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Social Support and Cognitive Processing in Men Treated for Localized Prostate Cancer

Eric Shuai Zhou

University of Miami, eszhou@gmail.com

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UNIVERSITY OF MIAMI

SOCIAL SUPPORT AND COGNITIVE PROCESSING IN
MEN TREATED FOR LOCALIZED PROSTATE CANCER

By
Eric Shuai Zhou

A THESIS

Submitted to the Faculty
of the University of Miami
in partial fulfillment of the requirements for
the degree of Masters of Science

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MEN TREATED FOR LOCALIZED PROSTATE CANCER

Eric Shuai Zhou

Approved:

Frank J. Penedo, Ph.D.
Associate Professor of Psychology

Terri A. Scandura, Ph.D.
Dean of the Graduate School

Suzanne Lechner, Ph.D.
Research Assistant Professor of Psychiatry

Michael H. Antoni, Ph.D.
Professor of Psychology

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Research has shown that men treated for localized prostate cancer (PC) experience physical side effects of treatment that can compromise emotional well being (EWB). Psychosocial factors such as social support can buffer decrements in EWB associated with cancer treatment. The Social Cognitive Processing (SCP) model proposes that communication between the patient and their social support network results in greater processing of cancer adjustment related information and that such processing mediates the relationship between social support and better EWB. Few studies have investigated this relationship in PC populations. The current study sought to evaluate the SCP model in a sample of men who have undergone treatment for localized PC. The study (N=260) was conducted in an ethnically (37% Caucasian, 37% Hispanic, 15% African American) and demographically diverse sample using a cross-sectional design. After controlling for factors significantly associated with EWB (ethnicity, medical comorbidities and number of years of education), results indicated that higher levels of social support were significantly related with higher levels of EWB ($\beta=.30$, $p<.01$). Results also showed that two measures of cognitive processing (illness coherence and cognitive processing as a coping strategy) partially mediated the relationship between social support and EWB (illness coherence: $z=2.28$, $p<.05$; cognitive processing as a coping strategy: $z=2.00$, $p<.05$). Furthermore, perceived stress appeared to moderate the overall mediation model ($\beta=.91$, $p<.01$) such that cognitive processing mediated the

relationship between social support and EWB for individuals perceiving low levels of stress ($z=1.90$, $p<.05$), but not for individuals perceiving high levels of stress ($z=.09$, $p>.05$). Results suggest the importance of cognitive processing and perceived stress as potential targets for future intervention work designed to improve the psychosocial adjustment of PC patients following treatment.

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Chapter 1: Introduction

Prostate Cancer

It is estimated that in the United States (US) in 2008, 186,320 men will be diagnosed with prostate cancer (PC) and that 28,660 men will die due to the disease. These significant numbers make PC the most common non-skin cancer and the second leading cause of cancer-related death among men in the US. Over the course of their lifetimes, almost 17% of men born today will develop PC (American Cancer Society, 2008). However, remarkable advances in preventative medicine and treatment coupled with the development of early prostate screening programs have given hope to those with a PC diagnosis. Current methods of treatment for PC are extremely effective. Mortality is rare as patients diagnosed with PC have a 98.4% 5-year relative survival rate (American Cancer Society, 2008).

However, life post-diagnosis often proves to be a very difficult adjustment process. They experience physical side effects of treatment which can cause long-term side effects that affect the patient years after they consider themselves to be cancer-free. The most common treatments for PC involve surgical removal of the prostate (radical prostatectomy; RP), radiation therapy (RT), hormonal therapy (HT), and watchful waiting, which involves active monitoring of prostate specific antigen (PSA) levels. Although there is limited research which has examined the clinical outcomes of these common treatment options, research suggests that, regardless of the treatment choice, PC patients will tend to experience feelings of hopelessness prior to treatment (Davidson & Baum, 1986).

These feelings of hopelessness are founded in the realities of post-treatment adjustment for these patients. Both RP and RT treatments often cause significant side

effects that negatively compromise the patient's disease-specific quality of life (QoL). For PC patients, the most relevant sources of concern were decrements in their urinary, sexual and/or bowel function (e.g., Litwin et al., 1995; Potosky et al., 2004; Korfage et al., 2005). In a sample of PC patients 12 months post-treatment, there was significant evidence of physical side effects. For example, in patients who underwent RP, 21.2% of patients experienced urinary incontinence and 73.4% experienced sexual dysfunction (Clark & Talcott, 2001). For patients who underwent RT, 22.1% experienced urinary obstruction and 60.3% experienced sexual dysfunction (Clark & Talcott, 2001).

Furthermore, different forms of treatment create different challenges that patients must overcome. PC survivors who have been treated with RP were more likely to experience impotence and have urinary dysfunction than those treated with RT, but were less likely to experience bowel dysfunction (Fowler et al., 1996; Shrader-Bogen et al., 1997). However, despite these individual differences, the overall significance of these treatment-related side effects must be considered. Hoffman et al. (2004) concluded that men treated for localized PC experienced significantly greater functional declines in urinary, sexual and bowel functioning compared with age-matched controls. These physical side effects can all potentially impact the lives of PC survivors. For example, urinary dysfunction was associated with a preoccupation with avoiding leakage, bowel dysfunction with both decreased sexual intimacy and greater concerns about disease progression and sexual dysfunction with poorer overall quality of life (Clark et al., 2003). Across all three domains of dysfunction, Clark et al. (2003) concluded that PC patients experienced lower self-esteem when compared to age-matched controls, possibly due to the side effects of treatment.

Post treatment, one of the most significant sources of concern for PC survivors is their sexual dysfunction (Robinson et al., 2002). In research involving over 1200 localized PC patients 18 months post-RP, Stanford et al. (2000) reported that 59.9% of men were impotent and that 41.9% of the men considered their sexual performance to be a moderate-to-large problem. Patients who underwent RT experience similar dysfunction, as 35% of the men reported a significant loss of sexual potency (Crook, Esche & Futter, 1996). The sexual side effects of treatment are problems that appear to persist well beyond the end of treatment. Five years post-treatment, both RP and RT patients were still experiencing significant declines in sexual function, with 79% and 64% respectively, of individuals experiencing some loss of function (Potosky et al., 2004).

Emotional Well-Being

The psychological challenges faced by PC survivors have been well-documented. Evidence suggests that they experience declines in emotional functioning up to four years post-diagnosis (Michael et al., 2000) and are at an increased risk of developing depressive symptoms as a result of the stress from dealing with their post treatment concerns (Polsky et al., 2005). These emotional consequences of treatment may be due to the “islands of disruption” in specific life domains that cancer creates for patients (Andersen, Anderson & de Prose, 1989), which can affect individuals in areas of concern such as uncertainty about the future, physical limitations and pain (Dunkel-Schetter, Feinstein, Taylor & Falke, 1992). These psychological challenges are often so significant that PC patients perceive them to be as difficult to cope with as the physical

side effects of treatment (Redd, 1990) and the concerns can persist for years post-treatment (Hoffman et al., 2004).

Despite the physical dysfunction caused by treatment, the majority of localized PC patients successfully adjust emotionally to the stressors of cancer treatment. Even though PC survivors experience decrements in disease-specific QoL, they often return to pre-treatment levels in general QoL measures; including measures of emotional functioning (e.g., Eton & Lepore, 2002, Lee, Hall, McQuellon et al., 2001). It is hypothesized that this may result from the relief that the patient experiences following treatment, which specifically targets their cancer and helps to reduce the fear associated with a cancer diagnosis (e.g., Korfage et al., 2005). With the exception of sexual dysfunction, the majority of localized PC patients report positive adjustment to the initial physical dysfunction that is experienced, two or more years following treatment (Wootten et al., 2007). However, there are some concerns regarding the study design of research examining post-treatment QoL that may limit the conclusions that may be drawn from this work. For example, the research of Lee, Hall, McQuellon et al. (2001) only assessed baseline emotional well-being post-diagnosis, without any follow ups more than one year after treatment.

Despite the inconsistencies in the domain of general QoL adjustment following treatment, research is consistent in asserting that treatment-related side effects may impact the patient's emotional well-being well after treatment has ceased because negative side effects are chronic (Potosky et al., 2004) and can develop many years following treatment (Raina et al., 2003). Individual differences in the adjustment process may be due to the patient's course of adjustment that is strongly influenced by their

subjective response to the side effects of treatment (Stanton, Revenson & Tennen, 2007). Penson et al. (2003) similarly suggest that perception may be more important than dysfunction when examining the patient's overall quality of life (QoL), concluding that urinary bother better predicts overall QoL than actual urinary dysfunction.

Influences on Emotional Well-Being

Individual cancer experiences vary as a consequence of unique treatment related side effects and perceptions of those side effects. A number of distinctive psychological and physical variables that influence the emotional adjustment of a PC patient to diagnosis and treatment have been hypothesized. The importance of a positive emotional adjustment to PC is illustrated by Helgeson, Snyder & Seltman (2004), who concluded that better psychological functioning four months post-diagnosis was predictive of higher psychological and physical functioning up to 55 months post-diagnosis. However, there only exists a small body of literature examining the relationship between symptoms of treatment and emotional well-being (e.g., Cliff & MacDonagh, 2001; Kunkel et al., 2000). Of the well understood factors, sexual dysfunction and bother, perceived stress and social support consistently appear to affect the psychological well-being of the PC patient.

The level of sexual dysfunction and extent of bother associated with this dysfunction has been associated with compromised general QoL two years following PC diagnosis (Penson et al., 2003) and the presence of physical symptoms in cancer patients can create more negative mood (Hadr et al., 2006). The high rates of sexual dysfunction reported by the patient causes significant distress in areas such as being able to satisfy

one's partner and being able to experience sexual enjoyment (Potosky et al., 2004). Work by Penson & Krieger (2001) further highlights that emotional well-being is not simply affected by sexual dysfunction, but also by sexual bother. They suggest that, rather than the physical aspects of the dysfunction, the negative impact of the sexual dysfunction on the individual's self-image was the most salient source of distress for the patient. It is important to note that the relationship between dysfunction and mood appears to be bi-directional. Evidence suggests that psychological interventions designed to improve mood can positively affect the course of chronic illness (Spiegel et al., 1989; Fawzy et al., 1995).

