of those stressors may be two of the many variables influencing one's quality of life. Hence, their influence on a stable construct such as quality of life may be

hard to determine using cross-sectional designs as minimal changes triggered by stress constructs are likely to occur.

4.5.2. Personal Characteristics

Personal characteristics among breast cancer survivors such as age and personality have been linked to reduced quality of life (Carver, 2006; Wenzel et al., 1999). BMI and SES, two other important variables, could also have a direct impact on survivors' quality of life. Results did not support the hypothesis that younger survivors would report lower levels of quality of life and was contradictory to previous findings (Baider et al., 2003; Wenzel et al., 1999). Surprisingly, older survivors reported significantly lower scores on physical health while the association with mental health was not significant. Most of the studies investigating these relationships have examined quality of life during or right after completion of treatment. Quality of life using longitudinal design has suggested that well-being values tend to increase to levels similar to the general population 18 months following the end of treatment (DiSipio, Hayes, Newman, & Janda, 2008). In this study, 88% of the participants had been post-treatment for 18 months or more. Hence, younger survivors' quality of life may have gone back to original levels after the drop normally experienced following cancer diagnosis and treatment.

Severe weight gains are often reported by breast cancer survivors post-treatment (Rock et al., 1999) and this can have a direct influence on quality of life. Wee and colleagues (2008) found that overweight and obese people tend to score lower on physical and mental health compared to people of normal BMI. In the current study, the mean score for BMI fell within the overweigh category (M_{BMI} = 25.60), with almost 15% of the sample classified as obese. Nevertheless, BMI was not a significant correlate of physical and mental health. Such findings suggest that BMI has a direct influence on some aspects of quality of life (i.e., significant

correlations found with domains of quality of life) but that its influence may be confounded with other stress-related variables.

Previous studies have also shown that cancer patients of lower SES tend to score lower on measures of well-being and that their scores keep decreasing at follow up assessments (Simon & Wardle, 2008). This was not the case in the current study looking at higher order quality of life domains. Nevertheless, a significant effect for SES was found when looking at quality of life subscales. This seems to suggest that SES may have an effect on quality of life but that other cancer-related variables and personal characteristics may play a more crucial role in influencing one's overall well-being.

Optimism has also been linked to quality of life, above and beyond the contribution of cognitive appraisal and stressor (Carver et al., 2006; Chang, 1998; Schou et al., 2005). This was also seen in the current study as optimism was significantly correlated with the two latent variables of physical and mental health. Nevertheless, optimism was not a significant correlate of physical health in the structural model. The ability to have a positive outlook on life seems to have a greater impact on mental health compared to physical health. Hence, survivors who score higher on the optimism scale may not be protected against the negative impact of cancer treatment on physical health but the effect on emotional and mental health might be minimized as they may expect to have a better and quicker recovery and believe that they will overcome all obstacles associated with overcoming the disease.

Physical activity, another personal characteristic, has also been shown to produce numerous benefits for survivors, including improving quality of life (Courneya & Friedenreich, 1999). This study partly supported previous research and our original hypothesis. While activity level was not a significant predictor of mental health, being active was beneficial for survivors as

it was positively associated with physical health. These findings are consistent with previous studies using physical activity interventions to modify health-related outcomes in cancer patients (Courneya, 2003; Courneya & Friedenreich, 1999). These studies highlighted the positive effect of being physically active on physical health and physiological variables. The current findings also help understand some benefits of physical activity by suggesting that similar relationships (i.e., positive association between exercise and physical health) exist when survivors make the decision to become active but may not meet the complete requirements for physical activity (i.e., exercising three to five time per week for at least 20 to 30 minutes at moderate intensity) (Courneya, Mackey, & McKenzie, 2002). To date, limited studies have shown the positive impact of physical activity on quality of life of cancer survivors using naturalistic approaches to assess physical activity.

The lack of relationship between physical activity and mental health was also consistent with the literature on cancer survivors (Humpel & Iverson, 2007). While most research has highlighted the positive effect of physical activity on physical health and functional well-being, inconsistent findings have been reported concerning the beneficial effect of physical activity on emotional well-being. Fox (1997) argued that physical activity can be an effective treatment for clinical depression and can also act as a moderator in the relationship between trait anxiety and global self-esteem, a potential indicator of emotional well-being. This suggests that a positive relationship should be found between physical activity and emotional health. Nevertheless, such relationship could be dependent on the type of constructs used to measure emotional well-being (e.g., self-esteem as opposed to psychological or emotional well-being). Furthermore, the positive relationship between physical activity and global self-esteem has yet to be seen in populations of cancer patients.

4.5.3. Cancer-related Characteristics

Previous research has shown that certain cancer-related characteristics such as type of treatment have a significant effect on quality of life (Carver et al., 2006; King et al., 2000). More specifically, more radical treatments such as chemotherapy and radiation have negative effects on well-being. Contrary to these findings, none of the cancer-related characteristics had influences on quality of life in the current study. The divergent findings from our study could be explained by the reported means of some of the cancer-related characteristics. It has been shown that cancer survivors often experience extensive negative physical and emotional outcomes during the first five years post-diagnosis but the number of side effects reported often decreases once the survivors believe that they are cancer-free (American-Cancer-Society, 2002). Our sample was almost six and a half years post-diagnosis (M_{diag} = 6.49, *SD* = 4.08). Hence, survivors might no longer be experiencing impairments in quality of life due to cancer as a number of them were officially classified as cancer-free.

4.5.4. Mediating Variables

Studies have investigated potential mediating variables in the stress process. In general, various literatures have shown that the effect of personality on coping or coping outcomes is mediated by elements of the stress process (Schou et al., 2005). Findings from this study were consistent with this line of research showing that stressor partially mediated the relationship between optimism and mental health. Some researchers have argued that conceptually, personality should directly influence each element of the stress model (DeLongis & Holtzman, 2005). While current findings supported this claim, it also showed the indirect effect that personality may have on coping outcomes such as mental health. To our knowledge, this is one

of the first studies to examine the mediating role of stressors (measured by specific cancer-related stressors) on stress-related variables.

The mediating effect of cognitive appraisal in the stress process has also been shown (Carver et al., 2006; David & Suls, 1999) but a similar finding was not supported in the current study. This is contradictory to Lazarus' model where both appraisals (i.e., primary and secondary appraisal) are expected to mediate relationships between stress, personal variables, and other elements of the stress process (e.g., coping actions and outcomes). The failure to identify threat as a mediator of relationships involving quality of life is contradictory to findings provided by Schou and colleagues (2005). These authors highlighted the mediating role of perception of threat in the relationships between optimism and quality of life. This divergence in findings could be due to methodological differences between the two studies. Schou and colleagues (2005) asked women how they had perceived their cancer diagnosis while the current study asked about perceptions of very specific cancer-related stressors. Future research should keep examining the potential mediating role of secondary appraisal in relationships involving quality of life.

4.5.5. Moderating Variables

Limited research has examined the potential moderating role of personal and cancer-related characteristics on the relationships between stressors, cognitive appraisal, and quality of life (Chang, 1998) while some researchers have done so with coping behaviours as the outcome (O'Brien & DeLongis, 1996). Chang (1998) highlighted the moderating effect of optimism on the relationships between stress and emotional well-being but failed to show the same relationship when physical well-being was the outcome. Inconsistent with Chang's study, the moderating effect of personal and cancer-related characteristics on various relationships involving stress-

related constructs was not shown in the current study. The high correlations between stressor, perception of threat, and quality of life may explain the lack of significant findings while testing for moderation as those three variables shared large amounts of variance. Furthermore, large amounts of variance in physical and mental health were explained in the final model which might make significant moderating effects hard to detect. Significant interaction terms often explain very small amount of additional variance.

4.6. Predicting Physical Activity

Research suggests that almost 50% of survivors post-treatment are inactive and can not physiologically and/or emotionally benefiting from physical activity (Denmark-Wahnefried, Peterson, McBride, Lipkus, & Clipp, 2000). More specifically, it has been shown that levels of physical activity tend to decline after cancer diagnosis and never go back to original levels once treatment is over (Irwin et al., 2004). This study tried to examine variables that could help predict levels of physical activity post-treatment. Understanding such relationships could help develop effective interventions to increase participation in physical activity. Findings showed that younger survivors and women who reported higher activity levels pre-diagnosis were more physically active. More specifically, age and physical activity pre-diagnosis were the strongest predictors of current PA. BMI and personality trait were also significant predictors of activity levels. These findings are consistent with physical activity research with healthy populations, showing that activity levels tend to decrease with age and that weight is often seen as a barrier to physical activity (Sternfeld, Ainsworth, & Quesenberry, 1999). Similar results have been found in cancer populations. Hence, health-care practitioners may want to consider designing specific physical activity interventions for older survivors of higher BMI who were not active pre-

diagnosis so these women can experience the physical health benefits associated with being active.

The effect of personality on active behaviours has often been discussed but rarely shown in breast cancer and healthy populations (Courneya & Hellsten, 1998; Kavussanu & McAuley, 1995). In the current study, a positive association between optimism and physical activity was found while the correlation between neuroticism and physical activity was also significant but negative. This suggests that survivors with distinctive personality traits may focus on different consequences associated with being active during cancer recovery. While optimistic women may be thinking about the benefits associated with being physically active, neurotic survivors may not be able to overlook the negative consequences or barriers they may face. Furthermore, it is likely that survivors with different personality traits might experience different emotions while exercising, which could, in turn, reinforce the desire (or lack of desire) to keep engaging in more physical activity. Consistent with this hypothesis, it has been shown that neurotic people tend to experience more negative emotions in general (Watson, 2000). Negative emotions associated with physical activity might discourage future participation. The opposite could be true for optimism.

4.7. Limitations

In addition to inherent limitations associated with cross-sectional and self-report research, there were additional measurement issues and shortcomings associated with this study. In particular, questions about the potential conceptual overlap of various constructs such as stressors, perceived threat, and quality of life domains, measurement concerns associated with variables in the stress process, conceptual issues associated with the measurement of quality of

life, and characteristics of the sample including ethnicity and length of time survivors had been diagnosed with cancer and had completed their treatment should be noted.

First, moderate to high correlations between stressors, perception of threat, and quality of life domains were found (*r* ranging from $|.36|$ to $|.67|$). This suggests that these constructs may share some common underlying traits. More specifically, it was hypothesized that frequency of stressors and perceived threat may be measuring very similar traits. This could have explained, in part, the large amount of variance in perceived threat and quality of life predicted. To address this issue, inter-correlations among items were examined. Correlations between the frequency of stressors and perception of threat ranged from .17 (R^2 = .03) to .58 (R^2 = .34). Furthermore, the majority of the correlations between stressors and quality of life subscales were between .25 and .50. Overall, the various stressors shared limited variance with quality of life constructs (R^2 ranged from .00 to .56). While the nature of the items on each scale seemed to differ conceptually and simple correlational analyses did not highlight issues of multicollinearity (*r* >.70), future research should try to better distinguish the concepts of stressors from perception of threat and quality of life issues.

Second, despite attempts to measure the situational nature of some constructs in the stress process, participants were asked to report on the prevalence of stressors "in the last four weeks" and reflect on how they had "generally" appraised those stressors. Such procedure might not have been adequate to measure context-specific constructs such as stressors and cognitive appraisal as advocated by Lazarus. Nonetheless, this was done to ensure that most participants had experienced some stress prior to answering the questionnaires and was used to standardize the recall period to make it consistent for all survivors. In addition, due to the large number of cancer-related stressors examined, a total score for each stressor factor was computed. This

decision led to some methodological issues. Combining several stressors together could have minimized the impact of key stressors (e.g., stressors occurring more frequently and/or intensely) on cognitive appraisal and/or quality of life. The failure to identify significant relationships between stressors and other constructs may have been caused by the agglomeration of several cancer-related stressors of various importance rather than only considering crucial stressors. One could also argue that survivors may have solely recalled very stressful situations (and the appraisal of those situations) and amplified the importance or meaning of some of those stress constructs. Also, further limitations associated with the cognitive appraisal questionnaire include the lack of stressors experienced by some survivors. Participants who did not experience several stressors in the last month might have found it challenging to answer items pertaining to stress appraisal. This might have led to the adoption of a more dispositional approach (i.e., what people do generally rather than in specific situations) when looking at stress relationships rather than a situational approach showing how they specifically appraised the stressors. Future research should consider using a daily process approach to measure each construct closer to its time of occurrence and to understand the evolving nature of stress relationships.

An additional issue pertains to the specific questionnaire used to assess quality of life in this study. The SF-36 Health Survey has been used widely and validated with various populations (Ware et al., 2000). According to the authors, the eight subscales can be classified into two higher orders: physical and mental health. Conceptually, some of the subscales (vitality, social functioning, and general health) included in the instrument have been shown to share attributes with both physical and mental health (Ware et al., 2000). While each of these subscales were forced to load solely on one higher order factor in the current study, results could have been somewhat different (e.g., no significant link between optimism and physical health) if those

items were allowed to cross-load on the other higher-order factor. Some additional analyses conducted on the current data have shown that these three scales significantly, albeit weakly, loaded on the other higher order factor of quality of life. Hence, more research needs to look at the factor structure of this scale as the decision to use certain items to measure each higher-order factor could inflate or deflate relationships between constructs in the structural model. While the procedure used in this study was consistent with some of the work by Ware and colleagues (Ware et al., 2000), this instrument needs to receive further attention as some items may need to be modify to ensure that, conceptually, they are associated with only one domain of quality of life.

Another limitation of the current study is the wide range of scores for the number of years since end of treatment (range between 0-16 years) reported by survivors. Consequently, some of the stressors reported by survivors might not have been cancer-related as they were officially classified as cancer free. It is also possible that some stressors in this study might be detrimental for the survivors shortly after treatment (or during treatment) but may not impact long term quality of life. Furthermore, questions concerning types of treatment received may have also been problematic. Despite asking participants to identify the specific cancer treatments they received, several participants could not recall the actual type of radiation or chemotherapy they had undertaken. Hence, the impact of specific types of treatment on elements of the stress process could not be determined. Furthermore, 89.5% of the respondents were Caucasian, limiting the generalization of the findings to this ethnicity only. Despite an attempt at recruiting survivors of other ethnicities, the response rate was quite low. The challenge of recruiting survivors of other ethnicities has been reported in psychosocial oncology (Ashing-Giwa, Padilla, Tejero, & Kim, 2004). Nevertheless, these challenges need to be overcome so women from all

ethnicity backgrounds can benefit from current findings. Future work should examine all potential stress relationships in a more homogenous sample (in terms of years since end of treatment) using longitudinal designs, should investigate the role of more specific treatments on stress constructs, and should try to examine similar relationship in a more ethnic diverse sample.

Last, coping was not assessed and could have potentially explained some (or lack of) relationships found in this study. For the current study, the decision was made to focus mostly on trying to understand how certain characteristics (i.e., personal and cancer-related) may influence the exposure to various stressors and the perception of those stressors (i.e., cognitive appraisal) by breast cancer survivors. To our knowledge, limited psychosocial research has really focused on this part of Lazarus' model (i.e., front end of the model). A better understanding of specific stressors faced by cancer survivors post-treatment and the meanings of those stressors may be useful to design more effective interventions for this population. Being aware of specific challenges occurring during this part of the cancer trajectory could make it easier to teach specific coping strategies that could help survivors experience enhanced quality of life. Nevertheless, while the notion of cognitive appraisal is central to Lazarus' model, one can not fully understand stress transaction without examining specific coping behaviours. According to Lazarus, coping strategies should mediate the relationships between cognitive appraisal and quality of life. Furthermore, one could argue that if coping is effective, good quality of life should be experienced, regardless of stressors prevalence and threat appraisals. Future research could try to validate the relationships found in this study and broaden our understanding of stress transactions in breast cancer survivors by also assessing coping.

4.8. Implications

4.8.1. Methodological Implications

This study used a multidimensional approach to measure stressors by assessing the frequency and intensity of each stressful situation. Whereas this was originally done to differentiate acute and chronic stressors, correlations around .85 were found between frequency and intensity of stressors. This suggests that future research could only measure one dimension of stress and find similar results. Nevertheless, careful consideration needs to be taken as participants in this study were, on average, five years post-treatment. Examining the multidimensional nature of stress may be more relevant in a sample where participants are in the midst of treatments or have just completed them, as it is probable that some of those cancer-related stressors would be more intense during this part of the cancer trajectory.

Consistent with theory, results suggest that cognitive appraisal should be measured closer to the actual occurrence of stressors. The use of retrospective designs, when too much time has elapsed, may lead to associations between stressors and cognitive appraisal that are not or marginally significant. Furthermore, subjective meanings of events should not be based on an *average* of the different meanings over a given period of time of stressors sharing some attributes but rather, should be specific to each stressor. Failure to meet those recommendations could lead to the measurement of a construct similar to Lazarus' construct of cognitive appraisal, but that would be dispositional rather than situation specific. In this study, an *average* score for appraisal was computed for feasibility purposes. Nevertheless, a daily process approach could be better suited to address this issue.

The choice of constructs measuring different elements of cognitive appraisal in specific populations also needs to be considered. Research examining potential relationships between key

variables and cognitive appraisal in breast cancer survivors has often measured perception of threat as a construct of primary appraisal. While this study tried to consider other types of appraisal constructs, significant relationships involving perception of challenge were rarely found. Furthermore, the items comprising the perceived challenge scale failed to significantly load under a latent variable called "primary appraisal" which also included items pertaining to perception of threat. While Lazarus argues that these two constructs (i.e., threat and challenge) are not measuring the opposite ends of the same continuum, results suggest that they can not be examined simultaneously as a higher order factor. Hence, measuring certain types of appraisal might provide more relevant information depending on the nature of the stressors. For example, it might be really hard to perceive cancer-related stressors as challenging when some of those stressors can be life threatening. Researchers may want to consider the nature of the stressors before selecting a primary appraisal construct.

Last, the SF-36 was conceptualized so no scale was allowed to cross-load onto the higher other levels of quality of life (i.e., physical and mental health). Additional analyses showed significant but weak cross-loading values for three subscales. Researchers need to be aware of the less than optimal fit indices they might obtain using different approach. Researchers might also want to test the factor structure of this inventory before the start of their study. They could do so by not allowing (or not allowing) item to cross-load on higher order factors. Finally, alternative options may need to be considered. Other quality of life inventories that have been validated and tested with various populations could also be used.

4.8.2. Practical Implications

The lack of significant associations found between physical activity and certain elements of the stress process have mixed implications. While being physically active does not seem to be

significantly associated with fewer cancer-related stressors, it also does not seem to create more stress for survivors (e.g., more stressors or negative appraisals of existing stressors). Survivors who are contemplating being active may not want to worry about experiencing negative stress-related effects but rather, could decide to focus solely on potential benefits (e.g., improved physical health) associated with physical activity. Furthermore, health care professionals could not only highlight the benefits of physical activity to their patients but could also mention that such benefits might be reached without adding more cancer-related stress. While some women are hesitant to exercise following cancer treatment, the physical, emotional, and social consequences of cancer should be viewed as minor obstacles rather than excuses not to exercise. Nevertheless, the cross-sectional nature of this study does not permit to infer whether being active improves physical health or whether high levels of quality of life are precursors of active behaviours. Naturalistic studies need to use longitudinal designs to investigate the directionality of the relationship between physical activity and quality of life (or other outcome variables).

Practitioners should also be aware that optimistic women seem to engage more frequently in physical activity. When interacting with people who are perceived as being less optimistic (or even neurotic), focus should be on highlighting the benefits of physical activity for physical health and survivors should be provided with concrete information (e.g., groups they may want to join, facilities available in the neighborhood) to help them consider becoming physically active. Furthermore, follow-up contacts should be made to remind the women of the importance of physical activity and help them through the process.

Finally, interventions designed to improve quality of life of breast cancer survivors should not solely include physical activity programs, as those techniques/activities do not seem to have a direct effect on the mental health of patients. Constructs that have been shown to

directly impact other domains of quality of life (e.g., peer support and counseling) should be included in intervention packages to ensure that survivors can fully benefit at various levels (e.g., mental health). Furthermore, stress management techniques should be included to reduce stressors and enhance mental health.

4.9. Future Research Recommendations

Future research should try to reproduce findings that emerged from this study and would benefit from including measures of coping behaviours. This would allow Lazarus' entire model to be tested. A daily process approach, where stressors, appraisal, coping, and outcome are measured twice on each day, could be used to better understand the transactional nature of stress and coping. Physical activity could also be measured daily and its influence on specific stressors, appraisal constructs, coping behaviours, and less stable outcomes (e.g., affect or mood) could be determined. Finally, the effect of specific types of physical activity on elements of the stress process could be examined. In the current study, while a total METS score was computed for all activities performed, most survivors seemed to be engaging in mild exercises. Researchers have started to investigate the role of more vigorous physical activity on various psychosocial variables but have yet to examine its impact on elements of the stress process (Wilson, Blanchard, Nehl, & Baker, 2005). Walking or gardening may not significantly impact the type of stressors reported by survivors whereas swimming or running may lead to experiencing different cancer-related stressors.

4.10. Concluding Remarks

In summary, this dissertation work shows the significant influences of stressors, personality, and physical activity on breast cancer survivors post-treatment. These findings lead to the identification of methodological and practical implications that can be useful for

researchers or health care practitioners working with breast cancer survivors. Nevertheless, future work should try to further examine these relationships by testing the entire model suggested by Lazarus (i.e., include coping strategies and outcomes variables other than quality of life). Although some key relationships found in the current study were in line with previous research, other relationships failed to reach significance. More specifically, constructs of cognitive appraisal were not part of the more parsimonious model predicting quality of life. A more global understanding of the role and usefulness of cognitive appraisal in stress relationships faced by survivors is warrant. To date, researchers have often operationalized constructs of cognitive appraisal in various ways, leading to inconsistencies in findings. While this issue needs to be addressed in future work, our findings suggest that stress management interventions should focus on reducing the occurrence of key cancer-related stressors. This, in turn, would contribute to the enhancement of quality of life.

The role (or lack of) of physical activity in the stress process was also investigated but still remains unclear. While it was hypothesized that the positive influence of physical activity on quality of life often seen in the cancer literature could be attributed to a reduction in the prevalence of stressors and/or negative perceptions of those stressors, this study failed to highlight the specific role of physical activity in the stress process (i.e., link between physical activity, stressors, and cognitive appraisal). Future studies could examine the effect of different types of physical activity on stress-related constructs as recent evidence suggest that more vigorous physical activity may be more beneficial for cancer survivors. Moreover, the potential role of physical activity as a coping strategy for survivors could also be investigated. Finally, efforts need to be made to reconcile the measurement of stress-related constructs to match the nature (i.e., dynamic) of such constructs. Employing daily process approaches to measure stress,

cognitive appraisal, and coping behaviours in cancer survivors may further our understanding of this field and render the implementation of stress management interventions more successful.

REFERENCES

Aiken, L. S., & West, S. G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. Newbury Park, CA: Sage.

Aldwim, C. M., Park, C. L., & Spiro III, A. (2004). *Handbook of Health Psychology and Aging*. New York, NY: The Guildford Press.

Aldwin, C. M. (1994). *Stress, coping, and development: An integrative perspective*. New York, NY: Guilford Publications, Inc.

Aldwin, C. M., Folkman, S., Shaefer, C., Coyne, J. C., & Lazarus, R. S. (1980). *Ways of coping checklist: A process measure.* Paper presented at the American Psychological Association Meetings, Montreal, Canada.

American-Cancer-Society. (2002). *American Cancer Society: Cancer Facts & Figures 2002* (No. Issue Brief No. 02-250M-No. 5008.02). Atlanta, GA.

Andersen, J. C., & Gerbing, G. W. (1992). Assumptions and Comparative Strengths of the Two-Step Approach *Sociological Methods & Research, 20*, 321-333.

Ashing-Giwa, K., Ganz, P. A., & Petersen, L. (1999). Quality of life of African-American and white long term breast carcinoma survivors. *Cancer, 85*, 418-426.

Ashing-Giwa, K. T., Padilla, G. V., Tejero, J. S., & Kim, J. (2004). Breast cancer survivorship in a multiethnic sample: Challenges in recruitment and measurement. *Cancer, 101*, 450-465.

Avis, N. E., Smith, K. W., McGraw, S., Smith, R. G., Petronis, V. M., & Carver, C. S. (2005). Assessing quality of life in adult cancer survivors (QLACS). *Quality of Life Research, 14*, 1007-1023.

Baider, L., Andritsch, E., Uziely, B., Goldzweig, G., Ever-Hadani, P., Hofman, G., et al. (2003). Effects of age on coping and psychological distress in women diagnosed with breast

cancer: review of literature and analysis of two different geographical settings. *Critical Reviews in Oncology/Hematology, 43,* 5-16.

Baider., L., Andritsch, E., Uziely, B., Goldzweig, G., Ever-Hadani, P., Hofman, G., et al. (2003). Effects of age on coping and psychological distress in women diagnosed with breast cancer: review of literature and analysis of two different geographical settings. *Critical Reviews in Oncology/Hematology, 43,* 5-16.

Baldwin, M. K., & Courneya, K. S. (1997). Exercise and self-esteem in breast cancer survivors: an application of the exercise and self-esteem model. *Journal of Sport & Exercise Psychology, 19,* 347-358.

Balneaves, L. G., & Long, B. (1999). An embedded decisional model of stress and coping: implications for exploring treatment decision making by women with breast cancer. *Journal of Advanced Nursing, 30,* 1321-1331.

Banks, P., & Martin, C. R. (2009). The factor structure of the SF-36 in Parkinson's disease. *Journal of Evaluation in Clinical Practice, 15,* 460-463.

Bárez, M., Blasco, T., Fernández-Castro, J., & Viladrich, C. (2008). Perceived control and psychological distress in women with breast cancer: a longitudinal study *Journal of Behavioral Medicine, 32,* 187-196.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality And Social Psychology, 51,* 1173-1182.

Benight, C. C., Antoni, M. H., Kilbourn, K., Ironson, G., Komar, M. A., Fletcher, M. A., et al. (1997). Coping self-efficacy buffers psychological and physiological disturbances in HIV infected men following a natural disaster. *Health Psychology, 16,* 248-255.

Biddle, S. J. H. (2000). Emotion, mood, and physical activity. In S.J.H. Biddle, K.R. Fox & S. H. Boutcher (Eds.), *Physical activity and psychological well-being* (pp. 63-87). London Routledge.

Blanchard, C. M., Courneya, K. S., & Stein, K. (2008). Cancer survivors' adherence to lifestyle behaviour recommendations and associations with health-related quality of life: Results from the American Cancer Society's studies of cancer survivors (SCS-II). *Journal Of Clinical Oncology, 26*, 6015-6016.

Blanchard, C. M., Denniston, M. M., Baker, F., Ainsworth, S. R., Courneya, K. S., Hann, D. M., et al. (2003). Do adults change their lifestyle behaviors after a cancer diagnosis? *American Journal of Health Behaviors, 27*, 246-256.

Bloom, J. R., Stewart, S. L., Chang, S., & Banks, P. J. (2004). Then and now: Quality of life of young breast cancer survivors. *Psycho-Oncology, 14*, 147-160.

Bolger, N., & Zuckerman, A. (1995). A framework for studying personality in the stress process. *Journal of Personality and Social Psychology, 69*, 890-902.

Bouchard, G. (2003). Cognitive appraisal, neuroticism, and openess as correlates of coping strategies: An integrative model of adaptation to marital difficulties. *Canadian Journal of Behavioural Science, 35*, 1-12.

Bouchard, G., Guillemete, A., & Landry-Leger, N. (2004). Situational and dispositional coping: An examination of their relation to personality, cognitive appraisals, and psychological distress. *European Journal of Personality, 18*, 221-238.

Bowen, D. J., Alfano, C. M., McGregor, B. A., Kuniyuki, A., Bernstein, L., Meeske, K., et al. (2007). Possible socioeconomic and ethnic disparities in quality of life in a cohort of breast cancer survivors. *Breast Cancer Research and Treatment, 106*, 85-95.

Bower, J. R., Ganz, P. A., Desmond, K. A., Rowland, J. H., Meyerowitz, B. E., & Belin, T. R. (2000). Fatigue in breast cancer survivors: Occurrence, correlates, and impact on quality of life. *Psycho-Oncology, 18*, 743-753.

Bowman, K. F., Deimling, G. T., Smerglia, V., Sage, P., & Kahana, B. (2003). Appraisal of the cancer experience by older long-term survivors. *Psycho-Oncology, 12*, 226-238.

Bowman, K. F., Smerglia, V., & Deimling, G. T. (2004). A stress model of cancer survivorship in older long-term survivors. *Journal of Mental Health and Aging, 10*, 1-21.

Broeckel, J. A., Thors, C. L., Jacobsen, P. B., Small, M., & Cox, C. E. (2002). Sexual functioning in long-term breast cancer survivors treated with adjuvant chemotherapy. *Breast Cancer Research and Treatment, 75*, 241-248.

Brown, W. J., Heesch, K. C., & Miller, Y. D. (2009). Life events and changing physical activity patterns in women at different life stages. *Annals of Behavioral Medicine, 37*, 294-305.

Browne, M., Cudeck, R., Bollen, K. A., & Long, J. S. (1993). *Testing Structural Equation Models*. Newbury Park, CA: Sage

Brugha, T., Bebington, P., Tennant, C., & Hurry, J. (1985). The list of threatening experiences: A subset of 12 life events categories with considerable long-term contextual threat. *Psychological Medicine, 15*, 189–194.

Byrne, B. M. (2000). *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming*. Mahwah, NJ: Lawrence Erlbaum Associates.

Canadian-Cancer-Society's-Steering-Committee. (April, 2009). *Canadian Cancer Statistics* (No. ISSN 0835-2976). Toronto.

Canadian-Cancer-Society. (2009). *Cancer Statistics 2009* (No. ISSN 0835-2976). Toronto, Canada.

Carmichael, A. R., & Bates, T. (2004). Obesity and breast cancer: A review of the literature. *The Breast, 13,* 85-92.

Carver, C. S. (2005). Enhancing adaptation during treatment and the role of individual differences. *Cancer, 104,* 2602-2607.

Carver, C. S. (2006). Stress, coping, and health. In *Foundation of Health Psychology* (pp. 117-144).

Carver, C. S., & Antoni, M. (2004). Finding benefit in breast cancer during the year after diagnosis predicts better adjustment 5 to 8 years after diagnosis. *Health Psychology, 23,* 595-598.

Carver, C. S., Pozo, C., Harris, S. D., Noriega, V., Scheier, M. F., Robinson, D. S., et al. (1993). How coping mediates the effect of optimism on distress: A study of women with early stage breast cancer. *Journal Of Personality And Social Psychology, 65,* 375-390.

Carver, C. S., & Scheier, M. F. (2000). *Perspectives on personality* (4th ed.). Boston: Allyn & Bacon.

Carver, C. S., Smith, R. G., Antoni, M. H., Petronis, V. M., Weiss, S., & Derhagopian, R. P. (2005). Optimistic personality and psychosocial well-being during treatment predict psychosocial well-being among long-term survivors of breast cancer. *Health Psychology, 24,* 508-516.

Carver, C. S., Smith, R. G., Petronis, V. M., & Antoni, M. H. (2006). Quality of life among long-term survivors of breast cancer: Different types of antecedents predict different classes of outcomes. *Psycho-Oncology, 15,* 749-758.

Caspersen, C. J., Pereira, M. A., & Curran, K. M. (2000). Changes in physical activity patterns in the United States by sex and cross-sectional age. *Medicine and Science In Sports and Exercise, 32*, 1601-1609.

Cella, D. (1994). *Functional Assessment of Cancer Therapy Scales, Version 3*. Chicago,: Rush Cancer Institute.

Chamberlain, K., & Zika, S. (1992). Stability and change in subjective well-being over short time periods *Social Indicators Research, 26*, 101-117.

Chang, E. C. (1998). Dispositional optimism and primary and secondary appraisal of a stessor: Controlling for confounding influences and relations to coping and psychological and physical adjustment. *Journal of Personality and Social Psychology, 74*, 1109-1120.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceive stress. *Journal of Health and Social Behavior, 24*, 385-396.

Cohen, S., Kessler, R. C., & Underwood Gordon, L. (1995). *Measuring stress: A guide for health and social scientists*. US: Oxford University Press.

Costa Jr., P. T., & McCrae, R. R. (1985). *The NEO Personality Inventory Manual*. Odessa, FL: Psychological Assessment Resources.

Costa Jr., P. T., & McCrae, R. R. (1990). Personality: Another "hidden factor" in stress research. *Psychological Inquiry, 1*, 22-26.

Costa Jr., P. T., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO PI-R) and the NEO Five-Factor Inventory (NEO-FFI) Professional Manual*. Odessa, FL: Psychological Assessments Resources.

Costanzo, E. S., Lutgendorf, S. k., Mattes, M. L., Trehan, S., Robinson, C. B., Tewfik, F., et al. (2007). Adjusting to life after treatment: distress and quality of life following treatment for breast cancer. *British Journal of Cancer, 97*, 1625-1631.

Courneya, K. S. (2003). Exercise in cancer survivors: An overview of research. *Medicine and Science in Sports and Exercise, 35*, 1846-1852.

Courneya, K. S., & Friedenreich, C. M. (1999). Physical activity and quality of life following cancer diagnosis: A literature review. *Annals of Behavioral Medicine, 21*, 171-179.

Courneya, K. S., Friedenreich, R. A., Sela, A., Quinney, H. A., Rhodes, R. E., & Jones, L. W. (2004). Exercise motivation and adherence in cancer survivors after participation in a randomized controlled trial: An attribution theory perspective. *International Journal of Behavioral Medicine, 11*, 8-17.

Courneya, K. S., & Hellsten, L. A. M. (1998). Personality correlates of exercise behavior, motives, barriers and preferences: An application of the five factor-model. *Personality and Individual Differences, 24*, 625-633.

Courneya, K. S., Katzmarzyk, P. T., & Bacon, E. (2008). Physical activity and obesity in canadian cancer survivors: Population-based estimates from the 2005 Canadian Community Health Survey. *Cancer, 112*, 2475-2482.

Courneya, K. S., Mackey, J. R., & McKenzie, D. C. (2002). Exercise for breast cancer survivors. *Physician and Sports Medicine, 30*, 33-42.

Crocker, P. R. E., Kowalski, K., & Graham, T. R. (1998). Measurement of coping in sport. In J. Duda (Ed.), *Advances in Sport and Exercise Psychology Measurement* (pp. 149-191). Morgantown, WV: Fitness Information Technology.

Culos-Reed, S. N., Shields, C., & Brawley, L. R. (2005). Breast cancer survivors involved in vigorous team physical activity: Psychosocial correlates of maintenance participation. *Psycho-Oncology, 14*, 594-605.

David, J. P., & Suls, J. (1999). Coping efforst in daily life: Role of big five traits and problem appraisals. *Journal of Personality, 67*, 265-294.

de Ridder, D. T., Schreurs, K. M., & Bensing, J. M. (1998). Adaptive tasks, coping, and quality of life of chronically ill patients: The cases of Parkinson's disease and chronic fatigue syndrome. *Journal of Health Psychology, 3*, 87-101.

Deimling, G. T., Bowman, K. F., Sterns, S., Wagner, L. J., & Kahana, B. (2006). Cancer-related health worries and psychological distress among older adult, long-term cancer survivors. *Psycho-Oncology, 15*, 306-320.

Deimling, G. T., Bowman, K. F., & Wagner, L. J. (2007). The effects of cancer-related pain and fatigue on functioning of older adult, long-term cancer survivors. *Cancer Nursing, 30*, 421-432.

Deimling, G. T., Kahana, B., Bowman, K. F., & Schaefer, M. L. (2002). Cancer survivorship and psychological distress in later life. *Psycho-Oncology, 11*, 479-494.

Deimling, G. T., Wagner, L. J., Bowman, K. F., Sterns, S., Kercher, K., & Kahana, B. (2006). Coping among older-adult, long-term cancer survivors. *Psycho-Oncology, 15*, 143-159.

DeLongis, A., & Holtzman, S. (2005). Coping in context: The role of stress, social support, and personality in coping. *Journal of Personality, 73*, 1633-1656.