The difficulties of coping with decrements in disease-specific QoL domains create significant stress in the lives of cancer survivors. In cancer populations, individuals experience severe, acute stress at the time of diagnosis (Maunsell, Brisson & Deschenes, 1992) that can lead into chronic stress if they cannot effectively adapt to and cope with the physical dysfunction resulting from their treatment (Cordova et al., 1995). For example, PC patients experiencing urinary dysfunction begin to associate feelings of embarrassment with their symptoms and this often leads to increased stress for the patient (Clarke et al., 2003). If this perceived stress is not addressed successfully, these patients can experience continuing problems with emotional distress (Broeckel et al., 2000) which ultimately can result in lowered QoL (Gotay & Muraoka, 1998).

Social Support

One aspect of the patient's environment that has often been associated with emotional and physical adjustment to chronic illness is the level of perceived social

support. Social support has been described as individuals in a social network upon whom one can rely on, offer guidance and provide feedback and validation about life experiences and decisions (Caplan, 1974). There are different aspects of social support, each of which contributes to its overall effect on the recipient's physical and psychological adjustment. The three primary categories into which social support is generally classified are instrumental, emotional and informational support. Instrumental support refers to various forms of tangible assistance the patient may receive. This could include tasks such as being driven to a physician's appointment or assistance with grocery shopping. Emotional support refers to non-tangible assistance which helps to make the patient feel cared for and bolsters their sense of self-worth. Emotional support is particularly valuable in the adjustment process for cancer patients because it allows the patient to express their concerns regarding the cancer experience to individuals with whom they feel comfortable disclosing with (House, Landis & Umberson, 1988). Informational support involves seeking information, help and advice from other people and is thought to be important in decreasing distress because it provides the patient with a sense of control over their situation and practical assistance with coping with the negative feelings associated with the cancer experience (House, Landis & Umberson, 1988).

The existing literature has emphasized that the perception of, rather than actual, quality and quantity of support is the most salient factor in predicting the effects of social support. For example, perceived levels of social support predicted depression, whereas actual support did not (Krishnan et al., 1998). Perceived unsupportive partner behaviour resulted in greater patient psychological distress (Manne et al., 2005). The importance of perceived support is further highlighted by work suggesting that incongruity between the

needs of the patient and the amount of support received predicts greater depressive symptomatology and decreased life satisfaction (Martire et al., 2002).

When a patient perceives positive social support, they experience a wide-range of positive benefits as a result. Positive social support has been shown to predict the extent of functional disability and pain (Evers et al., 2003), buffer against depressive symptoms and predict decreased incidence of major depression (Demange et al., 2004; Brown, Wallston & Nicassio, 1989; Krishnan et al., 1998). In addition, positive social support helps to explain different psychological adjustment patterns to illness (Helgeson, Snyder & Seltman, 2004; Bennett et al., 2001), promotes the use of adaptive coping strategies (Holtzman, Newth & DeLongis, 2004) and moderates the relationship between pain, functional limitation and depression on quality of life (Blixen & Kippes, 1999).

Conversely, a lack of social support is a significant predictor of declines in functional status, even more so than treatment choice or disease specific factors (Michael et al., 2000). The perception of a negative social relationship, from the patient's perspective, can detrimentally affect that individual. For example, a social network resulting in dissatisfaction can actually increase pain and disease activity (Zautra et al., 1997) and cause the patient to experience more distress (Schiaffino & Revenson, 1995), which ultimately predicts poorer adjustment and lower overall quality of life (Helgeson, 1993; Michael et al., 2000).

It is hypothesized that individuals who receive positive social support accrue benefits through a number of unique mechanisms. For example, Demange et al. (2004) suggest that social support helps individuals validate their emotions and educates them about health related information, while Baum, Revenson & Singer (2001) suggest that

social support serves to improve an individual's use of their own coping strategies and to increase positive or decrease negative health behaviours. These benefits of social support appear to affect the lives of individuals across health populations, both physiologically and psychologically. In the general population, social support appears to lower an individual's risk of mortality (Berkman, 1985), to improve mental health (Kessler & McLeod, 1985) and also to promote adjustment to illness (Wallston et al., 1983). In chronic illness populations, evidence suggests that patients suffering from illnesses ranging from arthritis to cardiac disease all tend to benefit from perceiving positive social support. These individuals appear to experience less depression (Primomo, Yates & Woods, 1990), adjust better psychologically and physiologically (Helgeson & Cohen, 1996) and are more effective in adjusting to their chronic illness (Baum, Revenson & Singer, 2001).

Perhaps the specific cancer population in which social support is best understood is with breast cancer (BC) patients. For BC patients, increased levels of social support were associated with multiple health outcomes including lower cancer incidence, reduced mortality and a longer disease-free interval (Cassileth, Walsh & Lusk, 1988; Funch & Marshall, 1983; Maunsell, Brisson & Deschenes, 1995; Waxler-Morrison et al., 1991). Psychologically, increased social support was associated with lower anxiety and depression (Neuling & Winefield, 1988), more positive self-perceived health following treatment in BC populations (Ganz et al., 2003), improved coping and adjustment (Bloom, 1982; Helgeson & Cohen, 1996) and better emotional well-being (Bloom et al., 2001). Additionally, BC patients whose partners were perceived to be unsupportive experienced greater distress regarding the cancer experience (Manne et al., 2005).

A limitation of the current body of literature of the effects of social support on emotional well-being is that it is not well understood in PC populations. The relevance of examining these effects specifically in PC patients is highlighted by research which suggests that social support appears to uniquely affect different cancer populations as a result of the distinct physical and psychological challenges that differing cancer diagnoses presents (Ell et al., 1992). In the existing research conducted with PC survivors, Helgason et al. (2001) reported that men who were not able to access emotional support from their social relationships were more likely to feel depressed and less likely to report positive overall psychological well-being. Additional work examining the social support construct in PC populations demonstrated that PC survivors who participated in an intervention focused on discussing their emotions in a positive group setting experienced reduced depression (Weber et al., 2004), that support was associated with decreased psychological distress (Balderson & Towell, 2003), and that satisfaction with social support was related to improved quality of life (Poole et al., 2001). Physiologically, limited research has implicated social support as a predictor of PSA scores (Stone et al., 1999).

Social-Cognitive Processing Model for Social Support

Current literature suggests that the effects of social support on an individual's adjustment to cancer may be mediated by cognitive processing (Lepore & Helgeson, 1998; Lepore, 2001; Redd et al., 2001). With Lazarus & Folkman's (1984) transactional theory of stress and coping serving as a foundation, Lepore and colleagues applied a Social-Cognitive Processing (SCP) model of adjustment to PC populations. This model

emphasizes the value of positive communication between the cancer patient and their social network. The significance of communication for these individuals is attributed, in part, to the view that the stress endured by cancer survivors, following diagnosis and treatment, strongly resembles the stress endured by individuals who are suffering from Post-Traumatic Stress Disorder (PTSD; Smith et al., 1999). Research suggests that the majority of individuals, when faced with a traumatic life event, talk about their experiences with their social network both immediately following, and years thereafter (Rime, 1995; Lehman et al., 1987). The mere act of discussing the traumatic event appears to aid in the emotional adjustment to cancer for these individuals (Rime, 1995). Evidence suggests that victims of traumatic events who feel constrained from talking about their trauma experience increases in depressive symptoms (Lepore et al., 1996) and increases in intrusive thoughts (Major & Gramzow, 1999). For cancer survivors, there may even be additional benefits that occur as a consequence of discussing their trauma. It has been hypothesized that cancer survivors have specific goals for their conversations with their social support network that provide unique benefits for these individuals. These goals include optimizing their own psychosocial response to their cancer experience by establishing a greater understanding of cancer (Feldman-Stewart et al., 2005) and maintaining a sense of control over the subsequent cancer experience (Hack, Degner & Parker, 2005).

However, Lepore and colleagues propose that it is not simply the act of communication that is fundamentally important to the emotional adjustment process. Rather, it is the cognitive processing that occurs following communication – for example, contemplating cancer treatment choices or re-evaluating life goals – which helps the

patient adjust by either helping them assimilate the information into an existing mental schema or by developing new mental schemas to accommodate the information presented (Lepore, 2001). Thus, the SCP model in PC populations proposes that the benefits of communication only occur if the exchange of ideas occurs within a supportive, open and non-judgmental social environment (Lepore et al., 1996) because the positive social environment helps facilitate cognitive processing of trauma-related thoughts and feelings (Clark, 1993; Albrecht, Burleson & Goldsmith, 1994) and assists in the maintenance of a positive self-image by demonstrating that the patient is cared for (Albrecht & Adelman, 1987). Additionally, it has been suggested that cognitive processing in a positive social environment provides the patient with coping information (Lepore et al., 1996), encourages acceptance of the situation (Silver et al., 1983) and can even provide positive perspectives on the traumatic experience (Clark, 1993).

Lepore and colleagues also contend that a negative and unsupportive social network would impede cognitive processing and, thus, emotional adjustment to cancer. This is hypothesized based on evidence suggesting that disclosure in a negative social context can result in increased psychological distress (Major et al., 1997), which prevents cognitive processing from occurring as the distress would push the patient to avoid thinking or talking about their trauma (Kliwer et al., 1998; Lepore, 1997; Lepore & Helgeson, 1998). This inhibition of thoughts interferes with cognitive processing and prevents the individual from discovering alternate perspectives (Tait & Silver, 1989), which reduces the opportunities patients have to form new, non-threatening associations with trauma-related stimuli (Creamer, Burgess & Pattison, 1990; Stiles, 1987) and

ultimately undermines the patient's ability to gain control over their negative emotions (Lepore & Greenberg, 2002).

Work with BC populations demonstrated that social constraints which may inhibit cognitive processing led to greater depression and poorer overall well-being (Cordova, Cunningham, Carlson & Andrykowski, 2001). In previous research involving PC patients, Lepore & Helgeson (1998) have demonstrated that men who reported avoiding conversations, acting uncomfortably or expressing difficulties while talking about cancer with their partners reported more cancer-related intrusive thoughts and were more likely to avoid thinking or discussing their cancer. Furthermore, Lepore & Helgeson (1998) demonstrated that PC patients with greater social constraints exhibited a stronger association between intrusive thoughts and poorer mental health compared with PC patients with fewer social constraints. In an intervention study conducted with localized PC patients, Lepore & Helgeson (1999) demonstrated that the men who participated in an intervention where they were encouraged to discuss their cancer experiences in a supportive social environment reported lower distress associated with intrusive thoughts about cancer and greater overall mental health. The intervention was particularly beneficial for men with inadequate social resources. In an evaluation of the SCP model in PC patients, Roberts, Lepore & Helgeson (2006) found evidence which suggests that positive social support appears to improve mental functioning and this may be mediated by the cognitive processing of their cancer experience. In limited research examining the SCP model in PC patients, evidence of cognitive processing was provided by the patient's responses to scales such as the Impact of Events Scale (IES; Horowitz, Wilner & Alvarez, 1979). The IES has been used primarily as a measure of distress following an

event, rather than as an assessment of cognitive processing. Although it has been suggested that it can be potentially used as a measure of cognitive processing (e.g., Creamer, Burgess & Pattison, 1992), the measure is not an ideal tool and may limit the conclusions that can be drawn from existing research which has used it.

Another limitation of the existing literature examining the SCP model is the lack of research which has investigated potential factors which may affect the impact of cognitive processing on the relationship between social support with emotional adjustment. Past research has demonstrated that variables such as sexual dysfunction and sexual bother potentially influence the emotional well-being of PC patients (Penson et al., 2003). Additionally, these variables are significantly related with an individual's level of perceived stress (Avis et al., 2005) which, in turn, can also influence the emotional well-being of PC patients (Broeckel et al., 2000). However, there has been no research conducted examining the effects of factors such as sexual dysfunction, sexual bother or perceived stress on the cognitive processing abilities of the PC patient. Related research in a general population demonstrated that increased psychological stress was negatively associated with positive re-focusing and positive re-appraisal of negative life events (Garnefski, Baan & Kraaij, 2005), suggesting that the individual may have reduced cognitive processing capabilities when faced with significant psychological stress.

Chapter 2: Proposed Study

The primary objective of this study is to evaluate the Social Cognitive Processing (SCP) model for patients who have undergone treatment for localized PC. The first test involved in testing the SCP model is to evaluate the relationship between social support and emotional well-being. It is hypothesized that this relationship will be mediated by measures of cognitive processing, including the illness coherence subscale from the Revised Illness Perception Questionnaire, selected items from the Brief COPE inventory and one selected item from the Inventory of Psychosocial Balance. Furthermore, this study sought to evaluate whether the relationship between social support and emotional well-being varied at different levels of factors salient to the adjustment process in PC patients (e.g., sexual dysfunction/bother and perceived stress). The overall conceptual model that was tested is illustrated in Figure 1.

Study Aims and Hypotheses:

Specific Aim 1: To determine whether higher levels of social support are significantly associated with higher levels of cognitive processing, which was assessed utilizing the illness coherence subscale from the Revised Illness Perception Questionnaire, selected items from the Brief COPE inventory and one selected item from the Inventory of Psychosocial Balance.

Hypothesis 1: Higher levels of social support are significantly associated with higher levels of cognitive processing.

Specific Aim 2: To determine whether higher levels of social support and cognitive processing are significantly associated with higher levels of emotional well-being.

Hypothesis 2a: Higher levels of social support are significantly associated with higher levels of emotional well-being.

Hypothesis 2b: Higher levels of cognitive processing are significantly associated with higher levels of emotional well-being.

Specific Aim 3: To determine whether the relationship between social support and emotional well-being is mediated by cognitive processing. See Figure 2.

Hypothesis 3: The relationship between social support and emotional well-being is mediated by cognitive processing.

Specific Aim 4: To determine if any mediation effects of the relationship between social support and emotional well-being, vary as a function of levels of perceived stress and sexual dysfunction/bother. See Figure 3.

Hypothesis 4: The relationship between social support and emotional well-being, mediated by cognitive processing, varies as a function of levels of perceived stress and/or sexual dysfunction/bother.

Statistical Analyses

Preliminary Analyses:

Each variable included in the proposed analyses was tested for internal consistency and normality. If the univariate frequency distributions express any non-

normal distribution patterns, the data was transformed to correct for the non-normality. Descriptive statistics were then calculated (e.g., mean and standard deviation) for demographic and disease-specific variables which are considered possible control variables. Zero-order correlations with the study outcome variable, emotional well-being, were conducted to determine if they are significant co-variates of any of the variables in the main analyses. If they are significantly related ($p < .10$) to emotional well-being, they were then included as control variables in all proposed models. The demographic variables that were considered included age, income, years of education and ethnicity; the disease-specific variables that were considered included time since diagnosis, time since treatment, medical co-morbidities and treatment type. As some of the issues that are addressed in this current study may differentially affect a PC patient who is in a committed relationship versus one who is not (e.g., sexual dysfunction), relationship status was also included as a potential control variable. The control variables which are identified as being significantly related to the outcome will be included in Block 1 of the stepwise hierarchical linear regression equations that will be tested in the course of study.

Additionally, if treatment type (radiation therapy versus radical prostatectomy) was a significant correlate of emotional well-being, then subsequent analyses also included a component that will distinguish if any of the models tested in the current study differ depending on treatment type. Should treatment type arise as a significant correlate, this would allow the additional benefit of being able to compare the emotional well-being scores against population data that exists for the measures of emotional well-being. External reference data from both a general population and a cancer specific population

will provide a meaningful context for the emotional well-being outcome that is assessed in this study. Recent, normative data has been collected within both a general U.S. adult population and a sample of adult patients with cancer (Brucker, Yost, Cashy et al., 2005) and these norms will be used to compare against the outcome data for patients in this study.

Specific Aim 1:

To determine whether higher levels of social support are significantly associated with higher levels of cognitive processing, multiple regression analyses will be conducted using stepwise multiple regression. Any identified control variables will be entered in the first block. Then social support will be added to the regression. Significance ($p < .05$) of the Beta coefficient for social support will indicate whether the association between social support and cognitive processing, after controlling for relevant psychosocial and disease-specific variables, is statistically significant. A separate regression analysis will be run for each measure of cognitive processing that is used. The three independent measures of cognitive processing that were assessed were the illness coherence subscale from the Revised Illness Perception Questionnaire, selected items from the Brief COPE inventory and one selected item from the Inventory of Psychosocial Balance.

Specific Aim 2:

To determine whether higher levels of social support and cognitive processing are significantly associated with higher levels of emotional well-being, regression analyses will be conducted as with *Specific Aim 1*. Any identified control variables will be

entered in the first block. In the first regression analysis, social support will then be added to the regression in the second block. Significance ($p < .05$) of the Beta coefficient for social support following this second step will indicate whether the association between social support and emotional well-being, after controlling for relevant psychosocial and disease-specific variables, is statistically significant. In the second through fourth regression analyses to be completed for *Specific Aim 2*, each of the three independent measures of cognitive processing will be entered as the second step in separate regression analyses. Again, significance ($p < .05$) of the Beta coefficient for cognitive processing following this second step will indicate whether the association between cognitive processing and emotional well-being, after controlling for relevant psychosocial and disease-specific variables, is statistically significant.

Specific Aim 3:

To determine whether the relationship between social support and emotional well-being is mediated by cognitive processing, three separate hierarchical multiple regression analyses will be conducted; one for each independent measure of cognitive processing. Emotional well-being will be the outcome variable for all three separate regression analyses. In the regression analyses, the first block of predictors will be any identified control variables. The second block entered will be one of the three independent measures of cognitive processing. The third block of predictors will include social support. The complete mediation hypothesis will be supported if the criteria established by Baron & Kenny (1986) are met. They are as follows: 1) the regression of emotional well-being on social support is significant; 2) the regression of cognitive processing on

social support is significant; 3) the regression of emotional well-being on cognitive processing is significant; 4) the addition of the mediator (cognitive processing) to the regression of emotional well-being on social support results in a non-significant relationship between social support and emotional well-being. If criterion 4 is not met, but criteria 1-3 are significant, then partial mediation is indicated. A Sobel test (Sobel, 1990) will be conducted in this case to test for the significance of partial mediation. The Sobel test requires that two regression analyses be conducted: 1) the independent variable predicting the mediator 2) the independent variable and mediator predicting the dependent variable. The un-standardized regression coefficients for the association between the independent variable and the mediator in the first regression analysis and for the association between the mediator and the dependent variable from the second regression analysis and their respective standard errors are utilized in the Sobel test statistic calculation.

Specific Aim 4:

To determine whether the relationship between social support, and emotional well-being, mediated by cognitive processing, is moderated by perceived stress, and/or sexual dysfunction/bother, the moderated mediation approach described by Muller, Judd & Yzerbyt (2005) will be utilized. The moderated mediation model implies that the one or more of the direct effect paths in the relationship between social support and emotional well-being, mediated by cognitive processing, depends on the level of perceived stress, sexual dysfunction or sexual bother. However, according to Muller, Judd & Yzerbyt (2005), there cannot be a moderation of the direct relationship between social support and

emotional well-being by one of the proposed moderating variables. If there is a significant moderation of the direct path between social support and emotional well-being, a moderation of the complete mediation model cannot be accurately assessed. In the moderated mediation model, there must be an overall effect of the predictor on the outcome (as discussed in *Hypothesis 2a*). However, the magnitude of the mediating relationship will depend on the moderators in question (perceived stress and sexual dysfunction/bother). In this case, the effect of the moderator must be examined on the direct path between the predictor and the mediator, as well as the direct path between the mediator and the outcome. The moderator may have an effect on the direct path (a) between the predictor and mediator, (b) between the mediator and outcome, and/or (c) the residual path between the predictor and the outcome, controlling for the mediator. If there is a significant moderation effect of at least one of the three paths in the mediation model, then an overall moderated mediation model is indicated.