Denmark-Wahnefried, W., Peterson, B., McBride, C., Lipkus, I., & Clipp, E. (2000). Current health behaviors and readiness to pursue life-style changes among men and women

diagnosed with early stage of prostate and breast cancinomas. *American Cancer Society, 88*, 674-684.

Devemy, N., Antoine, P., Grenier, J. L., & Beaune, D. (2006). Exploratory study of the stressors relating to the chronic somatic diseases: dimensions identification and analysis of relationships with the quality of life. *European Review Of Applied Psychology-Revue Europeenne De Psychologie Appliquee, 56*, 83-93.

DiSipio, T., Hayes, S., Newman, B., & Janda, M. (2008). Health-related quality of life 18 months after breast cancer: comparison with the general population of Queensland, Australia. *Supportive Care in Cancer, 16*, 1141-1150.

Dow, K. H., Ferrell, B. R., Leigh, S., Ly, J., & Gulasekaram, P. (1996). An evaluation of quality of life among long-term survivors of breast cancer. *Breast Cancer Research and Treatment, 39*, 261-273.

Emery, C. F., Yang, H.-C., Frierson, G. M., Peterson, L. J., & Sooyeon, S. (2009). Determinants of physical activity among women treated for breast cancer in a 5-year longitudinal follow-up investigation. *Psycho-Oncology, 18*, 377-386.

Epping-Jordan, J. E., Compas, B. E., Osowiecki, D. M., Oppedisano, G., Gerhardt, C., Primo, K., et al. (1999). Psychological adjustment in breast cancer: Processes of emotional distress. *Health Psychology, 18*, 315-326.

Fayers, P. M., & Machin, D. (2000). *Qality of Life: Assessment, Analysis and Interpretation*. New York, NY: John Wiley & Sons.

Felsten, G. (2004). Stress reactivity and vulnerability to depressed mood in college students. *Personality and Individual Differences, 36*, 789-800.

Ferrell, B. R., Hassey Dow, K., & Grant, M. (1995). Measurement of the quality of life in cancer survivors. *Quality of Life Research, 4*, 523-531.

Folkman, S. (2008). The case for positive emotions in the stress process. *Anxiety, Stress, and Coping, 21*, 3-14.

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.

Fox, K. R. (1997). *The Physical Self: From motivation to well-being*. Windsor, Canada: Human Kinetics.

Franks, H. M., & Roesch, S. C. (2006). Appraisals and coping in people living with cancer: A meta-analysis. *Psycho-Oncology, 15*, 1027-1037.

Gaab, J., Rohleder, N., Nater, U. M., & Ehlert, U. (2005). Psychological determinants of the cortisol stress response: The role of anticipatory cognitive appraisal. *Psychoneuroendocrinology, 30*, 599-610.

Gallagher, J., Parle, M., & Cairns, D. (2002). Appraisal and psychological distress six months after diagnosis of breast cancer. *British Journal of Health Psychology, 7*, 365-376.

Gaudreau, P., Blondin, J.-P., & Lapierre, A.-M. (2002). Athletes' coping during a competition: Relationships of coping strategies with positive affect, negative affect, and performance-goal discrepancy. *Psychology of Sport & Exercise, 3*, 125-150.

Giacobbi, P. R., Tucitto, D. E., & Frye, N. (2007). Exercise, affect, and university students' appraisal of academic events prior to the final examination period. *Psychology of Sport and Exercise, 8*, 261-274.

Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behaviour in the community. *Canadian Journal of Applied Sport Science, 10*, 141-146.

Gotay, C. C., Holup, J. L., & Pagano, I. (2002). Ethnic differences in quality of life among early breast and prostate cancer survivors. *Psycho-Oncology, 11*, 103-113.

Gunthert, K., & Armeli, S. (1999). The role of neuroticism in daily stress and coping. *Journal of Personality and Social Psychology, 77*, 1087-1100.

Hadd, V., McDonough, M. H., Sabiston, C. M., & Crocker, P. R. E. (in press). Sources of stress for breast cancer survivors involved in dragon boat: Examining associations with treatment characteristics and self-esteem. *Journal of Women's Health*.

Hamama-Raz, R., Solomon, Z., Schachter, J., & Azizi, E. (2007). Objective and subjective stressors and the psychological adjustment of melanoma survivors. *Psycho-Oncology, 16*, 287-294.

Hudek-Knežević, J., & Kardum, I. (2000). The effects of dispositional and situational coping, perceived social support, and cognitive appraisal on immediate outcome. *European Journal of Psychologycal Assessment, 16*, 190-201.

Humpel, N., & Iverson, D. C. (2007). Depression and quality of life in cancer survivors: is there a relationship with physical activity? *International Journal of Behavioral Nutrition and Physical Activity, 4*, 65-74.

Irwin, M. L., Crumley, D., McTiernan, A., Bernstein, L., Baumgartner, R., Gilliland, F. D., et al. (2003). Physical activity levels before and after a diagnosis of breast carcinoma: The Health, Eating, Activity, and Lifestyle (HEAL) study. *Cancer, 97*, 1746-1757.

Irwin, M. L., McTiernan, A., Bernstein, L., Gilliland, F. D., Baumgartner, R., Baumgartner, K., et al. (2004). Physical activity levels among breast cancer survivors. *Medicine and Science in Sports and Exercise, 36*, 1484-1491.

Jacobs, D. J., Ainsworth, B. E., Hartman, T. J., & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine and Science in Sports and Exercise, 25*, 81-91.

Jen, K. L. C., Djuric, Z., DiLaura, N. M., Buison, A., Redd, J. N., Maranci, V., et al. (2004). Improvement of metabolism among obese breast cancer survivors in differing weight loss regimens. *Obesity Research, 12*, 306-312.

Jex, S. M., Bliese, P. D., Buzzell, S., & Primeau, J. (2001). The impact of self-efficacy on stressor - strain relations: Coping style as an exploratory mechanism. *Journal of Applied Psychology, 86*, 401-409.

Kanner, A. D., Coyne, J. C., Schaefer, C., & Lazarus, R. S. (1981). Comparison of two models of stress measurement: Daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine, 38*, 245-254.

Kassin, S. (2003). *Psychology*. Toronto, ON: Prentice Hall.

Kavussanu, M., & McAuley, E. (1995). Exercise and optimism: Are highly active individuals more optimistic? *Journal of Sport & Exercise Psychology, 17*, 246-258.

Kendall, A. R., Mahue-Giangreco, M., Carpenter, C. L., Ganz, P. A., & Bernstein, L. (2005). Influence of exercise activity on quality of life in long-term breast cancer survivors. *Quality of Life Research, 14*, 361-371.

Kershaw, T., Northouse, L., Kritpracha, C., Schafenacker, A., & Mood, D. (2004). Coping strategies and quality of life in women with advanced breast cancer and their family caregivers *Psychology and Health, 19*, 139-155.

King, M. T., Kenny, P., & Shiell, A. (2000). Quality of life three months and one year after first treatment for early stage breast cancer: Influence of treatment and patient characteristics.

An International Journal of Quality of Life Aspects of Treatment, Care, & Rehabilitation, 9, 789-800.

Kline, R. B. (2005). *Principles and Practice of Structural Equation Modeling (2nd ed)*. New York, NY: The Guilford Press.

Kornblith, A. B., Herndon II, J. E., Weiss, R. B., Zhang, C., Zuckerman, E. L., Rosenberg, S., et al. (2003). Long-term adjustment of survivors of early-stage breast carcinoma, 20 years after adjuvant chemotherapy. *Cancer, 98*, 679-689.

Labouvie, E. W. (1981). Identity versus equivalence of psychological measures and constructs. In L. W. Poon (Ed.), *Aging in the 1980's* (pp. 493-502). Washington, DC: American Psychological Association.

Lazarus, R. S. (1991). *Emotion and adaptation*. New York, NY: Oxford University Press.

Lazarus, R. S. (1993). Coping theory and research: Past, present, and future. *Psychosomatic Medicine, 55*, 234-247.

Lazarus, R. S. (1999). *Stress and Emotion*. New York: Springer Publishing Company.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.

Lebel, S., Rosberger, Z., Edgar, L., & Devins, G. M. (2007). Comparison of four common stressors across the breast cancer trajectory. *Journal of Psychosomatic Research, 63*, 225-232.

Luria, G., & Turjman, A. (2009). Resources and coping with stressful events. *Journal of Organizational Behavior, 30*, 685-707.

Manning-Walsh, J. (2005). Social support as a mediator between symptom distress and quality of life in women with breast cancer *Journal of Obstetric Gynecologic and Neonatal Nursing, 34*, 482-493.

Marsh, H. W., Wen, Z., & Hau, K. T. (2004). Structural equation models of latent interactions: Evaluation of alternative estimation strategies and indicator construction. *Psychological Methods, 9,* 1-19.

Masthoff, E. D., Trompenaars, F. J., Van Heck, G. L., Michielsen, H. J., Hodiamont, P. P., & De Vries, J. (2007). Predictors of quality of life: A model based study. *Quality of Life Research, 16,* 309-320.

McCaul, K. D., Sandgren, A. K., King, B., O'Donnell, S., Branstetter, A., & Foreman, G. (1999). Coping and adjustment to breast cancer. *Psycho-Oncology, 8,* 230-236.

McCrae, R. R., & Costa Jr., P. T. (1999). A five-factor theory of personality. In L.A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (pp. 139-153). New York: Guilford.

McDonough, M. H., Sabiston, C. M., & Crocker, P. R. E. (2008). An interpretative phenomenological examination of psychosocial changes among breast cancer survivors in their first season of dragon boating. *Journal of Applied Sport Psychology, 20,* 425-440.

McKenzie, D. C. (1998). Abreast in a Boat - A race against breast cancer. *Canadian Medical Association Journal, 159,* 376-378.

Miles, J., & Shevlin, M. (2004). *Applying Regression & Correlation: A Guide for Students and Researchers*. Thousand Oaks: Sage Publications.

Miller, M., & Rahe, R. H. (1997). Life changes scaling for the 1990s. *Journal of Psychosomatic Research, 43,* 279–292.

Mischel, W., & Shoda, Y. (1998). Reconciling processing dynamics and personality dispositions. *Annual Review of Psychology, 49,* 229-258.

Mullens, A. B., McCaul, K. D., Erickson, S. C., & Sandgren, A. K. (2004). Coping after cancer: Risk perceptions, worry, and health behaviors among colorectal cancer survivors. *Psycho-Oncology, 13*, 367-376.

Northouse, L. L., Caffey, M., Deichelbohrer, L., Schmidt, L., Guziatek-Trojniak, L., West, S., et al. (1999). The quality of life of African American women with breast cancer. *Research in Nursing & Health, 22*, 449-460.

O'Brien, T. B., & DeLongis, A. (1996). The interactional context of problem-focused, emotion-focused, and relationship-focused coping: The role of big five personality factors. *Journal of Personality (Special issue: Personality and Coping), 64*, 775-813.

O'Brien, T. B., & DeLongis, A. (1997). Coping with chronic stress: An interpersonal perspective. In B. H. Bottlieb (Ed.), *Coping with Chronic Stress* (pp. 161-191). New York: Plenum Press.

Ong, L. M. L., Visser, M. R. M., Van Zuuren, F. J., Rietbroek, R. C., Lammes, F. B., & De Haes, J. C. J. M. (1999). Cancer patients coping styles and doctor-patient communication. *Psycho-Oncology, 8*, 155-166.

Pakenham, K. I., & Rinaldis, M. (2001). The role of illness, resources, appraisal, and coping strategies in adjustment to HIV/AIDS: The direct and buffering effects *Journal of Behavioral Medicine, 24*, 259-279.

Parry, D. C. (2007). “There is life after breast cancer”: Nine vignettes exploring dragon boat racing for breast cancer survivors. *Leisure Sciences, 29*, 53-69.

Parry, D. C. (2008). The contribution of dragon boat racing to women's health and breast cancer survivorship. *Qualitative Health Research, 18*, 222-233.

Peacock, E. J., & Wong, P. T. (1990). The Stress Appraisal Measure (SAM): A multidimensional approach to cognitive appraisal. *Stress Medicine, 6*, 227-236.

Phillips, D. M., & Balducci, L. (1996). Current management of breast cancer. *American Family Physician, 53*, 657-665.

Phillips, K. A., & Bernhard, J. (2003). Adjuvant breast cancer treatment and cognitive function: Current knowledge and research directions. *Journal of the National Cancer Institute, 95*, 190-197.

Pinquart, M., Fröhlich, C., & Silbereisen, R. K. (2007). Cancer patients' perceptions of positive and negative illness-related changes. *Journal of Health Psychology, 12*, 901-907.

Pinto, B. M., Clark, M. M., Maruyama, N. C., & Feder, S. I. (2003). Psychological and fitness changes associated with exercise participation among women with breast cancer. *Psycho-Oncology, 12*, 118-126.

Pinto, B. M., Frierson, G. M., Rabin, C., Trunzo, J. J., & Marcus, B. H. (2005). Home-based physical activity intervention for breast cancer patients. *Journal Of Clinical Oncology, 23*, 3577-3587.

Pinto, B. M., Trunzo, J. T., Cram, R., & Frierson, G. (2003). Maintenance of regular physical activity among breast cancer survivors. *Psycho-Oncology, 12*, S81-S81.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of literature and recommended remedies. *Journal of Applied Psychology, 88*, 879-903.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879-891.

Préau, M., Vincent, E., Spire, B., Reliquet, V., Fournier, I., Michelet, C., et al. (2005). Health-related quality of life and health locus of control beliefs among HIV-infected treated patients. *Journal of Psychosomatic Research, 59*, 407-413.

Quan, H., Fong, A., De Coster, C., Wang, J., Musto, M., Noseworthy, T. W., et al. (2006). Variation in health services utilization among ethnic populations *Canadian Medical Association Journal, 174*, 787-791.

Rabin, C. S., Pinto, B. M., Trunzo, J. J., Frierson, G. M., & Bucknam, L. M. (2006). Physical activity among breast cancer survivors: Regular exercisers vs participants in a physical activity intervention. *Psycho-Oncology, 15*, 344-354.

Raikkonen, K., Matthews, K. A., Flory, J. D., Owens, J. F., & Gump, B. B. (1999). The effects of optimism, pessimism, and trait anxiety on ambulatory blood pressure and mood during everyday life. *Journal of Personality and Social Psychology, 76*, 104-113.

Rejeski, W. J., Gauvin, L., Hobson, M. L., & Norris, J. L. (1995). Effects of baseline responses, in-task feelings, and duration of activity on exercise-induced feeling states in women. *Health Psychology, 14*, 350-359.

Rhodes, R. E., Courneya, K. S., & Bobick, T. M. (2001). Personality and exercise participation across the breast cancer experience. *Psycho-Oncology, 10*, 380-388.

Rock, C. L., Flatt, S. W., Newman, V., Caan, B. J., Haan, M. N., Stefanick, M. L., et al. (1999). Factors associated with weight gain in women after diagnosis of breast cancer *Journal of American Dietetic Association, 99*, 1212-1221.

Roesch, S. C., & Weiner, B. (2001). A meta-analytic review of coping with illness: Do causal attributions matter? *Journal of Psychosomatic Research, 50*, 205-219.

Rogers, L. D., Courneya, K. S., Shah, P., Dunnington, G., & Hopkins-Price, P. (2007). Exercise stage of change, barriers, expectations, values and preferences among breast cancer patients during treatment: A pilot study. *European Journal of Cancer Care, 16*, 55-66.

Rosmond, R., & Bjorntorp, P. (1999). Psychosocial and socio-economic factors in women and their relationship to obesity and regional body fat distribution. *International Journal of Obesity, 23*, 138-145.

Sabiston, C. M., & Crocker, P. R. E. (2008). Exploring self-perceptions and social influences as correlates of adolescent leisure time physical activity. *Journal of Sport & Exercise Psychology, 30*, 3-22.

Sabiston, C. M., McDonough, M. H., & Crocker, P. R. E. (2007). Psycho-social experiences of breast cancer survivors involved in a dragon boat program: Exploring links to positive psychological growth. *Journal of Sport & Exercise Psychology, 29*, 419-438.

Salmon, P. (2001). Effects of physical exercise on anxiety, depression, and sensitivity to stress: A unifying theory *Clinical Psychological Review, 21*, 33-91.

Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: Assessment and implications of generalized outcome expectancies. *Health Psychology, 4*, 219-247.

Scheier, M. F., & Carver, C. S. (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive Therapy and Research, 16*, 201-228.

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology, 67*, 1063-1078.

Schootman, M., Jeffe, D. B., Reschke, A. H., & Aft, R. L. (2003). Disparities related to socioeconomic status and access to medical care remain in the United States among women who never had a mammogram. *Cancer Causes and Control, 14*, 419-425.

Schou, I., Ekeberg, O., & Ruland, C. M. (2005). The mediating role of appraisal and coping in the relationship between optimisn-pessimism and quality of life. *Psycho-Oncology, 14*, 718-727.

Schou, I., Ekeberg, O., Ruland, C. M., Sandvik, L., & Karesen, R. (2003). Pessimism as a predictor of emotinal morbidity one year following breast cancer surgery. *Psycho-Oncology, 13*, 309-320.

Schroevers, M., Ranchor, A., & Sanderman, R. (2006). Adjustment to cancer in the 8 years following diagnosis: A longitudinal study comparing cancer survivors with healthy individuals. *Social Science & Medicine, 63*, 598-610.

Simon, A. E., Steptoe, A., & Wardle, J. (2005). Socioeconomic differences in coping with a stressful medical procedure. *Psychosomatic Medicine, 67*, 270-276.

Simon, A. E., & Wardle, J. (2008). Socioeconomic disparities in psychosocial wellbeing in cancer patients *European Journal of Cancer, 44*, 572-578.

Skinner, E. A., Edge, K., Altman, J., & Sherwood, H. (2003). Searching for the structure of coping: A review and critique of category systems for classifying ways of coping. *Psychological Bulletin, 129*, 216-269.

Smith, K. W., Avis, N. E., & Assmann, S. F. (1999). Distinguishing between quality of life and health status in quality of life research: A meta-analysis. *Quality of Life Research, 8*, 447-459.

Snyder, C. R. (2002). Hope theory: Rainbows in the mind. *Psychological Inquiry, 13*, 249-275.

Spirduso, W. W., Francis, K. L., & MacRae, P. G. (2005). *Physical Dimensions of Aging* (Second ed.). Champaign, IL: Human Kinetics.