Specifically, three steps will be completed to assess the overall validity of the moderated mediation model. They are as follows:

Step 1: Three separate regression analyses will be completed for the first step. First, the regression of emotional well-being on social support, moderated by perceived stress. Should the interaction term between social support and the moderator be significant ($p < .05$), the analyses of a potential moderated mediation model will stop as there is moderation of the direct relationship. Therefore, any further analyses of the moderation of the mediation effect cannot be accurately interpreted (Muller, Judd & Yzerbyt (2005)). The second and third regression analyses will utilize sexual dysfunction and sexual bother, respectively, as the moderating variable. Again, should the interaction term

between the moderating variable and social support be significant ($p < .05$), no further analyses of a potential moderated mediation model will be completed.

$$\text{Emotional Well-Being} = \beta_1 + \beta_2 * \text{Social Support} + \beta_3 * \text{Moderator} + \beta_4 * (\text{Social Support} * \text{Moderator})$$

Step 2: Should the interaction term between social support and the moderating variable not be significant, further testing will be conducted to assess the validity of the moderated mediation model. A regression of cognitive processing (the mediator) on social support, moderated by perceived stress will be run. As with Step 1, a second and third regression analyses will be conducted, except using sexual dysfunction and sexual bother, respectively, as the moderating variable. Should the interaction term between social support and the moderator be significant, we can conclude that there is a moderated mediation relationship for the path between social support and cognitive processing.

$$\text{Cognitive Processing} = \beta_1 + \beta_2 * \text{Social Support} + \beta_3 * \text{Moderator} + \beta_4 * (\text{Social Support} * \text{Moderator})$$

Step 3: Additionally, a third model will be tested. In this model, the moderating effects of perceived stress, sexual dysfunction or sexual bother will be assessed on the regression of emotional well-being on cognitive processes. Should the interaction term between the mediator (cognitive processing) and the moderator be significant, we can conclude that there is a moderated mediation relationship for the path between cognitive processing and emotional well-being. Should the interaction term between the predictor (social support) and the moderator (cognitive processing) be significant, we can conclude that there is a moderated mediation relationship for the residual effect between social support and emotional well-being, controlling for cognitive processing.

$$\text{Emotional well-being} = \beta_1 + \beta_2 * \text{Social Support} + \beta_3 * \text{Moderator} + \beta_4 * (\text{Social Support} * \text{Moderator}) + \beta_5 * (\text{Cognitive Processing}) + \beta_6 * (\text{Cognitive Processing} * \text{Moderator})$$

To increase the interpretability of the various parameters in the models, all variables (with the exception of the outcome) will be centered at their mean (Aiken & West, 1991). As a mediation model is hypothesized in this study, there must be a correlation between the predictor and the mediating variable. As a result, there may be some potential overlap between explanatory variables and this multi-collinearity is an area of concern. Baron & Kenny (1986) suggest that multi-collinearity is to be expected with all mediation models and a moderate level will still permit accurate interpretation of data. Following methods designed to detect significant multi-collinearity, a variance inflation factor (VIF) will be calculated for all mediation models and a VIF greater than 5 will signify that there is too much overlap between the variables for accurate interpretation of the results (Hair et al., 2006).

If the moderated mediation model is confirmed, post-hoc testing will examine the effects of the moderators at different levels. For all of the moderating variables (perceived stress, sexual dysfunction and sexual bother), the sample will be separated into high and low levels by a median split for further analysis. The moderated mediation models will then be run again, but only using high or low levels of the moderating variable to examine the differences between the high and low groups of the moderating variables.

Method

Participants:

Participants were a part of a larger National Institute of Health (NIH) funded study (Cognitive-Behavioral Stress Management in Prostate Cancer [CBSM in PC]; National Cancer Institute [NCI] grant 1P50CA84944). The purpose of the CBSM in PC study was to investigate the impact of a CBSM intervention on quality of life (QOL) among men who had been treated for localized (Stage I and II) PC with either radical prostatectomy (RP) or radiotherapy (RT).

Inclusion/Exclusion Criteria:

Men were required to be 45 years of age or older and have undergone treatment (radical prostatectomy, external beam radiation therapy or brachytherapy) for Stage I or II PC, within the past 18 months. Additionally, participants were required to have a minimum of a Grade 9 reading level in order to ensure their comprehension of assessment questionnaires and intervention content, and be willing to participate in the study for a period of 15 months. Participants were excluded from the study if they were on active hormone treatment (e.g., Lupron, Zoladex, Eligard or Viadur), had a history of other non-skin cancer, or had any significant cognitive impairment or active psychiatric symptoms (e.g., panic attacks, psychosis or alcohol/drug dependence within the past three months) that may interfere with their ability to participate in the intervention.

Measures:

Social Support

The Enhancing Recovery in Coronary Heart Disease Patients (ENRICH) project developed the ENRICH Social Support Instrument (ESSI) as a measure of perceived social support. The ESSI is a seven-item measure that has demonstrated acceptable internal consistency and has shown to correlate positively with other social support instruments (ENRICH investigators, 2000; ENRICH investigators, 2001) and has proven to be a reliable measure in cardiac patients (Vaglio et al., 2004). Individual items in the ESSI are summed for a total score, with higher scores indicating greater social support. Within this study, the ESSI measure demonstrated good internal reliability (Cronbach's alpha 0.91).

Emotional Well-Being

The Functional Assessment of Cancer Therapy-General Module (FACT-G) was used to assess quality of life in four domains: emotional, functional, physical and social/family (Cella et al., 1993). For the purposes of this study, the emotional subscale was used. The 27-item questionnaire asked participants to indicate the degree to which each statement in the questionnaire had been true for them over the past week. The FACT-G has demonstrated adequate reliability (Cronbach's alpha ranging from 0.59 to 0.87) and validity in a number of studies in men with PC (e.g., Yount et al., 2003).

Perceived Stress

The Perceived Stress Scale (PSS; Cohen, Kamarck & Mermelstein, 1983) was used to assess the participant's perceptions of how unpredictable, unmanageable and stressful their lives had been during the past month. The 14-item scale asks participants to rate the frequency of a list of general thoughts and feelings related to stress, with higher scores indicating increased feelings of perceived stress. This scale has been used in PC populations in the past and has demonstrated good reliability with a Cronbach's alpha of 0.88 (Lev et al., 2004).

Sexual Dysfunction & Bother

To assess post-treatment side effects, the UCLA-Prostate Cancer Index (UCLA-PCI; Litwin et al., 1998) was administered to post-surgery patients and the Expanded Prostate Cancer Index Composite (EPIC; Wei et al., 2000) was administered to post-radiation participants. Both measures evaluate the extent of urinary, bowel and sexual dysfunction and related bother for patients following PC treatment. In each of the three dysfunction domains, patients were asked to identify the frequency and severity of problems and the degree to which that dysfunction had been a bother for them during the past four weeks. The EPIC is an expanded version of the UCLA-PCI and contains the core subset of questions from the UCLA-PCI. These scales have demonstrated good internal reliability (Cronbach's alpha ranging from 0.70 to 0.89).

Cognitive Processing

There will be three measures that will serve as proxies for cognitive processing.

Illness Coherence

The Revised Illness Perception Questionnaire (IPQ-R) was developed to provide a quantitative assessment of an individual's perception of their illness experience. It has good internal reliability, and has demonstrated good predictive validity (Moss-Morris et al., 2001). The IPQ-R was based on Leventhal's model of self-regulation (Leventhal et al., 1984) and assesses nine unique subscales: identity, timeline (acute/chronic), timeline (cyclic), cause, consequences, treatment control, personal control, emotional representations and illness coherence. For all subscales, except the identity subscale, participants rated their agreement with a list of statements using a 5-point scale that ranged from 'Strongly Disagree' to 'Strongly Agree.' For the identity subscale, participants indicated 'Yes' or 'No' as to whether they had recently experienced a list of symptoms and whether each symptom was related to their illness. The IPQ-R has been used with a patient population in a range of chronic illnesses, including cancer populations (Buick, 1997) and has been demonstrated to have good internal reliability (Cronbach's alpha 0.89; Moss-Morris et al., 2002). This particular project used a generic adaptation of the IPQ-R and incorporated items to include PC-specific etiological factors (e.g., aging) and treatment side effects (e.g., sexual, urinary and bowel dysfunction). The Illness Coherence subscale will be used as a proxy for cognitive processing and consists of 5 items that focus around a basic understanding of what PC is. Items include 'The symptoms of my condition are puzzling to me,' 'I don't understand my illness,' 'My

illness is a mystery to me,' 'My illness doesn't make any sense to me' and 'I have a clear picture or understanding of my condition.' The Illness Coherence subscale has good internal reliability (Cronbach's alpha 0.81).

Brief COPE

The Brief COPE was devised to assess the range of coping responses that an individual may experience as a result of exposure to a stressful situation. It is an abbreviated version of the full COPE inventory and has been used in samples with BC patients. A factor analysis guided the elimination of items from the full COPE inventory and the Brief COPE contains two items per subscale. The Brief COPE contains 14 total subscales and all subscales of the Brief COPE had good internal reliability with Cronbach's alphas all exceeding 0.60 (Carver, 1997). The participants in this study were asked to assess how they reacted to dealing with cancer, specifically. The scale consists of 28 items to which participants are asked to indicate the extent to which they have been doing that particular coping activity on a scale ranging from 'I haven't been doing this at all' to 'I've been doing this a lot.' The items that were combined to create a composite score that will serve as a proxy for cognitive processing will be 7 (I've been giving up trying to deal with it), 9 (I've been refusing to believe that it's really happened), 14 (I've been trying to see it in a different light, to make it seem more positive), 15 (I've been trying to come up with a strategy, or plan, about what to do), 18 (I've been giving up the attempt to cope), 19 (I've been looking for something good in what's happening), 22 (I've been accepting the reality of the fact that this has happened) and 26 (I've been thinking hard about what steps to take). Items 7, 9 and 18 were reverse coded when item

scoring was completed. The composite score calculated by these combined items demonstrated good internal reliability with a Cronbach's alpha of 0.71.

Inventory of Psychosocial Balance

Derived from Erikson's theories of development, the Inventory of Psychosocial Balance (IPB) is a 30 item measure that assesses individual generativity and the extent to which the individual has successfully accomplished tasks which they have set out to accomplish during their mid-to-elderly years. Item 26 (I have given serious thought to the meaning of life) will be used from the IPB as a proxy for cognitive processing with a higher score on this item suggesting the patient agreed more fully with the statement.

Procedure:

Recruitment

Participants for the study were recruited from the South Florida area through flier advertisements, referrals from urologists and through mailings to PC survivors whose information was collected through the Florida Cancer Data System (FCDS), a registry of Florida cancer patients maintained by the Florida Department of Health (DOH). The FCDS disseminates information about cancer research studies to all Florida cancer patients who have acknowledged interest in the receipt of information regarding these studies. Use of the FCDS services was completed in full accordance with the Health Information Portability and Accountability Act (HIPAA), regulations by the Florida DOH and the University of Miami/Sylvester Comprehensive Cancer Center (UM/SCCC). Potential participants who met general inclusion criteria were mailed an informational

package which contained a letter explaining the study, signed by the Principal Investigator, a research study flyer, and a letter from the Florida DOH, endorsed by the Secretary of Health, that explained why they were being contacted. The recipients of the letter were invited to contact the research team via telephone or mail using contact information provided in the letter. Only the individuals who contacted the research team were screened for participation into the study.