Stava, C. J., Lopez, A., & Vassilopoulou-Sellin, R. (2006). Health profiles of younger and older breast cancer survivors. *Cancer, 107*, 1752-1759.

Sternfeld, B., Ainsworth, B. E., & Quesenberry, J., C.P. (1999). Physical activity patterns in a diverse population of women. *Preventive Medicine, 28*, 313-323.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics (5th ed.)*. Boston: Allyn and Bacon.

Tallman, B. A., Altmaier, E., & Garcia, C. (2007). Finding benefit from cancer. *Journal of Counselling Psychology, 54*, 481-487.

Taylor, S. E., & Seeman, T. E. (1999). Psychosocial resources and the SES-health relationship. *Annals New York Academy of Sciences, 896*, 210-225.

Tchen, N., Juffs, H. G., Downie, F. P., Yi, Q.-L., Hu, H., Chemerynsky, I., et al. (2003). Cognitive function, fatigue, and menopausal symptoms in women receiving adjuvant chemotherapy for breast cancer *Journal of Clinical Oncology, 21*, 4175-4183.

Thomas, J. R., Nelson, J. K., & Silverman, S. J. (2005). *Research Methods in Physical Activity (5th ed.)*. Champaign, IL.: Human Kinetics.

Ware, J. E. (1993). *SF-36 Health Survey: Manuel and Interpretation Guide*. Boston: The Health Institute, New England Medical Centre.

Ware, J. E., Kosinski, M., & Gandek, B. (2000). *SF-36 Health Survey: Manual & Interpretation Guide*. Lincoln, RI: QualityMetric Incorporated.

Watson, D. (1990). On the dispositional nature of stress measures: Stable and nonspecific influences on self-reported hassles. *Psychological Inquiry, 1*, 34-37.

Watson, D. (2000). *Mood and Temperament*. New York, NY: The Guildford Press.

Wee, C. C., Davis, R. B., & Hamel, M. B. (2008). Comparing the SF-12 and SF-36 health status questionnaires in patients with and without obesity. *Health and Quality of Life Outcomes, 6*, 1-7.

Wenzel, L. B., Fairclough, D. L., Brady, M. J., Cella, D., Garrett, K. M., Kluhsman, B. C., et al. (1999). Age-related differences in the quality of life of breast carcinoma patients after treatment. *Cancer, 86*, 1768-1774.

Wilmoth, M. C., Coleman, E. A., Smith, S. C., & Davis, C. (2004). Fatigue, weight gain, and altered sexuality in patients with breast cancer: Exploration of a symptom cluster *Oncology Nursing Forum, 31*, 1069-1075.

Wilson, P. M., Blanchard, C. M., Nehl, E., & Baker, F. (2005). Predicting physical activity and outcome expectations in cancer survivors: an application of Self-Determination Theory *Psycho-Oncology, 15*, 567-578.

Yang, H.-C., Brothers, B. M., & Andersen, B. L. (2008). Stress and quality of life in breast cancer recurrence: Moderation or mediation of coping? . *Annals of Behavioral Medicine, 35*, 188-197.

Zeidner, M., & Endler, N. S. (1996). *Handbook of Coping: Theory, Research, Applications*. New York: NY: Wiley.

APPENDICES

Appendix A: Ethics Approval

The University of British Columbia
Office of Research Services
Behavioural Research Ethics Board
Suite 102, 6190 Agronomy Road,
Vancouver, B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - FULL BOARD

PRINCIPAL INVESTIGATOR:	INSTITUTION / DEPARTMENT:	UBC BREB NUMBER:
Peter Crocker	UBC/Education/Human Kinetics	H07-01074

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:

Institution	Site
UBC	Point Grey Site

Other locations where the research will be conducted:
Participants will complete the questionnaires in their homes. Data will be analyzed at UBC, Point Grey campus.

CO-INVESTIGATOR(S):
Joanne Stephen
Valerie Hadd

SPONSORING AGENCIES:
UBC Hampton Research Endowment Fund - "Stress in breast cancer survivors: The influence of individual differences and physical activity"

PROJECT TITLE:
Stress and well-being in breast cancer survivors: The influence of personality, socio-economics, cancer-related characteristics, and physical activity levels

REB MEETING DATE:	CERTIFICATE EXPIRY DATE:
June 14, 2007	**June 14, 2008**

DOCUMENTS INCLUDED IN THIS APPROVAL: **DATE APPROVED: July 19, 2007**

Document Name	Version	Date
Protocol:		
Proposal	1	May 28, 2007
Consent Forms:		
Study 2 - Online Consent	3	July 12, 2007
Study 1 - Questionnaire Consent	4	July 18, 2007
Study 2 - Online Consent	5	July 18, 2007
Study 2 - Online Consent	2	July 4, 2007
Study 1 - Questionnaire Consent	5	July 18, 2007
Questionnaire Consent	3	July 18, 2007
Study 2 - Online Consent	1	June 1, 2007
Study 1 - Questionnaire Consent	1	June 1, 2007
Study 1 - Questionnaire Consent	2	July 4, 2007
Study 2 - Online Consent	4	July 18, 2007
Questionnaire, Questionnaire Cover Letter, Tests:		
Questionnaire Mail-out Study 1	2	July 4, 2007
Questionnaire Morning Study 2	1	May 31, 2007
Questionnaire Evening Study 2	1	May 31, 2007
Questionnaire Mail-out Study 1	1	May 31, 2007
Letter of Initial Contact:		
Study 1 - Introduction Letter	2	July 4, 2007
Study 1 - Introduction Letter	1	June 1, 2007

Other Documents:

Counseling Services 1 July 4, 2007

Other:

The web site for Study 2 has not been created yet. It will be created in the following weeks. A web survey excludes breast cancer survivors without access to or competency in internet use and without English language competency. Therefore, results can not be generealized for breast cancer survivors, but breast cancer survivors who have internet access and competency and for those who have English language competency only. This will be one limitation of this design which will be mentioned/considered when analyzing the data and drawing conclusions. The findings will only be generalized to breast cancer survivors living in BC who have English language competency and who have access to/competency in internet use.

The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:

Dr. Peter Suedfeld, Chair
Dr. Jim Rupert, Associate Chair
Dr. Arminee Kazanjian, Associate Chair
Dr. M. Judith Lynam, Associate Chair
Dr. Laurie Ford, Associate Chair

Appendix B: Consent Forms

School of Human Kinetics

Peter R.E. Crocker, Ph.D.

Exercise and Health Psychology Lab
Rm. 220A, War Memorial Gym
6081 University Blvd.
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QUESTIONNAIRE CONSENT FORM

Stress and well-being in breast cancer survivors: The influence of personality, socio-demographics, cancer-related characteristics and physical activity levels

Principal Investigator:
Peter Crocker, Ph.D.
W: 604-822-5580
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Co-Investigator:
Valerie Hadd, M.A
W: (604) 822-0219
sportpsychubc@yahoo.com

Purpose:

We are conducting a study to examine the relationships between personality, stressors, appraisal of stress, quality of life, physical activity, and cancer-related characteristics among breast cancer survivors post-treatment.

Study Procedures:

- You are being asked to complete a questionnaire once, and to mail it back to us in self-addressed (postage paid) envelope. The questionnaire asks you to answer questions about personality, stressors, appraisal of stress, quality of life, physical activity, demographics, and cancer-related information. The questionnaire will take approximately 30-40 minutes to complete. You have been approached with the opportunity to be a participant in this study because you are a female breast cancer survivor who have been diagnosed with stage I, II, or III of cancer and have been post-treatment for at least one year.
- Please read the instructions provided in the questionnaire and answer all items on the questionnaire honestly. You are free to not answer specific items or questions on the questionnaires.

Benefits and Risks to Participants

- There are no known physical or psychological benefits of participating in this research. There may be some discomfort in reflecting on personal stressors, and their appraisals. Some participants may feel emotionally upset as a result of reading or answering these questions. We hope that this happen rarely, if at all; but if participating in the research upsets you, and you would like to speak to someone

about it, you may use the list of counseling services that is attached to this questionnaire.

Confidentiality

Information gathered during the questionnaire assessments will be used for research purposes only, and your identity will not be revealed at any time. Results of this study will be analyzed in group form and will be used only in the preparation of academic research publications and presentations.

No persons other than the members of the research team will have access to the completed questionnaires or any other supporting documentation, which will be securely stored for a minimum of five years as required by the University of British Columbia guidelines.

Contact information about the rights of research subjects

If you have any concerns about the treatment or rights of research participants, you may contact the ORS Research Subject Information Line at 604-822-8598.

Contact information about the study:
If you have any questions concerning the procedures of this study or desire further information please contact Dr. Peter Crocker at (604) 822-5580 or Valerie Hadd at (604) 822-0219. A summary of the results of this study will be available upon request from Dr. Peter Crocker. You can also go to his website (http://www.hkin.educ.ubc.ca/behavioural/index.html) to obtain a copy of the summary once data collection and analysis have been completed.

Consent:

Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time with absolutely no penalty.

The completion of the questionnaire, indicates

- That you have been informed of the objectives and procedures of this research study, as outlined above
- That you have received a copy of this consent form for your records
- That you consent to participate in this project, as outlined above.

****** You may detach this page and keep it for your records.******

Appendix C: Questionnaires

Stressor Questionnaire

Below are a number of stressors that some breast cancer survivors have had after they are finished with treatment. Please indicate how often you have experienced each of them ***in the last four (4) weeks*** . If you have experienced them, also indicate on average, how intense they were.

Stressors	**How often have you experienced these stressors in the last month?** **1- Never** **2- A few times** **3- Almost every week** **4- Once or twice every week** **5- Several times per week**					**On average, when you experienced this stressor, how intense was it?** **1. Not very intense** **2. Somewhat intense** **3. Moderately intense** **4. Intense** **5. Extremely intense**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Physical Stressors										
1. Fatigue	☐	☐	☐	☐	☐	1	2	3	4	5
2. Reduced physical ability that resulted from treatment(s)	☐	☐	☐	☐	☐	1	2	3	4	5
3. Side effects from medication	☐	☐	☐	☐	☐	1	2	3	4	5
4. Feeling overweight	☐	☐	☐	☐	☐	1	2	3	4	5
5. Lymphedema	☐	☐	☐	☐	☐	1	2	3	4	5
6. Disruption of sleep	☐	☐	☐	☐	☐	1	2	3	4	5
7. Memory loss	☐	☐	☐	☐	☐	1	2	3	4	5
8. Changes in appearance that resulted from treatment(s)	☐	☐	☐	☐	☐	1	2	3	4	5
9. Aches and pains	☐	☐	☐	☐	☐	1	2	3	4	5
10. Sexual dysfunction	☐	☐	☐	☐	☐	1	2	3	4	5
11. Symptoms of treatment-induced menopause	☐	☐	☐	☐	☐	1	2	3	4	5

Stressors	**How often have you experienced these stressors in the last month?** **1- Never** **2- A few times** **3- Almost every week** **4- Once or twice every week** **5- Several times per week**					**On average, when you experienced this stressor, how intense was it?** **1. Not very intense** **2. Somewhat intense** **3. Moderately intense** **4. Intense** **5. Extremely intense**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Emotional Stressors										
12. Fear of recurrence	☐	☐	☐	☐	☐	1	2	3	4	5
13. Anxiety	☐	☐	☐	☐	☐	1	2	3	4	5
14. Feelings of uncertainty about your future	☐	☐	☐	☐	☐	1	2	3	4	5
15. Feeling that your body is out of control	☐	☐	☐	☐	☐	1	2	3	4	5
Social Stressors										
16. Difficulty in disclosing information about your health to your family	☐	☐	☐	☐	☐	1	2	3	4	5
17. Difficulty in disclosing information about your health to your friends	☐	☐	☐	☐	☐	1	2	3	4	5
18. Feeling that others expect you to act like your life is the same as it was before breast cancer	☐	☐	☐	☐	☐	1	2	3	4	5
19. Stress in social settings	☐	☐	☐	☐	☐	1	2	3	4	5
20. Worried about family or friends getting breast cancer	☐	☐	☐	☐	☐	1	2	3	4	5

Cognitive Appraisal of Physical Stressors

This questionnaire is concerned with your thoughts and feelings about various **PHYSICAL** stressors identified in the Stressor Questionnaire (see items 1 to 11). There are no right or wrong answers. Please respond according to ***how, in general, you viewed the PHYSICAL stressors in the last four weeks***. Please answer **ALL** questions. Answer each question by **CIRCLING** the appropriate number corresponding to the following scale.

	1 Not at all	2 Slightly	3 Moderately	4 Considerably	5 Extremely
These stressors made me feel anxious	1	2	3	4	5
These stressors had a positive impact on me	1	2	3	4	5
I knew what I could do when facing these stressors	1	2	3	4	5
I was eager to tackle these stressors	1	2	3	4	5
I became a stronger person because of these stressors	1	2	3	4	5
The outcome of these stressors was seen as negative	1	2	3	4	5
I had **no idea** what I could do.	1	2	3	4	5
I had the ability to do well when facing these stressors	1	2	3	4	5
I had what it took to do well when facing these stressors	1	2	3	4	5
I was excited thinking about the outcome of these stressors	1	2	3	4	5
When facing these stressors, I could think of lots of action alternatives	1	2	3	4	5
These stressors were threatening	1	2	3	4	5
I thought I would be able to overcome the problem	1	2	3	4	5
I had the skills necessary to achieve a successful outcome to these stressors	1	2	3	4	5
I could think of lots of solutions for handling these stressors	1	2	3	4	5
These stressors had a negative impact on me	1	2	3	4	5

Cognitive Appraisal of Emotional Stressors

This questionnaire is concerned with your thoughts and feelings about various **EMOTIONAL** stressors identified in the Stressor Questionnaire (see items 12 to 15). There are no right or wrong answers. Please respond according to ***how, in general, you viewed the EMOTIONAL stressors in the last four weeks***. Please answer **ALL** questions. Answer each question by **CIRCLING** the appropriate number corresponding to the following scale.

	1 Not at all	2 Slightly	3 Moderately	4 Considerably	5 Extremely
These stressors made me feel anxious	1	2	3	4	5
These stressors had a positive impact on me	1	2	3	4	5
I knew what I could do when facing these stressors	1	2	3	4	5
I was eager to tackle these stressors	1	2	3	4	5
I became a stronger person because of these stressors	1	2	3	4	5
The outcome of these stressors was seen as negative	1	2	3	4	5
I had **no idea** what I could do.	1	2	3	4	5
I had the ability to do well when facing these stressors	1	2	3	4	5
I had what it took to do well when facing these stressors	1	2	3	4	5
I was excited thinking about the outcome of these stressors	1	2	3	4	5
When facing these stressors, I could think of lots of action alternatives	1	2	3	4	5
These stressors were threatening	1	2	3	4	5
I thought I would be able to overcome the problem	1	2	3	4	5
I had the skills necessary to achieve a successful outcome to these stressors	1	2	3	4	5
I could think of lots of solutions for handling these stressors	1	2	3	4	5
These stressors had a negative impact on me	1	2	3	4	5

Cognitive Appraisal of Social Stressors

This questionnaire is concerned with your thoughts and feelings about various **SOCIAL** stressors identified in the Stressor Questionnaire (see items 16 to 20). There are no right or wrong answers. Please respond according to ***how, in general, you viewed the SOCIAL stressors in the last four weeks***. Please answer **ALL** questions. Answer each question by **CIRCLING** the appropriate number corresponding to the following scale.

	1 Not at all	2 Slightly	3 Moderately	4 Considerably	5 Extremely
These stressors made me feel anxious	1	2	3	4	5
These stressors had a positive impact on me	1	2	3	4	5
I knew what I could do when facing these stressors	1	2	3	4	5
I was eager to tackle these stressors	1	2	3	4	5
I became a stronger person because of these stressors	1	2	3	4	5
The outcome of these stressors was seen as negative	1	2	3	4	5
I had **no idea** what I could do.	1	2	3	4	5
I had the ability to do well when facing these stressors	1	2	3	4	5
I had what it took to do well when facing these stressors	1	2	3	4	5
I was excited thinking about the outcome of these stressors	1	2	3	4	5
When facing these stressors, I could think of lots of action alternatives	1	2	3	4	5
These stressors were threatening	1	2	3	4	5
I thought I would be able to overcome the problem	1	2	3	4	5
I had the skills necessary to achieve a successful outcome to these stressors	1	2	3	4	5
I could think of lots of solutions for handling these stressors	1	2	3	4	5
These stressors had a negative impact on me	1	2	3	4	5

Quality of Life Questionnaire

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Please answer these questions by "checking" your choice. Please select only one choice for each item.

1- In general, would you say your health is:

☐ Excellent

☐ Very good

☐ Good

☐ Fair

☐ Poor

2- Compared to AT THE END OF YOUR TREATMENT, how would you rate your health in general NOW?

☐ MUCH BETTER than at the end of your treatment.

☐ Somewhat BETTER now than at the end of your treatment.

☐ About the SAME as at the end of your treatment.

☐ Somewhat WORSE now than at the end of your treatment.

☐ MUCH WORSE now than at the end of your treatment.

3- The following items are about activities you might do during a typical day.

Does your health now limit you in these activities? If so, how much?

Activities	**Yes, Limited A Lot**	**Yes, Limited A Little**	**No, Not Limited At All**
a) **Vigorous activities,** such as running, lifting heavy objects, participating in strenuous sports?	☐	☐	☐
b) **Moderate activities,** such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?	☐	☐	☐
c) Lifting or carrying groceries?	☐	☐	☐
d) Climbing **several flights** of stairs?	☐	☐	☐
e) Climbing **one** flight of stairs?	☐	☐	☐

f) Bending, kneeing or stooping?	☐	☐	☐
g) Walking **more than a mile**?	☐	☐	☐
h) Walking **several** blocks?	☐	☐	☐
i) Walking **one** block?	☐	☐	☐
j) Bathing or dressing yourself?	☐	☐	☐

4- During the **past 4 weeks**, have you had any of the following problems with your work or other regular activities *as a result of your physical health*?

	Yes	No
a) Cut down on the **amount of time** you spent on work or other activities?	☐	☐
b) **Accomplished less** than you would like?	☐	☐
c) Were limited in the **kind** of work or other activities?	☐	☐
d) Had **difficulty** performing the work or other activities (for example it took extra effort)?	☐	☐

5. During the **past 4 weeks**, how much time have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

	All of the time	**Most of the time**	**Some of the time**	**A little of the time**	**None of the time**
a) Cut down on the **amount of time** you spent on work or other activities?	☐	☐	☐	☐	☐
b) **Accomplished less** than you would like?	☐	☐	☐	☐	☐
c) Didn't do work or other activities as **carefully** as usual?	☐	☐	☐	☐	☐

6. During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

☐ Not at all

☐ Slightly

☐ Moderately

☐ Quite a bit

☐ Extremely

7. How much **bodily pain** have you had during the **past 4 weeks**?

☐ None

☐ Very mild

☐ Mild

☐ Moderate

☐ Severe

☐ Very severe

8. During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?

☐ Not at all

☐ A little bit

☐ Moderately

☐ Quite a bit

☐ Extremely

9. These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

(Please check **one** box on each line)

How much of the time during the **past 4 weeks** …	**All of the time**	**Most of the time**	**A good bit of the time**	**Some of the time**	**A little of the time**	**None of the time**
a) Did you feel full of pep?	☐	☐	☐	☐	☐	☐
b) Have you been a very nervous person?	☐	☐	☐	☐	☐	☐
c) Have you felt so down in the dumps that nothing could cheer you up?	☐	☐	☐	☐	☐	☐
d) Have you felt calm and peaceful?	☐	☐	☐	☐	☐	☐
e) Did you have a lot of energy?	☐	☐	☐	☐	☐	☐
f) Have you felt downhearted and blue?	☐	☐	☐	☐	☐	☐
g) Do you feel worn out?	☐	☐	☐	☐	☐	☐
h) Have you been a happy person?	☐	☐	☐	☐	☐	☐
i) Did you feel tired?	☐	☐	☐	☐	☐	☐

10. During the **past 4 weeks**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?

☐ All of the time

☐ Most of the time.

☐ Some of the time

☐ A little of the time.

☐ None of the time.

11. How TRUE or FALSE is **each** of the following statements for you?

(Please check **one** box on each line)

	Definitely true	**Mostly true**	**Don't know**	**Mostly false**	**Definitely false**
a) I seem to get sick a little easier than other people?	☐	☐	☐	☐	☐
b) I am as healthy as anybody I know?	☐	☐	☐	☐	☐
c) I expect my health to get worse?	☐	☐	☐	☐	☐
d) My health is excellent?	☐	☐	☐	☐	☐

Recent Life Events:

Listed below are a number of events. Please read each item carefully and indicate whether or not each event has happened to you **in the past year**.

	Yes	No
a) Have you, your immediate family, or close friends had a serious illness or been seriously injured?	☐	☐
b) Have you separated from your partner?	☐	☐
c) Have you had any serious problem with a close friend, neighbor or relative?	☐	☐
d) Have you, or an immediate family member been subject to serious abuse, attack or/and threats?	☐	☐
e) Have you or your partner been unemployed or seeking work for more than one month?	☐	☐
f) Have you or your partner been sacked from your job or made redundant?	☐	☐
g) Have you had any major financial difficulties (e.g., debts, difficulty paying bills)?	☐	☐
h) Have you moved house or have housing difficulties?	☐	☐
i) Have you had any other significant event (Please specify)?	☐	☐

Please specify: _____

_____

Optimism Questionnaire

Please be as honest and accurate as you can. Try not to let your response to one statement influence your responses to other statements. There are no "correct" or "incorrect" answers. Answer according to your own feelings, rather than how you think "most people" would answer.

0 = I agree a lot, **1** = I agree a little, **2** = I neither agree nor disagree, **3** = I DISagree a little, **4** = I DISagree a lot

	I agree a lot 0	1	2	3	I disagree a lot 4
In uncertain times, I usually expect the best	0	1	2	3	4
It's easy for me to relax	0	1	2	3	4
If something can go wrong for me, it will	0	1	2	3	4
I'm always optimistic about my future	0	1	2	3	4
I enjoy my friends a lot	0	1	2	3	4
It's important for me to keep busy	0	1	2	3	4
I hardly ever expect things to go my way	0	1	2	3	4
I don't get upset too easily	0	1	2	3	4
I rarely count on good things happening to me	0	1	2	3	4
Overall, I expect more good things to happen to me than bad	0	1	2	3	4

Neuroticism Scale

Read each statement carefully. For each statement, choose the response that best represents your opinion. Try not to let your response to one statement influence your responses to other statements. There are no "correct" or "incorrect" answers. Make sure that your answer each question.

1 = **Strongly Disagree,** 2 = **Disagree,** 3 = **Neutral,** 4 = **Agree,** 5 = **Strongly Agree**

	Strongly Disagree 1	2	3	4	**Strongly Agree** 5
I am not a worrier.	**1**	**2**	**3**	**4**	**5**
I often feel inferior to others.	**1**	**2**	**3**	**4**	**5**
When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.	**1**	**2**	**3**	**4**	**5**
I rarely feel lonely or blue.	**1**	**2**	**3**	**4**	**5**
I often feel tense and jittery.	**1**	**2**	**3**	**4**	**5**
Sometimes I feel completely worthless.	**1**	**2**	**3**	**4**	**5**
I rarely feel fearful or anxious.	**1**	**2**	**3**	**4**	**5**
I often get angry at the way people treat me.	**1**	**2**	**3**	**4**	**5**
Too often, when things go wrong, I get discouraged and feel like giving up.	**1**	**2**	**3**	**4**	**5**
I am seldom sad or depressed.	**1**	**2**	**3**	**4**	**5**
I often feel helpless and want someone else to solve my problems.	**1**	**2**	**3**	**4**	**5**
At times I have been so ashamed I just wanted to hide.	**1**	**2**	**3**	**4**	**5**

Godin Leisure-Time Exercise Questionnaire

1. During a typical **7-Day period** (a week), how many times on average do you do the following kinds of exercise for **more than 15 minutes** during your free time (write on each line the appropriate number)?

Times Per Week

a) STRENUOUS EXERCISE

(HEART BEATS RAPIDLY) _____

(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE

(NOT EXHAUSTING) _____

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE

(MINIMAL EFFORT) _____

(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)

2. During a typical 7-Day period (a week), in your leisure time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

OFTEN	SOMETIMES	NEVER/RARELY
1. ☐	2. ☐	3. ☐

Background Information

1. Age (years) _____
2. Weight (pounds) _____
3. Height (feet and inches) _____
4. What is your menopausal status?
   - ☐ Pre-menopausal
   - ☐ During menopause
   - ☐ Post-menopausal
   - ☐ Drug-induced (not permanent)

5. What is your marital status?
   - ☐ Never married
   - ☐ Married
   - ☐ Separated
   - ☐ Divorced
   - ☐ Widowed

6. Ethnicity (please check ***all*** that apply)

   - ☐ Caucasian
   - ☐ Asian
   - ☐ Hispanic
   - ☐ First Nations/Aboriginal
   - ☐ African
   - ☐ East Indian
   - ☐ Other. Please specify: _____

7. What is your household income?
   - ☐ less than $20,000
   - ☐ $20,000 to $39,999
   - ☐ $40,000 to $59,999
   - ☐ $60,000 to $79,999
   - ☐ $80,000 to $99,999
   - ☐ $100,000 or more

8. What is your highest level of education?
   - ☐ Did not complete high school
   - ☐ High school diploma
   - ☐ Some post-secondary
   - ☐ College or technical diploma or certificate
   - ☐ University undergraduate degree
   - ☐ Post-graduate degree

9. Are you currently employed? ☐ Yes ☐ No
   If yes, please describe your occupation _____

10. When were you first diagnosed with breast cancer? _____

11. What cancer stage were you diagnosed at (at diagnosis)?
    - ☐ Stage I: tumor is localized in breast and 2 centimeters or less. The skin is not involved. There is no metastase (spread of cancer from one part of the body to another) in axillary lymph nodes.
    - ☐ Stage II: tumor is localized in breast and more than 2 centimeters but less than 5. There are a few axillary lymph nodes and no metastase (spread of cancer from one part of the body to another).
    - ☐ Stage III: tumor diffusely infiltrates breast and can be bigger than 5 centimeters. There are many axillary lymph nodes and no metastase (spread of cancer from one part of the body to another).
    - ☐ Other. Please Specify. _____

12. How many lymph nodes containing cancer were found? _____

13. Have you had a recurrence of breast cancer? ☐ Yes ☐ No

14. What medical treatments have you received for breast cancer? (please check ***all*** that apply)
    - ☐ Lymph node or axillary node dissection
    - ☐ Lumpectomy
    - ☐ Mastectomy
        - ☐ Simple mastectomy (i.e., only the breast is removed, not the lymph nodes)
        - ☐ Modified radical mastectomy (i.e., removal of lower 2 levels of lymph nodes in axilla)
        - ☐ Radical mastectomy (i.e., removal of all 3 levels)
        - ☐ Skin-sparing mastectomy
        - ☐ Double mastectomy
    - ☐ Reconstructive surgery
    - ☐ Chemotherapy
    - ☐ Radiation
        - ☐ Ionizing radiation
        - ☐ Particulate radiation
        - ☐ Whole-breast radiation
        - ☐ Partial-breast radiation (e.g., interstitial brachitherapy, intraoperative, IMRT, and balloon catheter-based brachetherapy)
    - ☐ Hormonal therapy
        - ☐ Tamoxifen
        - ☐ Nolvadek
    - ☐ Targeted therapy
        - ☐ Herceptin
    - ☐ Other: (please list) _____

15. When did you complete your last treatment for breast cancer (excluding tamoxifen and reconstructive surgery)? _____

16. History of physical activity pre-diagnosis. Please select all activities listed below that you have done more than 10 times in the year prior to your cancer diagnosis.

☐Jogging (outdoor, treadmill)	☐Swimming (laps, snorkeling)	☐Strength/Weight training
☐Bicycling (indoor, outdoor)	☐Softball/Baseball	☐Rock Climbing
☐Volleyball	☐Bowling	☐Scuba Diving
☐Basketball	☐Skating (roller, ice, blading)	☐Stair Master
☐Martial Arts (karate, judo)	☐Tai Chi	☐Fencing
☐Calisthenics/Toning Exercises	☐Wood Chopping	☐Hiking
☐Water/Coal Hauling	☐Walking for exercise (outdoor, indoor at mall or fitness center, treadmill)	☐Tennis
☐Football/Soccer	☐Racquetball/Handball/ Squash	☐Golf
☐Horseback Riding	☐Hunting	☐Canoeing/Rowing/Kayaking
☐Fishing	☐Aerobic Dance/Step Aerobic	☐Water Skiing
☐Water Aerobics	☐Dancing (square, line, ballroom)	☐Jumping Rope
☐Gardening or Yardwork	☐Badminton	☐Snow Skiing (X-country/ Nordic trek/ downhill)
☐Snow Shoeing	☐Yoga	☐Others

If Others, please list activitie(s): _____

17. In general, during the last year before you cancer diagnosis, how many day(s) a week did you engage in at least thirty (30) minutes of physical activity? _____

Appendix D: Reasons to Decline Participation

Nov. 29/07

Peter Crocker, Ph.D.
Primary Investigator

In reply to your Stressor Questionnaire, it has been over 10 years since I had a small lump removed from my right breast and at no time did I experience any anxiety or stress due to the surgery. I never dwelled on what if, nor was concerned about anything.

I was and still am sensitive in the area of the surgery but I accept it as a normal part of having surgery, it has in no way interferred in any activities or my well being.

The questions you pose are just not applicable in my case. I have since had other health issues that are stressful (like Hydrocephalus to name one) but none of my current health problems are in any way related to my breast surgery.

To Valerie Hadd

This is #1743 reporting in. I received you questionnaire this week, and after reading it find that I'm unable to complete it for the following reasons.
I am eighty years old now, I had my mastectomy five and a half years ago, finished the Tamoxofin treatment this May. Once the mastectomy was over, and I didn't have to have radiation, there was a weakness in my arm from the lymph glands removal, but other than that I just got on with living.
In the last four years I have had total knee replacement on both knees, our dear son died from asbestos-related cancer last year, so you see I have no memory of any psychological or physical problems from the cancer operation, other more important things have happened in the interim. I still garden three allotments, look after two flowerbeds at the Lodge, fund raise for the hospital auxiliary, go to the Naturalist meetings, and enjoy life.

[redacted]

December 8, 2007

School of Human Kinetics
6081 University Blvd.
Vancouver, B.C.
V6T 1Z1

Dear Miss Hadd:

In reply to your letter & questionnaire re breast cancer stressors which was recently sent to me - I'm sorry to not return as I don't believe I'm a good candidate for your study.

My breast cancer & subsequent radiation (lumpectomy) took place in 1995 & while stressful, I don't feel it contributed a great deal to a change in lifestyle or what used to be an optomistic personality. I'm now 78 & arthritic. Most of the physical, emotional/mental & social stressors outlined in your questionnaire I would presently attribute to arthritis which has affected my life in negative ways.

Also, when I was 54 I had ovarian cancer & went through a year of tough chemotherapy, & just a couple of months later moved from Calgary to Vancouver Island. It was a very traumatic 14 or 15 months & in 1985-86 your questions would have been relevant & not difficult to answer!

Yours truly

[redacted]

To Valerie Dadd –

Apologize for not returning this questionnaire sooner. I opted not to have radiation after my breast cancer surgery in 2002. Have been cancer free for 5 years – last mammogram in May '07. My oncologist could not guarantee radiation would not affect my heart or lungs.

Did not fill out questionnaire about breast cancer survivors after they are finished with treatment as there was none – for me.

Hope this is somewhat helpful.

Sincerely –

TO WHOM IT MAY CONCERN. Dec 18/07

(1) When I saw 16 pages of questions "I WAS STRESSED" therefore took a while to do it ∴ I am not doing part 2. 566

(2) I do not like being called a "survivor" or "victim". Thankfully you only used survivor.
How about a person who has had cancer or is living with cancer.

(3) Page 1-16 of Question 11
How about using N/A (ie) in # 11
Pge 2 - 16
Put stressors + what they represent on both side of page

(4) Sometimes you said circle appropriate # sometimes not.

Anyway thanks for trying

By the way I am from the Sept 1959 VGH nursing class. Our whole class was in a breast ca research program.
ALL THE RESEARCH WAS LOST.

So we're in an affair relationship
altho there hasn't been any sex in 7 years
I did miss not being intimate.
I have completed my 5 years of
Tamoxifen after care & I was an emotional
roller coaster & had hot flushes. I am
presently taking Faremea 1 year & that's
going well without any reacurrence.
I can't explain this in a 1, 2, 3, 4,
analysis.
I enjoy gardening fishing & campaing
my children & grand children of which I
I am very proud of them all.
Yours truly

1607 [illegible]

December 10, 2007

Valerie Hadd
School of Human Kinetics
U.B.C.

Dear Valerie:

I spoke to you by phone several weeks ago and promised to send to you some information regarding my pre cancerous condition. Sorry to have taken so long.

First of all I must tell you that I have had IDDM for 57 years. That was diagnosed after my first baby was born but sadly died shortly after birth. I was told at that time, that I would never have any more children. One year & two weeks after that I had a baby boy 9 lbs & 3 oz. My third child a girl was born 5 ½ years & eight months later. My fourth child, a boy was born 3 years later by C section, in 1957.

During all the joy & the work with these children, my husband was having some classic symtoms of paranoia, and evidence of social maladjustment. These were not problems that I had ever dealt with in my youth, but by the time I had to deal with it, three children had to be taken care of & I did not, at that time, have the finacial resources to do so. My breast cancer was evident by a routine mammogram in Sept of 1995 and surgery was done, a lumpectomy, on Oct 31, 1995. My general practitioner does not think that I should continue having mammograms. I wonder why? My age? 79. other conditions congestive heart failure? cronic Osteoarthritis?

"I have no concern regarding Confidentiality"

Yours Truly

P.T.O.

[redacted]

December 8, 2007

School of Human Kinetics
6081 University Blvd.
Vancouver, BC
V6T 1Z1

Dear Miss Hadd:

In reply to your letter & questionnaire re breast cancer stressors which was recently sent to me - I'm sorry to not return, as I don't believe I'm a good candidate for your study.

My breast cancer & lumpectomy & subsequent radiation took place in 1995 & while stressful, I don't feel it contributed a great deal to a change in lifestyle or what used to be, an optomistic personality. I'm now 75 & arthritic. Most of the physical, emotional/mental & social stressors outlined in your questionnaire I would presently attribute to arthritis which has affected my life in negative ways.

Also, when I was 54 I had ovarian cancer & went through a year of tough chemotherapy, & just a couple of months later moved from Calgary to Vancouver Island. It was a very traumatic 14 or 15 months & in 1985-86 your questions would have been relevant & not difficult to answer!

Yours truly

[redacted]

Just a quick note...

Jan. 6, 2008.

Dear Valerie,

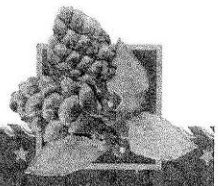
Happy New Year!

I apologize for not returning this questionnaire earlier.

Although I did log on to the online study, I did not get really involved due to short trips away from home and then the busyness of Christmas preparations. If it is not too late, I could give it another try.

Sincerely

Q20009



To whom it may concern.

Yes I was upset when my diagnoses came back; I was also well informed in my treatment; so the surgery was very quick with in two weeks. I also had an axillery surgery to make sure I had nothing left. This was in June & July of 01. The waiting to hear when my 15 Radiation treatments were to begin was very stressful; They did not begin until NOV 01. I did not have alot of energy left after driving to & from treatment in Kelowna. Time went by; my treatments & the treatment was well organized. Nurses & Oncologest were very helpful & kind.

After the new year of 02. There was a crisis in the family which I needed to make a bus trip to Kansas & return with two little boys & their mother. It was not a pleasant trip altho we got threw it.

Then I had an abuse in my ingission which took a month to completely heal & alot of visits to the health unit for repacking. Life has gone on quite normal until I entered into a relationship, which should not have been. Needless to say my stress came from this person not being able to touch me. So whats wrong with me! Do I smell bad? I take baths brush teeth. Needless to say when this fellow also had prostate cancer about the same time & had gone thro the Zolidex treatment along with radiation. Others mine seemed well.