Screening

A potential participant's initial eligibility for the study was assessed via a telephone interview. Those who met initial criteria (for example, at least a Grade 9 reading level) during the initial telephone screening were scheduled for an in-person interview at the Behavioral Medicine Research Center (BMRC) at the University of Miami. The in-person interview commenced with the Folstein Mini-Mental Status Exam (MMSE; Folstein, Folstein & McHugh, 1985) which was used to identify men with any potential cognitive impairments that may preclude their participation in the study. A MMSE score of less than 24 was used as the cut-off to exclude the individual from further participation in the study. Following this, screener items from the Structured Clinical Interview for DSM-IV/non-Patient edition (SCID-IV/NP; First, Spitzer, Gibbon & Williams, 2002) were used to identify any active psychiatric symptoms. If the PC survivor endorsed a screener item, the full SCID-IV/NP module was then administered. Participants who met full SCID criteria for panic attacks, post-traumatic stress disorder, psychosis and/or alcohol or drug dependence within the past three months were excluded from the study and immediately referred to an appropriate mental health resource.

Participants who met the full eligibility criteria were then provided with an explanation of the goals and procedures of the study, as well as the amount of compensation they would receive for their participation. They were then invited to participate in the study. Those who agreed were asked to sign an informed consent form, approved by the University of Miami Internal Review Board (IRB), before entering the study.

Assessments

All participants were administered a comprehensive psychosocial assessment battery by clinical health psychology graduate students or research assistants in both an interview and self-report format. The face-to-face component of the assessment lasted approximately 2.5 hours and consisted of a series of questionnaires as well as the collection of blood samples. The self-report component of the assessment was comprised of a series of questionnaires which were mailed to the participant's home prior to their in-person interview. These questionnaires were completed and returned to the laboratory during their interview. The proposed study will utilize the data that was collected prior to the start of a cognitive-behavioural stress management intervention and will not utilize any of the immune or endocrine results that were collected from the blood samples. Participants in the study all received \$100 compensation following each assessment.

Chapter 3: Results

Preliminary Analyses

Sample Description

All of the analyses were conducted with a sample consisting of 260 men who have been treated for early stage PC (Stage I or II) within the past 18 months. Demographically, participants were an average of 65.4 years of age (SD=7.6), with 13.8 years of education (SD=3.3) and an average income of \$50,960 (SD=\$50,164). The sample was ethnically diverse, with 36.5% of the sample being Non-Hispanic White, 14.9% Hispanic and 36.5% African-American. About 45% of the sample was employed at the time of their assessment, 45% were retired and the remainder were otherwise unemployed. Approximately 76% of the sample were married, or in an equivalent relationship at the time of their assessment.

The participants were an average of 15.6 months (SD=6.9) post PC diagnosis and 10.3 months (SD=4.5) post treatment. The majority of participants (48%) chose surgery treatment while approximately 52% of the men received radiation treatment. The mean number of medical co-morbidities was 1.8 (SD=2.1).

Analysis of Covariates

Demographic and disease-specific variables were assessed as possible covariates in the proposed models. All potential covariates were tested using bivariate correlations and one-way analysis of variance. Significance was determined at a $p < .10$. All significant demographic or disease-specific variables were included as control variables in subsequent analyses.

A greater number of years of education ($r=.16$, $p<.05$), and number of medical co-morbidities ($r=-.13$, $p<.05$) were all related to emotional well-being. Additionally, ethnic group identification had a main effect on emotional well-being ($F=8.33$, $p<.01$). Specifically, both Non-Hispanic Whites and African-Americans reported significantly higher emotional well-being than Hispanics. However, there was no significant difference in the level of emotional well-being when comparing Non-Hispanic Whites and African-Americans.

Primary Analyses

Analyses were conducted to test the specific hypotheses that: 1) higher levels of social support are significantly associated with increased cognitive processing; 2) higher levels of social support and cognitive processing are significantly associated with increased emotional well-being; 3) cognitive processing mediates the relationship between social support and emotional well-being; 4) the relationship between social support and emotional well-being, mediated by cognitive processing, is moderated by perceived stress and/or sexual dysfunction/bother. All statistical analyses were conducted using SPSS 16.0 statistical software. A p-value below .05 was used as an indicator of model significance. Prior to conducting the proposed analyses, results showed that all psychosocial measures demonstrated adequate psychometric properties and did not violate the assumption of normality. All analyses controlled for relevant demographic (number of years of education, ethnic group identification) and disease-specific (number of medical co-morbidities) variables.

Specific Aim 1:

The first set of analyses conducted assessed whether higher levels of social support were significantly associated with higher levels of cognitive processing. After controlling for relevant demographic and disease-specific variables, ESSI total social support was a significant predictor of two proxies for cognitive processing: IPQ illness coherence ($\beta=.16$, $p<.05$) and COPE cognitive processing ($\beta=.16$, $p<.01$). ESSI total social support was not a significant correlate of the remaining proxy for cognitive processing (Inventory of Psychosocial Balance, item 26). As a result, item 26 from the Inventory of Psychosocial Balance will be dropped from any further analyses involving cognitive processing measures. These results indicate that higher levels of social support are significantly associated with higher levels of cognitive processing as measured by the IPQ illness coherence and COPE cognitive processing scales.

Specific Aim 2:

The second set of analyses tested whether higher levels of social support and cognitive processing were significantly associated with higher levels of emotional well-being. The first model evaluated the relationship between social support and emotional well-being. After controlling for relevant demographic and disease-specific variables, ESSI total social support remained a significant predictor of emotional well-being ($\beta=.30$, $p<.001$).

The second model evaluated the relationship between cognitive processing and emotional well-being. It was established that, after controlling for relevant demographic and disease-specific variables, both IPQ illness coherence ($\beta=.32$, $p<.001$) and COPE

cognitive processing ($\beta=.12$, $p<.05$) were significant predictors of emotional well-being. These results indicate that higher levels of social support and cognitive processing are significantly associated with higher levels of emotional well-being.

Specific Aim 3:

A third set of analyses assessed whether the relationship between social support and emotional well-being was mediated by cognitive processing. As IPQ illness coherence and COPE cognitive processing were significantly correlated with emotional well-being, they will be the two measures assessed for mediation effects. The analyses were conducted in a series of steps according to the mediation model guide as outlined by Baron & Kenny (1986). Should complete mediation not be indicated by the Baron & Kenny (1986) model, the Sobel test (Sobel, 1990) was be utilized to assess for any partial mediation effects. The use of the Sobel test to assess for partial mediation effects, when complete mediation in the model is not indicated, has been demonstrated by researchers in a variety of contexts. Past literature, using the Sobel test for partial mediation effects, have studied psychosocial variables in general health populations (e.g., Fuemmeler et al., 2006), chronic disease populations (e.g., Cohen, Mansoor, Langut & Lorber, 2007) and cancer populations (e.g., Wong & Fielding, 2007).

Mediator: IPQ illness coherence

The first model tested utilized IPQ illness coherence as the cognitive processing proxy. The first three steps of Baron & Kenny's (1986) mediation model were established in the analyses conducted for Specific Aims 1 and 2. First, the regression of

emotional well-being on social support was demonstrated to be significant. Secondly, the regression of IPQ illness coherence was demonstrated to be significant. Thirdly, the regression of emotional well-being on IPQ illness coherence was also demonstrated to be significant. The fourth step in Baron & Kenny's (1986) mediation model stipulates that the addition of the mediator (cognitive processing) to the regression of emotional well-being on social support must result in a non-significant relationship between social support and emotional well-being to indicate a complete mediation model. The introduction of IPQ illness coherence as the mediating variable to the regression of emotional well-being on social support did not cause the relationship between social support and emotional well-being to drop to non-significance. This suggests that IPQ illness coherence does not completely mediate the relationship between social support and emotional well-being. As a result, the Sobel test was employed to assess for partial mediation effects. The Sobel test analysis revealed that the relationship between social support and emotional well-being is partially mediated by IPQ illness coherence ($z=2.28$, $p<.05$).

Mediator: COPE cognitive processing

The next model utilized COPE cognitive processing as the proxy for cognitive processing. Again, the first three steps of Baron & Kenny's mediation model were verified in the analyses conducted in Specific Aims 1 and 2. In the fourth step of the mediation model, the introduction of COPE cognitive processing as the mediator to the regression of emotional well-being on social support did not cause the relationship between social support and emotional well-being to drop to non-significance. This

suggests that COPE cognitive processing does not completely mediate the relationship between social support and emotional well-being. Again, the Sobel test was employed to test for potential partial mediation effects. The Sobel test analysis revealed that the relationship between social support and emotional well-being is partially mediated by COPE cognitive processing ($z=-2.00$, $p<.05$).

Specific Aim 4:

Following Muller, Judd & Yzerbyt's (2005) approach, the analyses for an overall moderated mediation model involves testing three separate models, each individually assessing unique paths of the moderated mediation. All variables, with the exception of the outcome (emotional well-being), were centered at their mean so as to increase interpretability of the models (Aiken & West, 1991).

Step 1:

First, a moderation model of the direct relationship between the independent variable (social support) and the dependent variable (emotional well-being) was evaluated. If there was a moderation effect for the direct relationship between the independent variable (social support) and dependent variable (emotional well-being), that particular moderating variable was then excluded from any further analysis as an overall moderated mediation model could no longer be accurately assessed (Muller, Judd & Yzerbyt, 2005).

The first analysis evaluated perceived stress as a potential moderator. The interaction term between social support and perceived stress was non-significant ($\beta=.04$,

$p > .05$), permitting further analysis of whether perceived stress moderates the relationship between social support and emotional well-being, mediated by cognitive processing.

The next analysis evaluated sexual dysfunction as a potential moderating variable. Sexual dysfunction proved to be a significant moderator of the direct relationship between social support and emotional well-being ($\beta = .38$, $p < .01$). Consequently, this precluded sexual dysfunction from being evaluated as a potential moderating variable for the relationship between social support and emotional well-being, mediated by cognitive processing.

The third analysis evaluated sexual bother as a potential moderating variable. It too proved to be a significant moderator of the direct relationship between social support and emotional well-being ($\beta = .39$, $p < .01$). This precluded sexual bother from being a potential moderating variable for the relationship between social support and emotional well-being, mediated by cognitive processing.

Step 2:

The next step in assessing a moderated mediation relationship requires a regression of cognitive processing on social support, moderated by perceived stress, to be evaluated. As perceived stress was the only hypothesized moderating variable to have a non-significant interaction with social support (Step 1), it is the only variable that can accurately be interpreted for an overall moderated mediation model. These analyses will reveal if the path between social support and cognitive processing, in the overall mediation model, depends on levels of perceived stress.