It took me four months of counselling to realize the problem wasn't me. It was his problem.

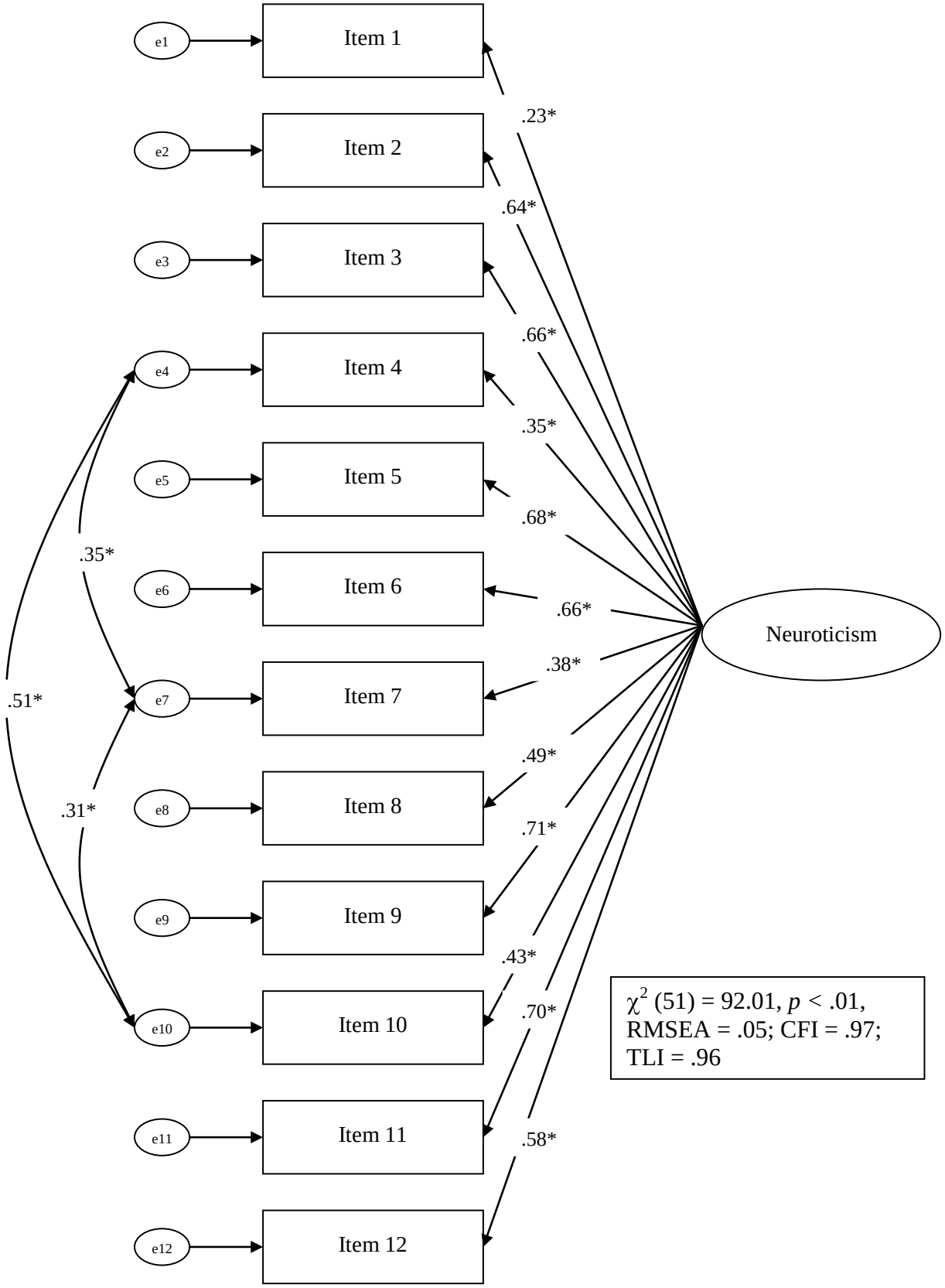
Appendix E: Miller & Rahe's Scale

From Miller & Rahe (1997)

Life Change Event	LCU
Health	
An injury or illness which:	
kept you in bed a week or more, or sent you to the hospital	74
was less serious than above	44
Major dental work	26
Major change in eating habits	27
Major change in sleeping habits	26
Major change in your usual type and/or amount of recreation	28
Work	
Change to a new type of work	51
Change in your work hours or conditions	35
Change in your responsibilities at work:	
more responsibilities	29
fewer responsibilities	21
promotion	31
demotion	42
transfer	32
Troubles at work:	
with your boss	29
with coworkers	35
with persons under your supervision	35
other work troubles	28
Major business adjustment	60
Retirement	52
Loss or job:	
laid off	68
fired from work	79
Correspondence course to help you in your work	18
Home and Family	
Major change in living conditions	42
Change in residence:	
move within the same town or city	25
move to a different town, city, or state	47
Change in family get-togethers	25
Major change in health or behavior of family member	55
Marriage	50
Pregnancy	67
Miscarriage or abortion	65
Gain of new family member:	
birth of a child	66
adoption of a child	65
a relative moving in with you	59
Spouse beginning or ending work	46
Child leaving home:	

to attend college	41
due to marriage	41
for other reasons	45
Change in arguments with spouse	50
In-law problems	38
Change in the marital status of your parents:	
divorce	59
remarriage	50
Separation from spouse:	
due to work	53
due to marital problems	76
Divorce	96
Birth of grandchild	43
Death of spouse	119
Death of other family member:	
child	123
brother or sister	102
parent	100
Personal and social	
Change in personal habits	26
Beginning or ending school or college	38
Change of school or college	35
Change in political beliefs	24
Change in religious beliefs	29
Change in social activities	27
Vacation	24
New, close, personal relationship	37
Engagement to marry	39
Partner problems	47
Sexual difficulties	44
"Falling out" of a close personal relationship	47
An accident	48
Minor violation of the law	20
Being held in jail	75
Death of a close friend	70
Major decision regarding your immediate future	51
Major personal achievement	36
Financial	
Major change in finances:	
increased income	38
decreased income	60
investment and/or credit difficulties	56
Loss or damage or personal property	43
Moderate purchase	20
Major purchase	37
Foreclosure on a mortgage or loan	58

Appendix F: Results with Neuroticism


e1
Item 1
e2
Item 2
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Item 3
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Item 4
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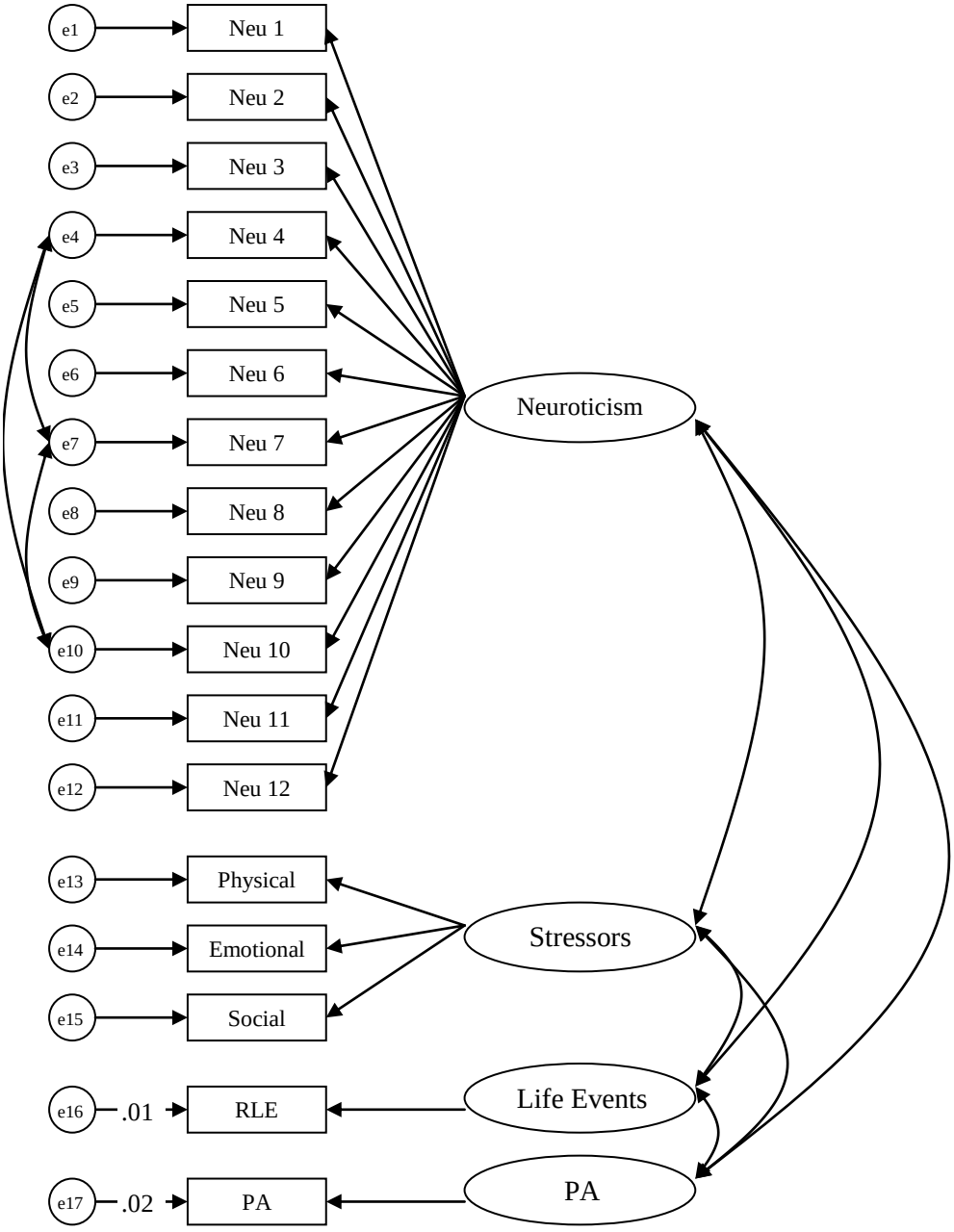
Item 5
e6
Item 6
e7
Item 7
e8
Item 8
e9
Item 9
e10
Item 10
e11
Item 11
e12
Item 12
Neuroticism
.23*
.64*
.66*
.35*
.68*
.66*
.38*
.49*
.71*
.43*
.70*
.58*
.35*
.51*
.31*
χ^2 (51) = 92.01, p < .01,
RMSEA = .05; CFI = .97;
TLI = .96



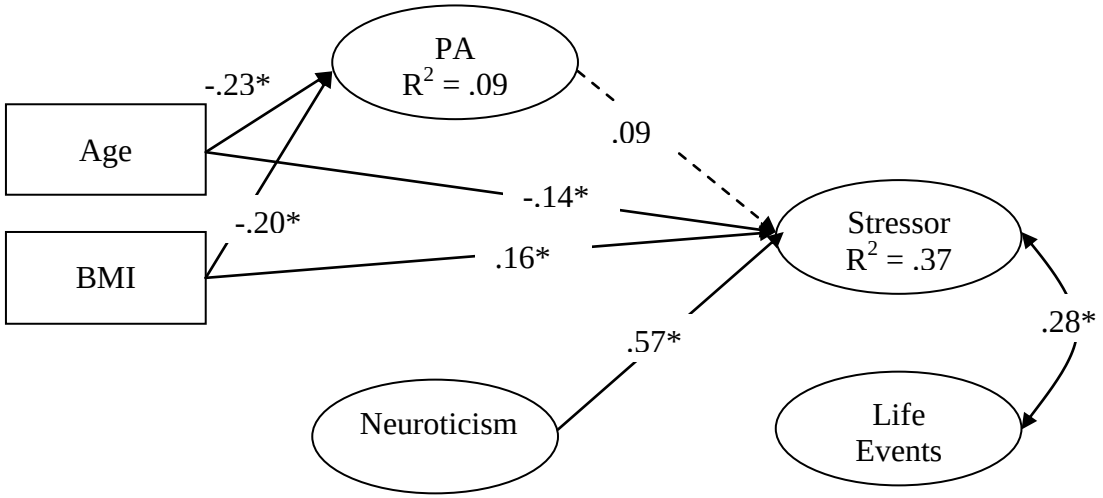
χ^2 (112) = 179.63, p < .01; RMSEA = .04; CFI = .96; TLI = .96

Measurement model predicting stressor with neuroticism, life events, and physical activity

Standardized Factor Loadings for the Latent Variables and Correlations among the Latent Variables in the Measurement Model including Stressor, Threat, Secondary Appraisal, Neuroticism, Physical Activity, and Life Events

Latent variables and indicators	Factor loadings	Correlations			
		Stressor	Neuroticism	PA	Life Events
Stressor		--	.64**	-.06	.35**
Physical	.69				
Emotional	.84				
Social	.87				
Neuroticism			--	-.18**	.26**
NEU1	.23				
NEU2	.64				
NEU3	.66				
NEU4	.37				
NEU5	.70				
NEU6	.66				
NEU7	.40				
NEU8	.49				
NEU9	.70				
NEU10	.45				
NEU11	.69				
NEU12	.58				
Physical Activity				--	-.02
PA	1.00				
Life Events					
RLE	1.00				--

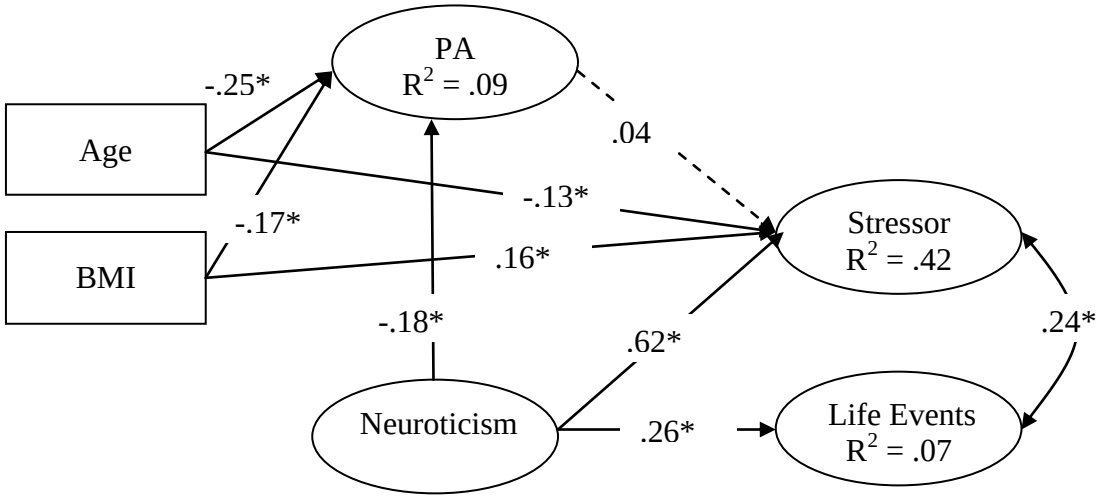
Note: * = $p < .05$; ** = $p < .01$; All standardized factor loadings are significant at $p < .01$. PA = physical activity



Note: * = $p < .01$; Pathway coefficients are standardized estimates.

Structural Equation Modeling Predicting (M1) Stressor by Neuroticism, Physical Activity, Age, and BMI.

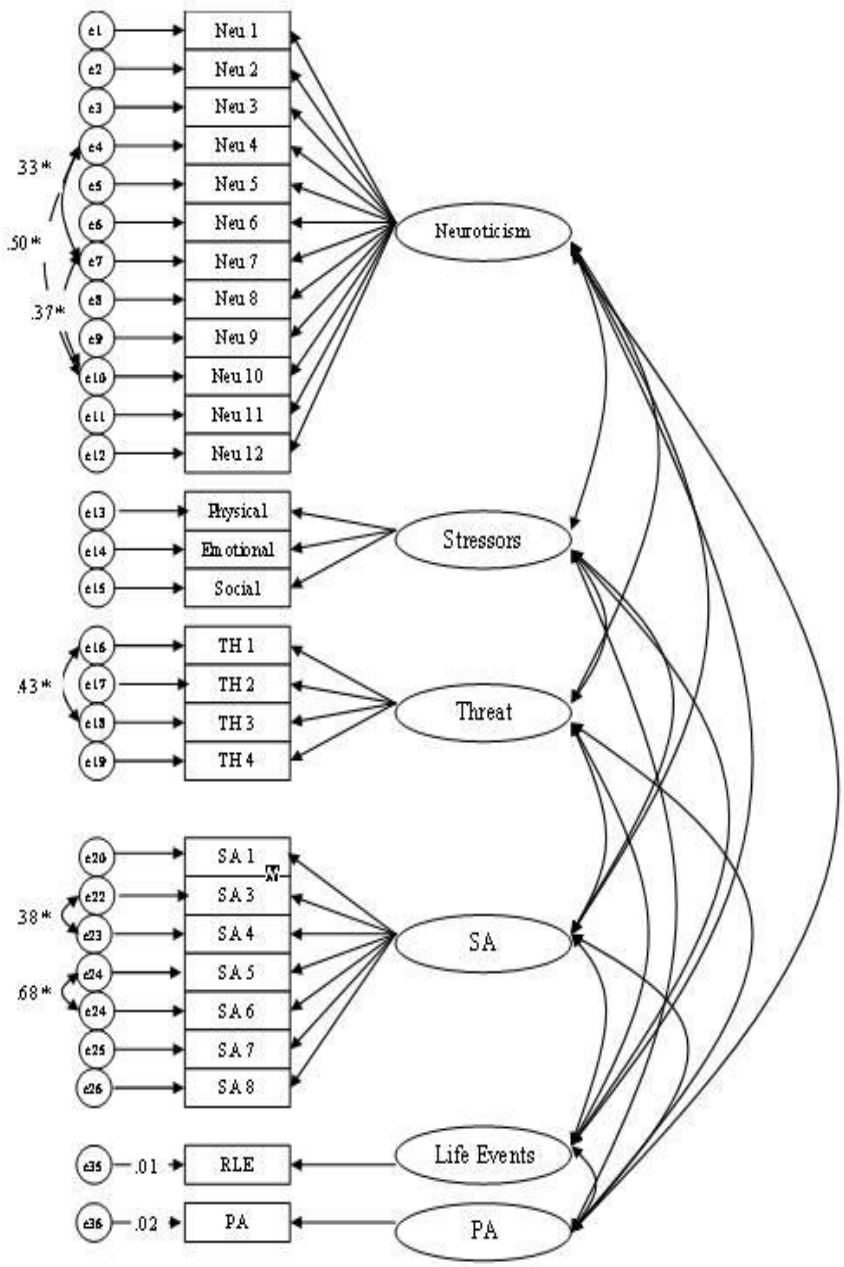
$\chi^2 = 299.18$, df = 146, $p < .01$; RMSEA = .06; CFI = .92, TLI = .91



Note: * = $p < .01$; Pathway coefficients are standardized estimates.