The first model tested IPQ illness coherence as the proxy for cognitive processing. A regression of IPQ illness coherence on social support, moderated by perceived stress, was evaluated. This analysis revealed that the path between social support and IPQ illness coherence, in the overall mediation model, does not depend on levels of perceived stress ($\beta = -.01$, $p > .05$).

The second model tested COPE cognitive processing as the proxy for cognitive processing. A regression of COPE cognitive processing on social support, moderated by perceived stress, was evaluated. This analysis revealed that the path between social support and COPE cognitive processing, in the overall mediation model, does not depend on levels of perceived stress ($\beta = -.00$, $p > .05$).

Step 3:

The next step in assessing the moderated mediation relationship evaluates whether the partial effect of cognitive processing on emotional well-being, in the overall mediation model, depends on levels of the moderator. Additionally, this model will assess whether the residual effects of social support on emotional well-being, controlling for cognitive processing, are moderated by perceived stress. Again, as perceived stress was the only hypothesized moderating variable to have a non-significant interaction with social support, it will be the only variable that can be accurately interpreted for moderated mediation analyses.

The first model evaluated IPQ illness coherence as the proxy for cognitive processing. Results revealed that the partial effect of IPQ illness coherence on emotional well-being, in the overall mediation model, does not depend on levels of perceived stress

for the high stress sample ($\beta=.39$, $p>.05$). Additionally, the residual effect of social support on emotional well-being, controlling for IPQ illness coherence, in the overall mediation model, does not depend on levels of stress ($\beta=.08$, $p>.05$).

The next model evaluated COPE cognitive processing as the proxy for cognitive processing. Results revealed that the partial effect of COPE cognitive processing on emotional well-being, in the overall mediation model, does depend on levels of perceived stress ($\beta=.91$, $p<.01$). However, the residual effect of social support on emotional well-being, controlling for COPE cognitive processing, in the overall mediation model, does not depend on levels of stress ($\beta=.10$, $p>.05$).

Final Model:

Following the analyses conducted for Specific Aims 1-4, the final model proposes that the relationship between social support and emotional well-being is mediated by COPE cognitive processing and that the partial effect of COPE cognitive processing on emotional well-being is further moderated by levels of perceived stress. See Figure 4.

Secondary Analyses:

Post-hoc testing of the moderated mediation model examined the effects of perceived stress at different levels. The sample was separated into high and low levels of perceived stress by a median split at a perceived stress total score of 17.

The first set of analyses examined the sample of PC patients perceiving high levels of stress. A regression analysis evaluated whether COPE cognitive processing mediates the relationship between social support and emotional well-being. Results

revealed that for the high stress sample, COPE cognitive processing did not either completely mediate, nor partially mediate ($z=.09$, $p>.05$) the relationship between social support and emotional well-being. See Figure 5.

The second set of analyses examined the sample of PC patients perceiving low levels of stress. A regression analysis evaluated whether COPE cognitive processing mediates the relationship between social support and emotional well-being. Results revealed that for the low stress sample, COPE cognitive processing does not completely mediate the relationship between social support and emotional well-being. However, results demonstrated that for men perceiving low levels of stress, that COPE cognitive processing partially mediates the relationship between social support and emotional well-being ($z=1.90$, $p<.05$). See Figure 6.

Further post-hoc testing examined the mediation model at high versus low levels of sexual dysfunction, due to the significant moderation relationship of the main effect between social support and emotional well-being. The sample was split into high and low sexual dysfunction groups by a median split at a score of 44.

The first set of analyses examined the sample of PC patients experiencing high levels of sexual dysfunction. A regression analysis evaluated whether COPE cognitive processing mediates the relationship between social support and emotional well-being. Results revealed that for the high sexual dysfunction sample, COPE cognitive processing does not mediate the relationship between social support and emotional well-being ($\beta=.05$, $p>.05$).

The second set of analyses examined the sample of PC patients experiencing low levels of sexual dysfunction. A regression analysis evaluated whether COPE cognitive

processing mediates the relationship between social support and emotional well-being. Results revealed that for the low sexual dysfunction sample, COPE cognitive processing nearly meets significance for mediating the relationship between social support and emotional well-being ($\beta=.18$, $p<.10$).

Post-hoc testing continued with an examination of the mediation model at high versus low levels of sexual bother, due to the significant moderation relationship of the main effect between social support and emotional well-being. The sample was split into high and low sexual bother groups by a median split at a score of 2.5.

The first set of analyses examined the sample of PC patients experiencing high levels of sexual bother. A regression analysis evaluated whether COPE cognitive processing mediates the relationship between social support and emotional well-being. Results revealed that for the high sexual bother sample, COPE cognitive processing does not mediate the relationship between social support and emotional well-being ($\beta=-.12$, $p>.05$).

The second set of analyses examined the sample of PC patients experiencing low levels of sexual bother. A regression analysis evaluated whether COPE cognitive processing mediates the relationship between social support and emotional well-being. Results revealed that for the low sexual bother sample, COPE cognitive processing does not mediate the relationship between social support and emotional well-being ($\beta=.20$, $p>.05$).

Chapter 4: Discussion

The current study sought to evaluate the Social-Cognitive Processing (SCP) model in men who underwent treatment for early stage (Stage I or II) prostate cancer (PC) within the past 1.5 years. A secondary aim of the study was to evaluate potential moderating variables of the SCP model so as to better understand the effects of dysfunction or stress on the ability of the individual to cognitively process their PC experience. More specifically, this study aimed to identify potential targets for interventions that could assist the psychosocial adjustment of PC patients to the physical side effects of treatment. As the most common current treatments for PC often cause significant decrements in physical function (e.g., Potosky et al., 2004; Korfage et al., 2005), the patient's ability to adjust emotionally to the psychological challenges presented by their sexual, urinary and/or bowel limitations becomes a critical component to the overall cancer adjustment process. A supportive social network has been shown to assist in this emotional adjustment process, predicting overall psychological well-being (Helgason et al., 2001), decreased psychological distress (Balderson & Towell, 2003) and improved quality of life (Poole et al., 2001) in PC patients. However, the majority of research examining social support in cancer populations has been conducted in either general cancer populations or with breast cancer patients. As a result, there is a limited body of research work which has examined social support specifically within the PC population.

In particular, there is a notable lack of understanding of the mechanisms through which social support benefits PC patients. Current literature proposes that one of the processes through which social support appears to benefit PC patients is by enabling

them to better cognitively process their cancer experience. Consequently, this improves their understanding of the challenges they face, their ability to address those challenges, and helps them psychologically cope with those challenges which they cannot change (e.g., Lepore & Helgeson, 1998; Lepore, 2001). However, there are only a handful of studies which have examined the SCP model. Existing research which has examined the SCP model in PC patients has been limited in the respect that the research used proxies for cognitive processing that are limited in quantity (i.e., using two items from a questionnaire) or quality (i.e., using measures which were originally intended to measure levels of subjective distress related to a specific event). Consequently, the previously used assessments of cognitive processing may not be truly accurate measures.

The current study sought to fill three current gaps in the social support literature. First, the current study provided further evidence for an existing model explaining a potential mechanism through which social support benefits PC patients. Second, this study sought to better examine the construct of cognitive processing and how it affects quality of life outcomes for PC patients. The study examined both negative evidence of cognitive processing (e.g., I've been refusing to believe that it's really happened) and positive evidence of cognitive processing (e.g., I have a clear picture or understanding of my condition). Additionally, the measures of cognitive processing assessed evidence of current cognitive processing (i.e., active positive re-framing) as well as evidence of past cognitive processing (i.e., illness coherence) together to develop a fuller understanding of cognitive processing in PC patients. Third, the current study contributed to the limited body of existing research of social support conducted with PC patients.

To accomplish the task of filling the three aforementioned gaps in the social support literature, the current study was divided into four aims. The first aim examined the relationship between social support and cognitive processing. Results confirmed the hypothesis that higher levels of social support are significantly associated with higher levels of cognitive processing, as measured by both IPQ illness coherence and COPE cognitive processing. This is consistent with work presented by Roberts, Lepore & Helgeson (2006), who suggested that increased social support levels predicted decreased levels of intrusive thoughts, which they hypothesized to be mediated by increased cognitive processing. These findings then expand upon Roberts, Lepore & Helgeson's (2006) research by expanding the assessment of cognitive processing in PC patients. Their existing work measured cognitive processing by asking two questions regarding how often patients thought about their illness. Other researchers have used the Impact of Events Scale (IES) as the measure of cognitive processing. This is also a limited measure as it is designed to measure intrusive thoughts associated with the stressful event, and is an indirect measure of cognitive processing. The measures used in the current study take the assessment of cognitive processing one step further in depth. Although the measures used were not originally intended to measure cognitive processing, they capture a broader picture of cognitive processing. The current study used measures which utilized more items on each scale assessing cognitive processing (5 items on the IPQ illness coherence and 8 items on the COPE cognitive processing) and attempted to tap into multiple facets of cognitive processing (i.e., examining emotion-focused [e.g., I've been looking for something good in what's happening] and problem-focused coping [e.g., I've been trying to come up with a strategy, or plan, about what to do] in the same measure).

The second aim of the study examined the relationship between cognitive processing and social support with emotional well-being. Consistent with findings from Roberts, Lepore & Helgeson (2006) and Schmidt & Andrykowski (2004), higher levels of cognitive processing, as measured by IPQ illness coherence and COPE cognitive processing, were associated with higher levels of emotional well-being. Again, these results expand upon the existing literature by capturing, with greater depth, cognitive processing in PC patients. Results from this aim also supported existing work by Helgeson et al. (2001) and Balderson & Towell (2003), demonstrating that higher levels of social support were significantly associated with higher levels of emotional well-being. Despite inconsistent literature regarding the extent to which PC patients suffer decrements in emotional well-being following diagnosis and treatment, it is still of importance to demonstrate that social support benefits the emotional adjustment of PC patients, regardless of whether or not they experienced significant declines in emotional well-being. Additionally, this is fundamentally important to the basic tenets of the SCP model by verifying that improved social support is indeed associated with higher levels of emotional well-being.