Structural Equation Modeling Predicting (M2) Stressor by Neuroticism, Physical Activity, Age, and BMI.

$\Delta\chi^2 = 30.27$, df = 1, $p < .01$; $\chi^2 = 268.91$, df = 144, $p < .01$; RMSEA = .05; CFI = .94, TLI = .92



χ^2 (358) = 711.14, p < .01; RMSEA = .05; CFI = .95; TLI = .94

Measurement model predicting cognitive appraisal

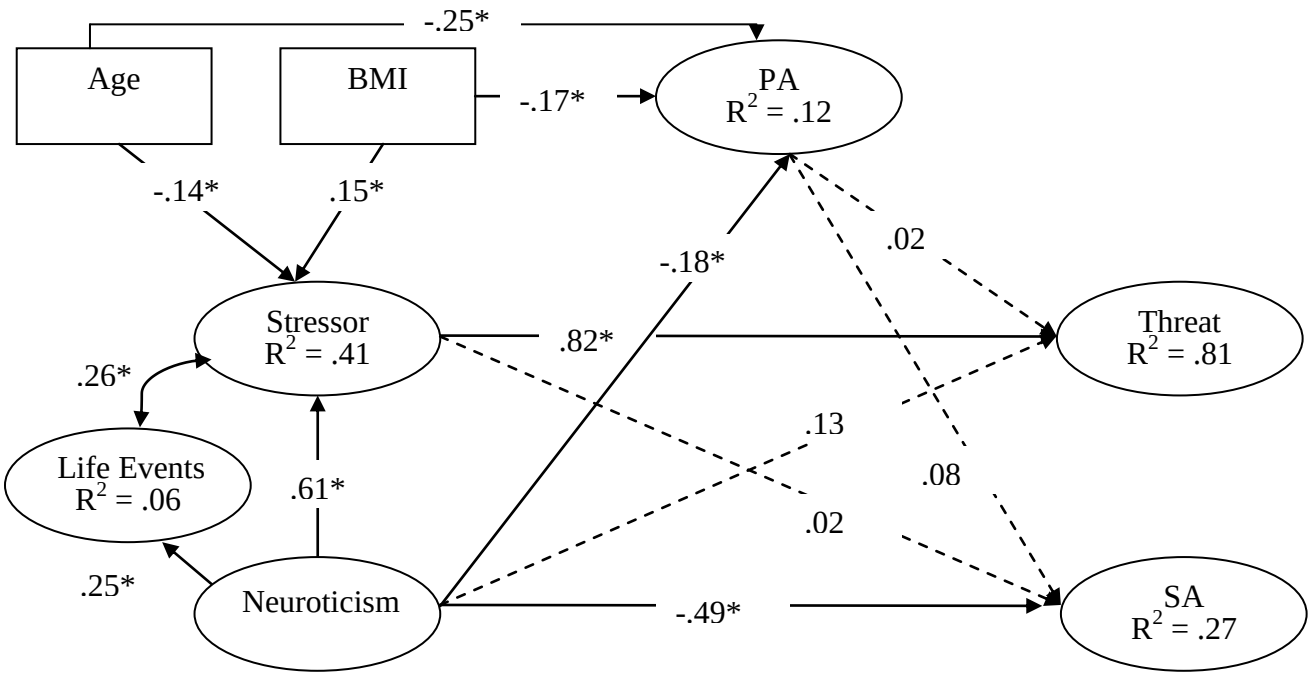
Fit Indices for Models Predicting Cognitive Appraisal

Model	χ^2	**df**	$\Delta\chi^2$	**Δdf**	**p**	**CFI**	**TLI**	**RMSEA**
Measurement 1	711.14	358	--	--	--	.95	.94	.05
Measurement 2	614.23	331	96.91	27	<.01	.95	.94	.05
M1	759.84	386	145.61	55	<.01	.94	.93	.05
M2	780.09	393	20.25	7	ns	.93	.93	.05

Note: χ^2 = chi-square; df = degree of freedom; $\Delta\chi^2$ = difference in chi-square; Δdf = difference of degree of freedom; CFI = confirmatory fit index; TLI = non-normed fit index; RMSEA=root mean square error of approximation; Measurement 1: measurement model with all items; Measurement 2: measurement model with one item (#2) from secondary appraisal removed; M1: initial model based on theoretical concepts and hypotheses; M2: modified model where not significant paths between variables were removed

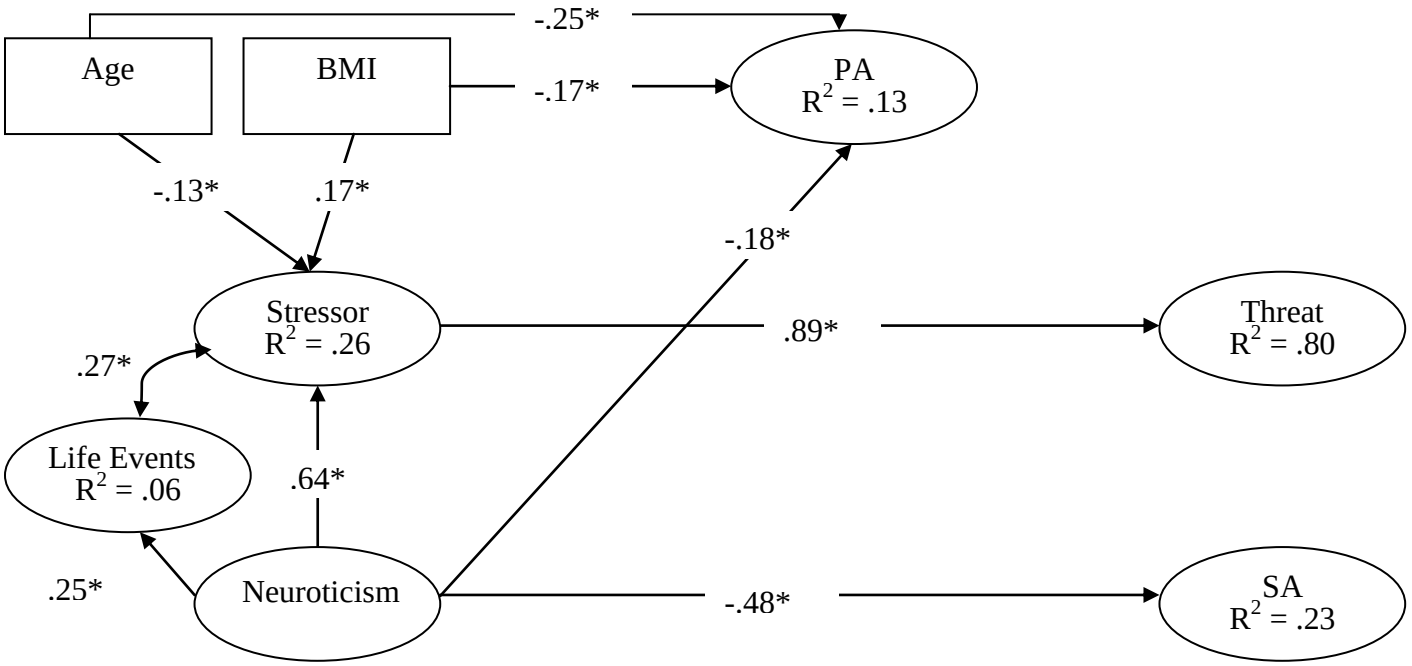
Standardized Factor Loadings for the Latent Variables and Correlations among the Latent Variables in the Measurement Model including Stressor, Threat, Secondary Appraisal, Neuroticism, Physical Activity, and Life Events

Latent variables and indicators	Factor loadings	Correlations					
		Stressor	**Threat**	**SA**	**Neuroticism**	**PA**	**Life Events**
Stressor		--	.88**	-.27**	.64**	-.06	.35**
Physical	.68						
Emotional	.86						
Social	.86						
Threat			--	-.29**	.63**	-.09	.35**
TH 1	.91						
TH 2	.72						
TH 3	.88						
TH 4	.83						
SA				--	-.48**	.17**	-.03
CE1	.89						
CE3	.85						
CE4	.92						
PC1	.89						
PC2	.91						
PC3	.89						
PC4	.93						
Neuroticism					--	-.18**	.26**
NEU1	.23						
NEU2	.64						
NEU3	.66						
NEU4	.38						
NEU5	.70						
NEU6	.64						
NEU7	.41						
NEU8	.49						



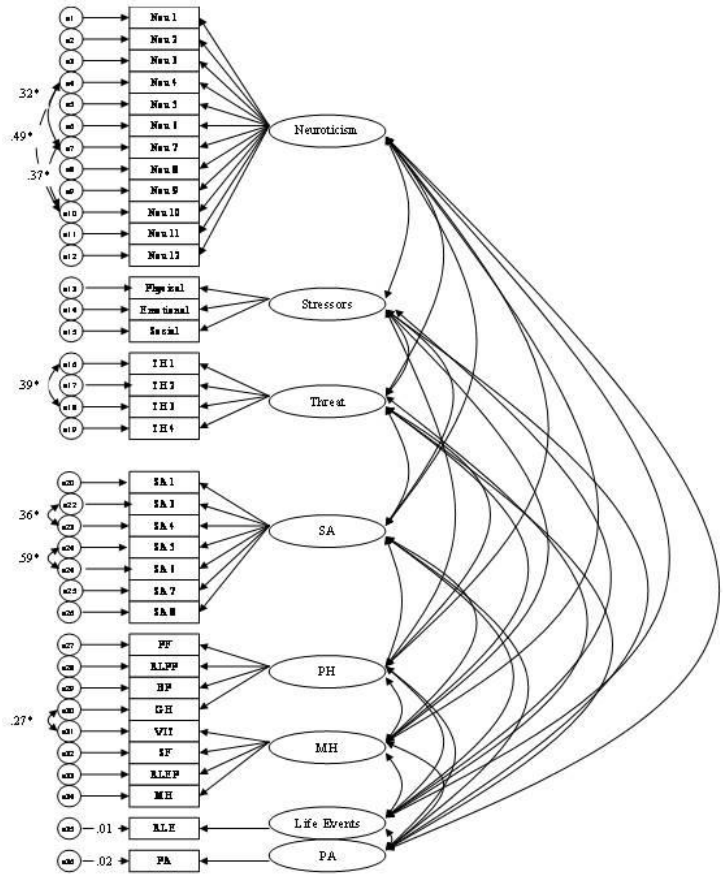
Note: * = $p < .01$; Pathway coefficients are standardized estimates

Structural Equation Modeling Predicting (M1) Cognitive Appraisal by Stressor, Neuroticism, and Physical Activity.



Note: * = $p < .01$; Pathway coefficients are standardized estimates

Structural Equation Modeling Predicting (M2) Cognitive Appraisal from Stressor, Neuroticism, and Physical Activity.



Measurement model predicting quality of life

Standardized Factor Loadings for the Latent Variables and Correlations among the Latent Variables in the Measurement Model including Stressor, Threat, Secondary Appraisal, Neuroticism, Physical Activity, and Life Events

Latent variables and indicators	Factor loadings	Correlations							
		Stressor	**Threat**	**SA**	**Physical Heath**	**Mental Health**	**Neuroticism**	**PA**	**Life Events**
Stressor		--	.88**	-.28**	-.65**	-.79**	.64**	-.06	.35**
Physical	.71								
Emotional	.85								
Social	.85								
Threat			--	-.29**	-.60**	-.71**	.64**	-.09	.35**
TH 1	.91								
TH 2	.72								
TH 3	.88								
TH 4	.84								
SA				--	.22**	.36**	-.49**	.17**	-.03
SA1	.90								
SA3	.85								
SA4	.92								
SA5	.89								
SA6	.91								
SA7	.89								
SA8	.93				--	.83**	-.49**	.31**	-.32**
Physical Health									
PF	.77								
RLPP	.83								
BP	.81								
GH	.69								
Mental Health						--	-.75**	.20**	-.39**
SF	.87								
RLEP	.82								

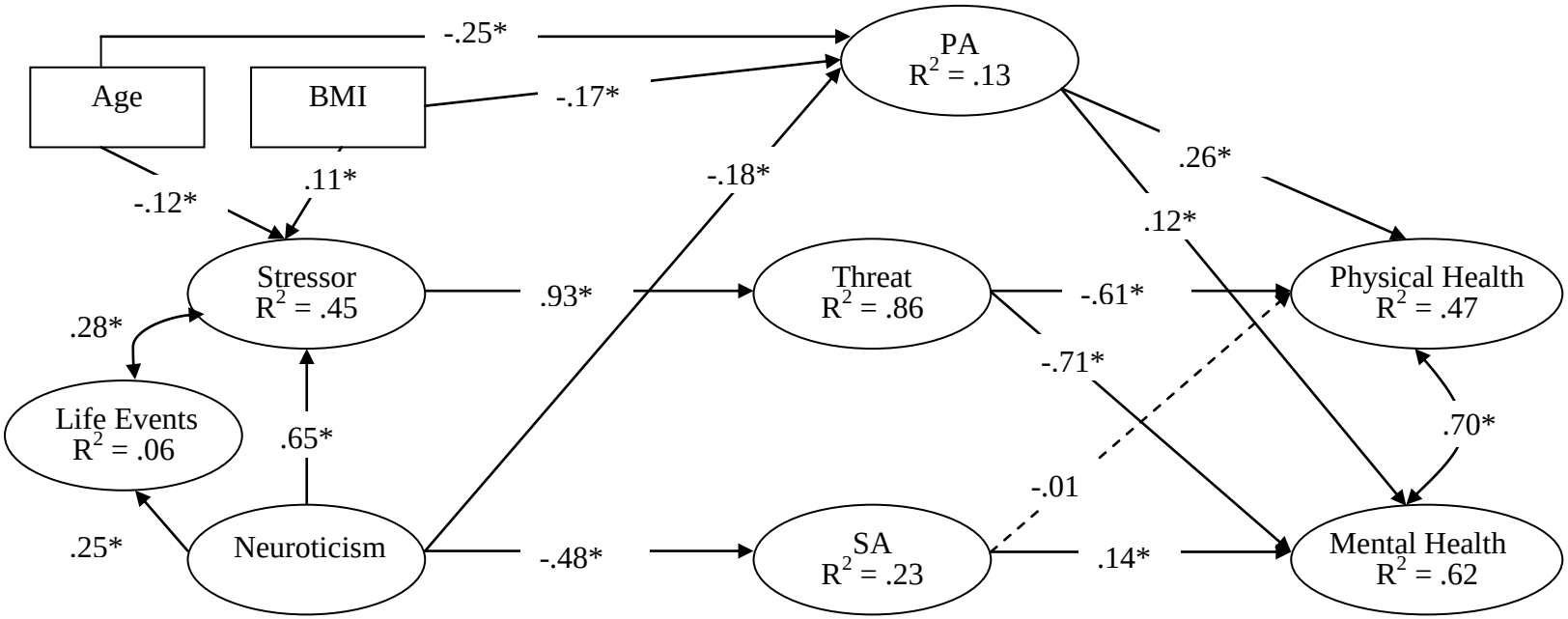
MH	.82				
VIT	.83				
Neuroticism			--	-.18**	.26**
NEU1	.24				
NEU2	.63				
NEU3	.67				
NEU4	.40				
NEU5	.70				
NEU6	.64				
NEU7	.41				
NEU8	.49				
NEU9	.71				
NEU10	.49				
NEU11	.69				
NEU12	.56				
Physical Activity				--	-.02
PA	1.00				
Life Events					
RLE	1.00				--

Note: * = $p < .05$; ** = $p < .01$; All standardized factor loadings are significant at $p < .01$. SA = secondary appraisal; PA = physical activity

Fit Indices for Models Predicting Quality of Life

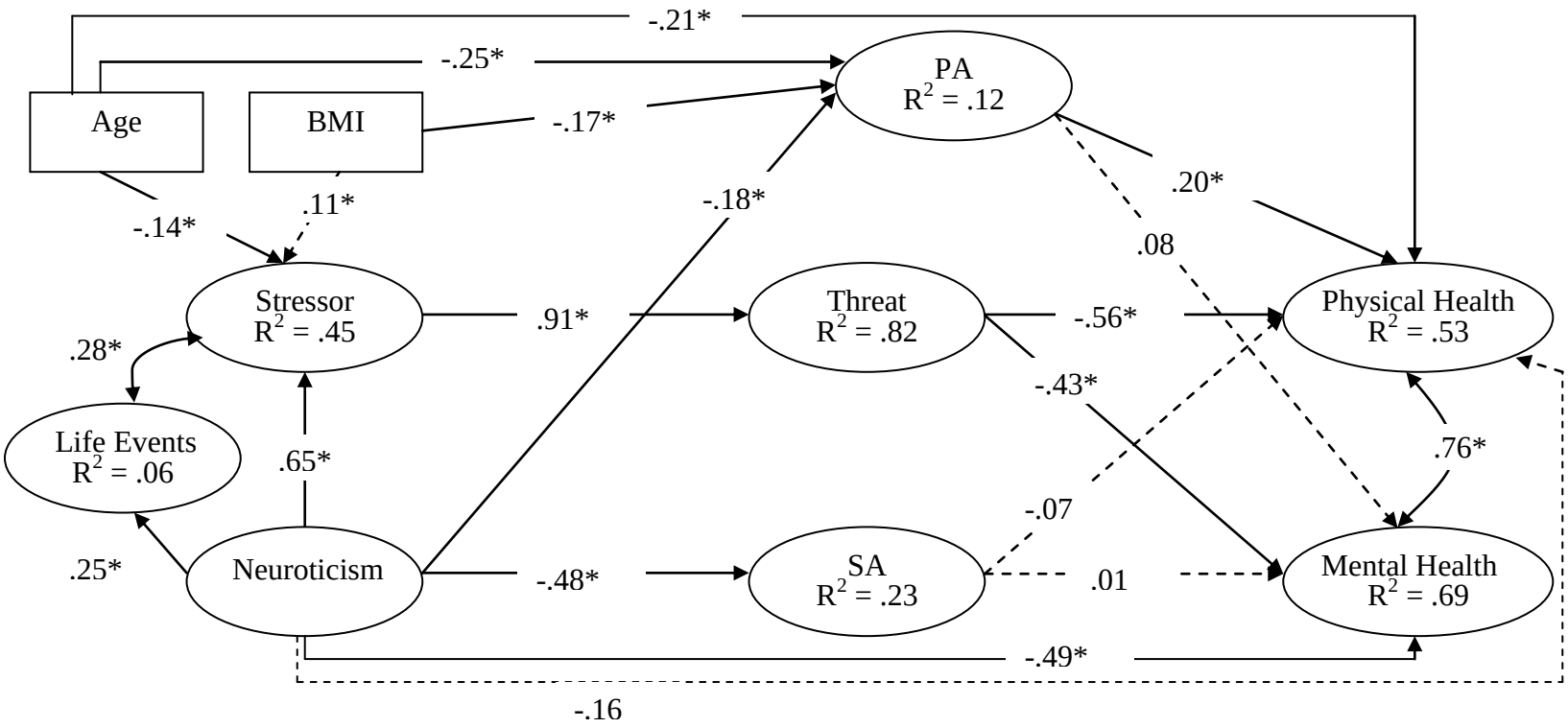
Model	χ^2	**df**	$\Delta\chi^2$	**Δdf**	**p**	**CFI**	**NNFI**	**RMSEA**
Measurement 1	1156.76	561	--	--	--	.93	.92	.06
M1	1481.72	645	324.96	84	<.01	.90	.89	.06
M2	1387.29	642	94.43	3	<.01	.91	.90	.06
M3	1404.28	649	16.99	7	ns	.91	.90	.06
Measurement 2	578.35	258	--	--	--	.92	.91	.06
M4	723.66	308	145.31	50	<.01	.90	.89	.06

Note: χ^2 = chi-square; df = degree of freedom; $\Delta\chi^2$ = difference in chi-square; Δdf = difference of degree of freedom; CFI = confirmatory fit index; NNFI = non-normed fit index; RMSEA=root mean square error of approximation; M1: initial model based on theoretical concepts and hypotheses; M2: modified model where direct paths are added based on the literature and modification indices; M3: modified model were not significant paths between variables were removed; Measurement 2: measurement model where threat and secondary appraisal were removed; M4: structural model without threat and secondary appraisal.