The third aim of the study was to provide further evidence for the basic assumptions of the SCP model as proposed by Lepore and colleagues (2001) by evaluating whether the relationship between social support and the PC patient's emotional well-being was mediated by cognitive processing. As mentioned previously, existing studies which have sought to examine the SCP model were limited by the measure of cognitive processing that was used, as it was restricted by the number and depth of the questions assessing cognitive processing (e.g., Roberts, Lepore & Helgeson,

2006). Results from the current study revealed that two separate measures of cognitive processing (IPQ illness coherence and COPE cognitive processing) both partially mediated the relationship between social support and emotional well-being. These findings provide further evidence for the SCP model in PC patients, and do so while utilizing broader measures of cognitive processing. These results suggest that one of the mechanisms through which PC patients emotionally benefit from perceiving good social support is through an active cognitive process. It appears that a part of the explanation for why social support appears to emotionally benefit PC patients is by helping them engage in active thought concerning their PC condition, strategies to improve their adjustment to the diagnosis and subsequent treatment and ways to emotionally accept the challenges presented. Through these active thought processes, PC patients appear to better cope with the stressors endured as part of the PC experience.

Beyond the primary goal of evaluating the SCP model in PC patients, a secondary goal was to examine potential moderators of the model. The exploratory fourth aim of the study investigated whether there were any psychosocial moderators of the SCP model. This investigative analysis of potential moderators is believed to be the first for a study investigating the SCP model. Based on existing literature, perceived stress, sexual dysfunction and sexual bother were identified as variables that could potentially impact the emotional well-being of PC patients and were tested in a moderated mediation model. Perceived stress was identified as the only moderator of the mediation model. The overall moderated mediation model proposes that levels of perceived stress impact the partial effect of cognitive processing on emotional well-being. Further post-hoc analyses revealed that the effects of cognitive processing on the relationship between social

support and emotional well-being differed when comparing PC patients perceiving high versus low levels of stress. For individuals perceiving high levels of stress, cognitive processing did not appear to mediate the relationship between social support and emotional well-being. For individuals from the low stress sample, cognitive processing did appear to mediate the relationship between social support and emotional well-being. These findings suggest that individuals who are perceiving a significant level of stress may be simply overwhelmed psychologically by their challenges, and may not have the capacity to cognitively process and receive the rewards of good social support. However, patients who are perceiving low levels of stress appear to be more mentally capable of cognitive processing, and benefiting from positive social support. This may be a result of research which suggests that individuals who are experiencing stress are cognitively biased towards processing threatening or concern-related information (e.g., Kindt, Broscchot & Everaerd, 1997). Consequently, PC patients perceiving high levels of stress may not be able to fully process information received from their social support network while individuals perceiving low levels of stress may be in a better position to do so.

Implications

These findings provide further evidence for the SCP model in PC patients. By more broadly and accurately assessing cognitive processing, the current study was able to conclusively demonstrate the vital role that cognitive processing plays in the process by which social support appears to benefit the emotional adjustment of PC patients. The more comprehensive understanding of cognitive processing in PC patients advances the current state of SCP model research. Furthermore, although current research is

inconsistent as to the extent to which PC patients suffer emotional declines following diagnosis and treatment, the current study highlighted the impact that social support can have on the lives of patients, regardless of current level of emotional functioning.

These findings have implications for potential future interventions designed to improve the psychosocial well-being of PC patients who have undergone treatment. The significant physical consequences of treatment for PC may impact patient emotional well-being and these effects appear to be partly mitigated by the presence of a positive social support network. As it appears that cognitive processing is one of the mechanisms through which positive social support benefits the emotional adjustment of PC patients, finding ways to encourage these men to discuss their cancer experience in a supportive, and open environment where they feel safe, should be a goal for future intervention work involving PC patients. One of the goals of these groups should be to engage the men in active discussions of their cancer experience and their personal coping strategies in their attempt to adjust to the challenges they face. This will hopefully assist in modifying the appraisal process, ultimately affecting the coping process for the PC patients.

However, it appears that identifying the perceived stress level of individual patients may be critical to the ability of the PC patient to cognitively process their cancer experience. Patients who perceive high levels of stress may benefit more from interventions that focus on identifying and seeking social support, rather than an intervention which emphasizes the cognitive processing of their cancer experience. The opposite appears to be true for patients who perceive low levels of stress. For these individuals, they may benefit more from an intervention which is designed to help them more thoroughly cognitively process their cancer experience, rather than assisting them in

a social support context. In light of these findings, it may be important to consider sequentially structuring intervention sessions for PC patients if the men are experiencing high levels of perceived stress. It will be important to first address the issue of perceived stress, before encouraging the participants to seek social support and to find ways to cognitively process the information they receive. For example, the men perceiving high levels of stress may benefit from first being instructed in relaxation and stress management techniques before moving them forward to sessions discussing social support and re-structuring cognitions regarding their coping processes.

Limitations and Guidance for Future Work

Although the current sample was comprised of an ethnically and demographically diverse group of PC patients, there were several limitations to the work that should be considered. Primarily, this work was limited to patients with localized PC and excluded men who had significant psychopathology or cognitive impairment. Consequently, whether these findings can be generalized to PC patients with advanced PC or with significant psychopathology or cognitive impairment is unknown as these individuals may be faced with a different set of emotional and physical challenges that localized PC patients are not experiencing. Additionally, although the results of the current study provide support for the SCP model in PC patients, it potentially raises as many questions as it answers. The current study demonstrated that cognitive processing partially mediates the relationship between social support and emotional well-being. A logical follow-up question would be what other variables may also mediate the relationship. Other potential mediators that can be considered in future studies include health

behaviours (e.g., drug and alcohol use, exercise, sleep) as well as personality characteristics (e.g., emotional awareness). Additionally, although the use of the three separate measures of cognitive processing was a step in the right direction towards more accurately assessing cognitive processing in PC patients, the measures are still limited. Despite identification of items on the scales that were associated with evidence of past and present cognitive processing, the scales were not originally designed for the purpose of assessing cognitive processing. Finally, as these analyses were conducted at a single time point and this was a cross-sectional design, causal inferences cannot be made. It should be mentioned that the relationship between social support and emotional well-being can be considered to be, in part, bi-directional. It is possible that an individual who is emotionally stable is more mentally aware of the social support they are receiving and that this occurs via cognitive processing.

In the future, additional studies which further support for the SCP model must be completed to further examine the model. This work must not only be conducted in localized PC populations, but in both advanced stage PC and in cancer populations in general so that the findings can be generalized beyond the localized PC population. Future studies should include a measure designed to assess cognitive processing in PC patients. The current proxies for cognitive processing have all not been specifically designed for that purpose and, consequently, may not completely assess the cognitive processing that occurs in PC patients in their adjustment process. Moreover, a longitudinal design which includes multiple time-points at which social support, cognitive processing and emotional well-being are assessed would allow for causal inferences to be made regarding the directionality of the relationships analyzed in the

current study. Although this study has demonstrated that cognitive processing mediates the relationship, it does not sufficiently answer the question of what specific aspect of cognitive processing is most beneficial for PC patients. Is it the act of generating a plan or a strategy to actively cope with the challenges of PC; is it contemplating the challenges that are being faced and finding effective emotional coping strategies; or is it something else altogether about the act of cognitive processing that helps these individuals? The current SCP model is a work in progress, and the developing hypotheses that cognitive processing helps to assimilate cancer information into an existing mental schema or helps to develop new mental schemas to accommodate cancer information is somewhat rudimentary. This may hinder psychologists in their attempt to develop intervention work that incorporates cognitive processing into the toolbox for PC patients to learn as they attempt to emotionally adjust to their stressors. It is critical that research develops an understanding of what specific aspects of social support and cognitive processing are truly impacting the PC patient's adjustment process so that psychologists can fine tune their intervention work.

Tables

Table 1. Baseline demographic, disease-specific and psychosocial variables.

Variable	Total Sample (N=260)	
	<i>Mean</i>	<i>SD</i>
Age (years)	65.4	7.6
Education (years)	13.8	3.3
Income (\$K)	51.0	50.2
Months since diagnosis	15.6	6.9
Months since treatment	10.3	4.5
Medical co-morbidity	1.8	2.1
ESSI total social support	24.9	5.4
IPQ illness coherence	19.3	4.0
COPE cognitive processing	25.3	4.0
Perceived stress	17.9	7.2
Sexual dysfunction	8.0	6.8
Sexual bother	2.5	1.6
Emotional well-being	20.6	3.4
Variable		
Treatment type		
Surgery	47.6%	
Radiation	45.9%	
Ethnicity		
Non-Hispanic White	36.5%	
Hispanic	14.9%	
African-American	36.5%	
Primary language		
English	53.4%	
Spanish	34.8%	
Marital status		
Married, or similar relationship	66.7%	
Not married	21.6%	
Employment status		
Employed	43.7%	
Retired	39.5%	
Otherwise not employed	5.1%	

Table 2. Correlations between possible control variables, social support, cognitive processing, perceived stress, sexual dysfunction, sexual bother and emotional well-being.

Variable (Pearson r)	Age	Income	Yrs Educ	Ethnicity	Time Since Dx	Time Since Tx	Med Co-morbidities	Tx Type	Soc Support	IPQ	COPE	Perc Stress	Sex Dysfn	Sex Bot her	Emotional Well-Being
Age	—	-.18*	-.13*	.22**	.22**	.09	.33**	.60**	-.03	-.10	-.07		-.12	-.24**	.05
Income	-.183**	—	.38**	-.41**	.01	.05	-.15*	-.12	.11	.27**	-.06		.15*	-.02	.10
Years of Education	-.131*	.38**	—	-.34**	-.05	-.03	-.05	-.11	.02	.33**	.01		.08	-.03	.16*
Ethnicity	-.014	-.41**	-.34**	—	-.06	-.00	.04	.01	-.14*	-.25**	.21**		-.09	.16**	-.24**
Time Since Diagnosis	.22**	.01	-.05	-.06	—	.61**	.03	.24**	-.03	-.04	.06		.17**	-.17**	-.06
Time Since Treatment	.09	.05	-.03	-.00	.61**	—	-.02	.07	.04	-.02	.07		.18**	-.12	.02
Medical Co-Morbidities	.33**	-.15*	-.05	.04	.03	-.02	—	.25**	-.02	-.07	-.06		-.18**	-.06	-.13*
Treatment Type	.60**	-.12	-.11	.01	.24**	.07	.25**	—	-.05	.01	-.01		.12	-.35**	.03
Social Support	-.03	.11	.02	.14*	-.03	.04	-.02	-.05	—	.16**	.16**		.11	.10	.30**
IPQ Illness Coherence	-.10	.28**	.33**	-.25**	-.04	-.02	-.07	.01	.16**	—	.01		.10	-.09	.32**
COPE Cognitive Processing	-.07	-.06	.01	.21**	.06	.07	-.06	-.01	.16**	.01	—		.01	.13*	-.12*
Perceived Stress	-.02	-.06	-.07	-.01	.02	.02	.05	.02	-.28**	.19**	.03	—	-.104	.13*	-.43**
Sexual Dysfunction	-.12	.15*	.08	-.09	.17**	.18**	-.18**	.12	.11	.10	.01		—	-.39**	.11
Sexual Bother	-.24**	-.02	-.03	.16**	-.17**	-.12	-.06	-.35**	-.10	-.09	.13*		-.39**	—	-.25**
Emotional Well-Being	.05	.10	.16*	-.24**	-.06	.02	-.13	.03	.30**	.32**	-.12*		.11	-.25**	—

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

Figures

Figure 1. The overall conceptual model that is to be evaluated. The proposed conceptual model suggests that increased levels of social support is associated with increased levels of emotional well-being, and this relationship is mediated by cognitive processing. This mediated relationship is then further moderated by perceived stress, sexual dysfunction and sexual bother.