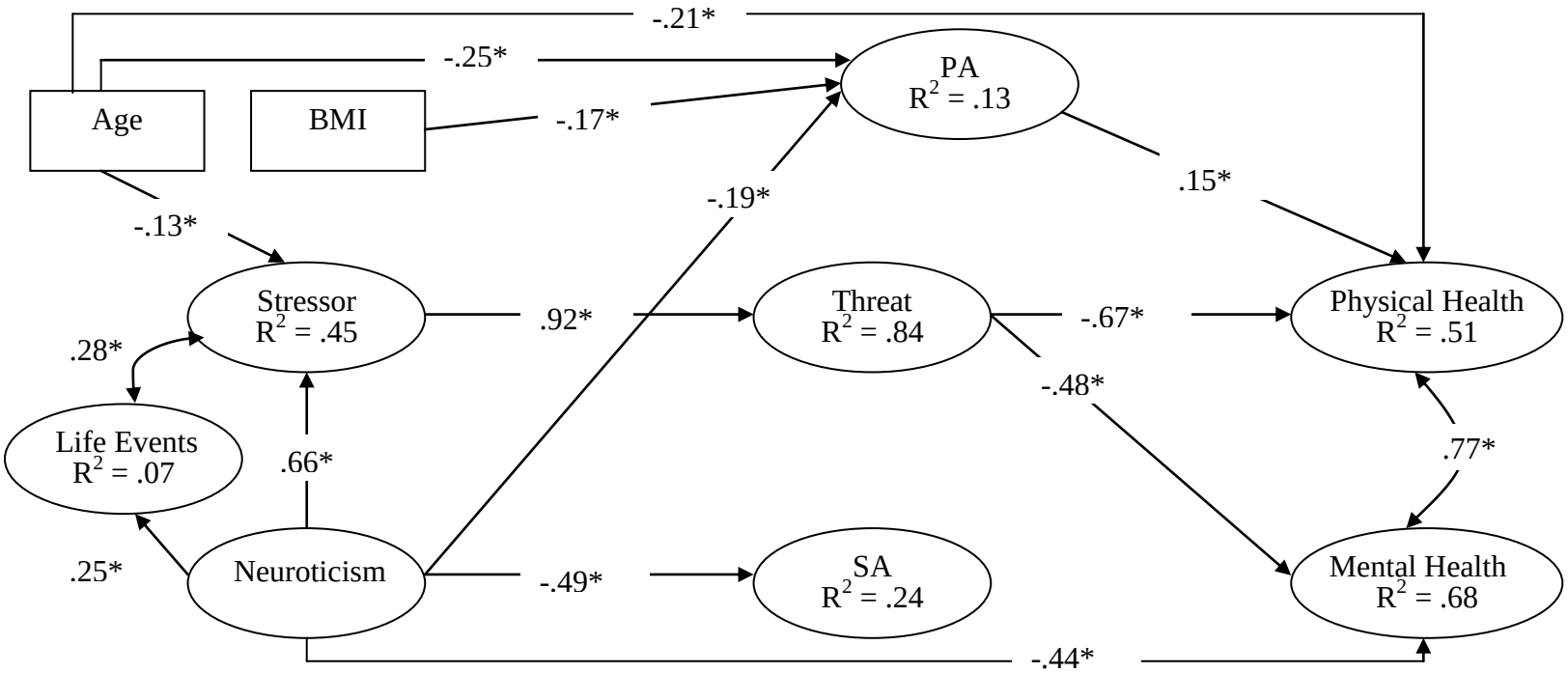
Note: * = $p < .01$; Pathway coefficients are standardized estimates

Structural Equation Modeling Predicting (M1) Quality of Life by Cognitive Appraisal, Stressor, Neuroticism, and Physical Activity.



Note: * = $p < .01$; Pathway coefficients are standardized estimates

Structural Equation Modeling Predicting (M2) Quality of Life by Cognitive Appraisal, Stressor, Neuroticism, and Physical Activity.



Note: * = $p < .01$; Pathway coefficients are standardized estimates

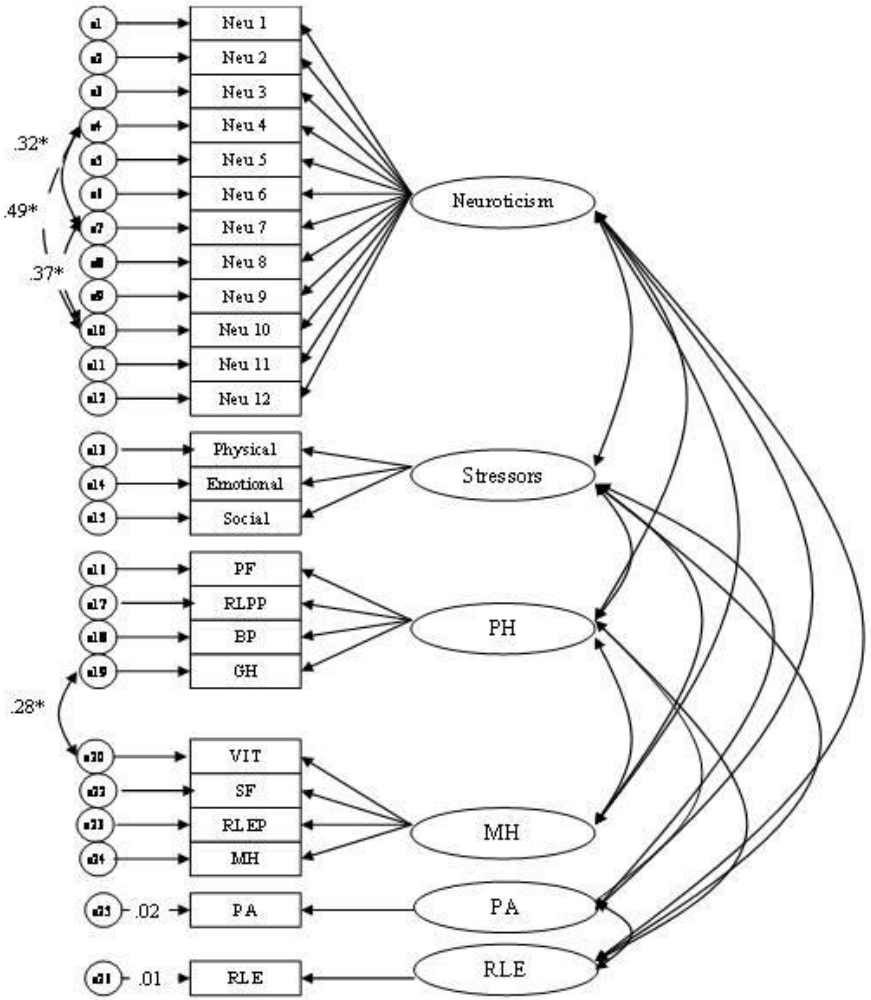
Structural Equation Modeling Predicting (M3) Quality of Life by Cognitive Appraisal, Stressor, Neuroticism, and Physical Activity.

Standardized Factor Loadings for the Latent Variables and Correlations among the Latent Variables in the Measurement Model including Stressor, Neuroticism, Physical Activity, and Life Events

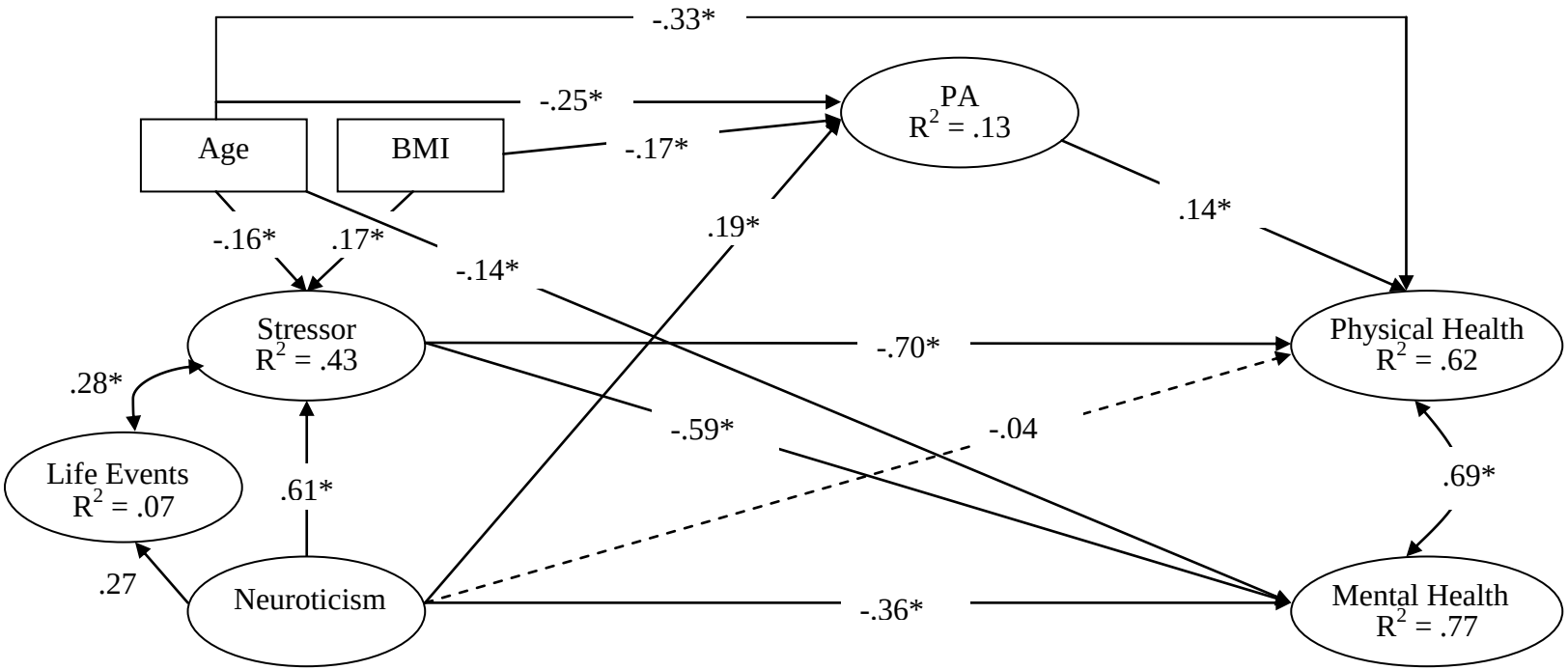
Latent variables and indicators	Factor loadings	Correlations					
		Stressor	**Physical Heath**	**Mental Health**	**Neuroticism**	**PA**	**Life Events**
Stressor		--	-.65**	-.79**	.64**	-.06	.36**
Physical	.73						
Emotional	.83						
Social	.85		--	.84**	-.49**	-.31**	.31**
Physical Health							
PF	.77						
RLPP	.83						
BP	.81						
GH	.69						
Mental Health				--	-.75**	.20**	-.39**
SF	.87						
RLEP	.82						
MH	.82						
VIT	.83						
Neuroticism					--	-.18**	.26**
NEU1	.24						
NEU2	.63						
NEU3	.67						
NEU4	.40						
NEU5	.70						
NEU6	.64						
NEU7	.41						
NEU8	.49						
NEU9	.71						
NEU10	.49						

	NEU11	.69		
	NEU12	.56		
Physical Activity			--	-.02
	PA	1.00		
Life Events				
	RLE	1.00		--

Note: * = $p < .05$; ** = $p < .01$; All standardized factor loadings are significant at $p < .01$. SA = secondary appraisal; PA = physical activity



χ^2 (258) = 578.35, p < .01; RMSEA = .06; CFI = .92; TLI = .91



Note: * = $p < .01$; Pathway coefficients are standardized estimates

Structural Equation Modeling Predicting (M4) Quality of Life by Stressor, Neuroticism, and Physical Activity.

Note: The mediating effect of stress, threat, secondary appraisal, and physical activity was examined. No partial or full mediation was identified as each model violated at least one step suggested by Barron & Kenny (1986). Moderation models were also tested but failed to reach significance ($p < .01$).

Appendix G: Regression Models Predicting Physical Activity without Physical Activity Pre-Diagnosis

Step	Variables	β	ΔR^2	R^2	t-value
	Current level of PA				
	Age	-.24	.10**	.10**	-4.80**
1	BMI	-.20			-4.01**
2	Age	-.25	.03**	.13**	-5.13**
	BMI	-.17			-3.44**
	Optimism	.18			3.56**
	Current level of PA				
1	Age	-.24	.10**	.10**	-4.80**
	BMI	-.20			-4.01**
2	Age	-.26	.03**	.13**	-5.28**
	BMI	-.18			-3.54**
	Neuroticism	-.17			-3.29**

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

Appendix H: Primary Appraisal Predicting Quality of Life

Step	Predictor	ΔR^2	R^2	β	t-test
		Physical Functioning			
1	Challenge	.00	.00	-.06	-1.09
2	Challenge	.10*	.11*	.01	.13
	Threat			-.33*	-6.28*
		Role Limitation due to Physical Health			
1	Challenge	.02	.02	-.14	-2.61
2	Challenge	.20*	.22*	-.05	-.99
	Threat			-.46*	-9.29*
		Role Limitation due to Emotional Health			
1	Challenge	.00	.00	-.01	-.13
2	Challenge	.30*	.30*	.11	2.27
	Threat			-.56*	-12.05*
		Vitality			
1	Challenge	.00	.00	.04	.76
2	Challenge	.32*	.32*	.16*	3.43*
	Threat			-.58*	-12.59*
		Mental Health			
1	Challenge	.00	.00	.02	.38
2	Challenge	.37*	.37*	.15*	3.27*
	Threat			-.62*	-13.94*

		Social Functioning			
1	Challenge	.00	.00	-.07	-1.20
2	Challenge	.31*	.31*	.05	1.04
	Threat			-.57*	-12.25*
		Bodily Pain			
1	Challenge	.01	.01	-.12	-2.19
2	Challenge	.20*	.21*	-.03	-.57
	Threat			-.45*	-9.13*
		General Health			
1	Challenge	.00	.00	.30	.55
2	Challenge	.30*	.30*	.14*	3.05*
	Threat			-.56*	-12.01*

*: $p < .01$

Appendix I: Cancer-Related Variable Predicting Stressor

Step	Predictor	ΔR^2	R^2	β	t-test
			Physical Stressor		
1	Optimism	.11*	.11*	-.32*	-6.29*
2	Optimism	.09*	.20*	-.28*	-5.68*
	Age			-.24*	-4.98*
	BMI			.19*	3.76*
3	Optimism	.00	.20	-.28*	-5.58*
	Age			-.23	-4.59*
	BMI			.19*	3.76*
	Years since Diagnosis			.03	.33
	Years since Treatment			-.08	-1.10
			Emotional Stressor		
1	Optimism	.19*	.19*	-.44*	-9.03*
2	Optimism	.04*	.23*	-.41*	-8.48*
	Age			-.15*	-3.22*
	BMI			.14*	2.92*
3	Optimism	.01	.24*	-.41*	-8.48*
	Age			-.14*	-2.78*
	BMI			.14*	2.91*
	Years since Diagnosis			-.11	-1.47

	Years since Treatment			.61	.54
		Social Stressor			
1	Optimism	.18*	.18*	-.43*	-8.71*
2	Optimism	.03*	.21*	-.40*	-8.20*
	Age			-.13*	-2.60*
	BMI			-.12*	2.40*
3	Optimism	.00	.21*	-.41*	-8.19*
	Age			-.12*	-2.40*
	BMI			.12*	2.39*
	Years since Diagnosis			-.06	-.81
	Years since Treatment			.04	.56

*: $p < .01$