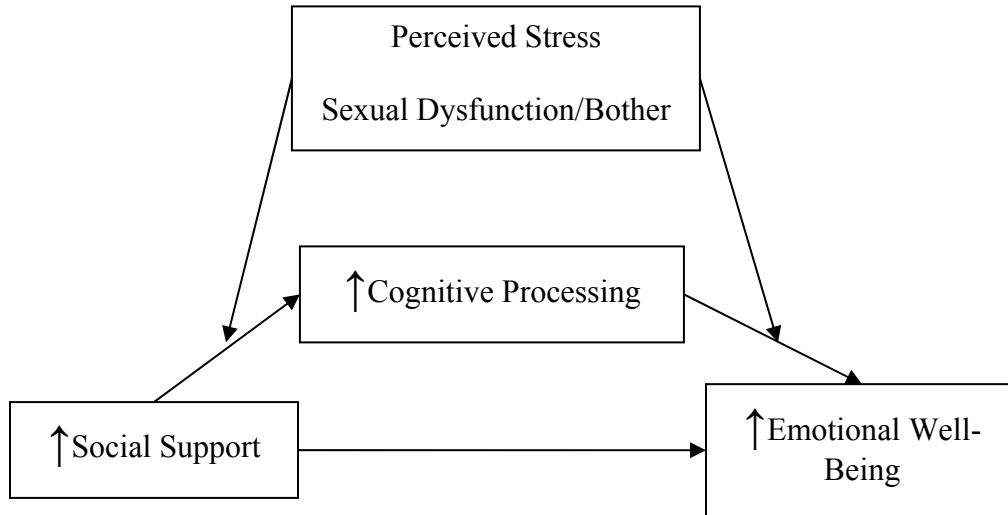


Figure 2. The model that was tested in Specific Aim 3 of the study. The proposed analyses evaluated whether cognitive processing mediated the relationship between social support and emotional well-being.

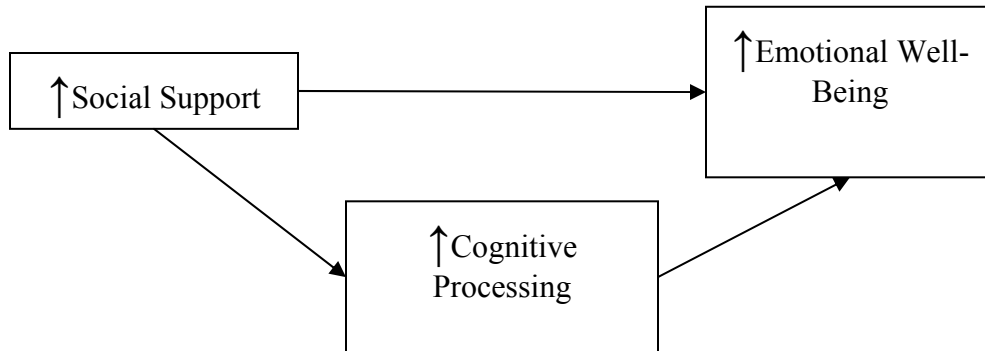


Figure 3. The model that was tested in Specific Aim 4 of the study. The proposed analyses evaluated whether the relationship between social support and emotional well-being, mediated by cognitive processing, was then further moderated by perceived stress, sexual dysfunction and sexual bother.

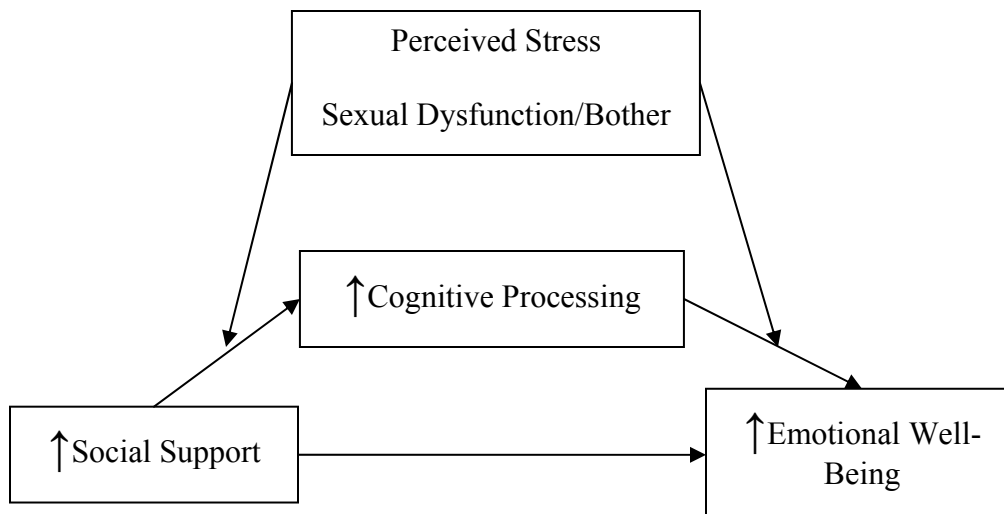


Figure 4. Following statistical analyses, the final overall model suggests that the one measure of cognitive processing (COPE cognitive processing) mediates the relationship between social support and emotional well-being. Furthermore, perceived stress moderates the overall mediation model. The Beta coefficient within the brackets are the coefficients for direct relationship between the two variables, while the Beta coefficient outside of the brackets are the coefficients for the relationship between the two variables in the overall mediation model.

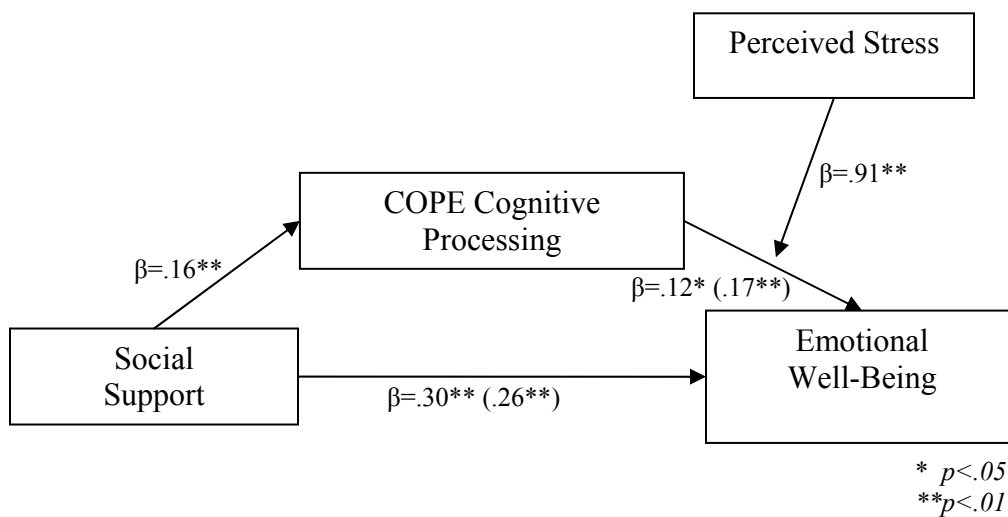
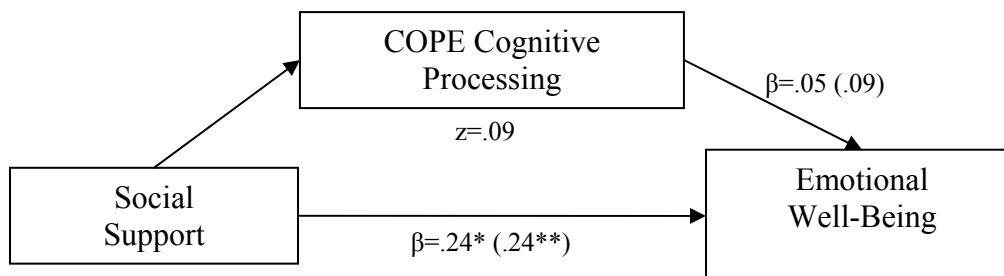


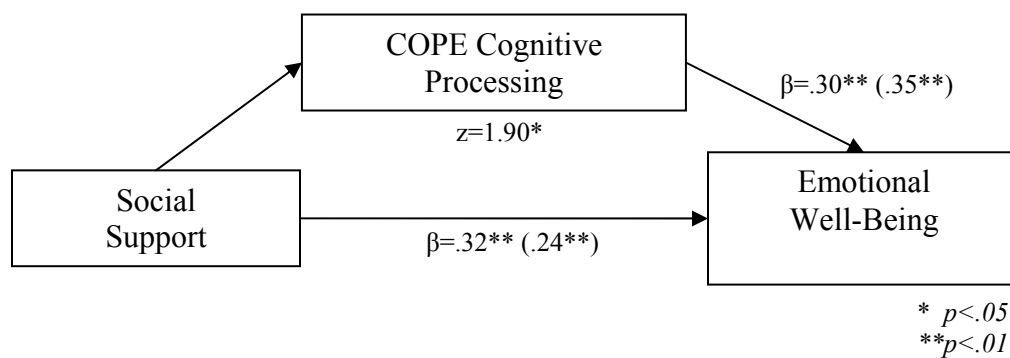
Figure 5. Post-hoc analyses investigating the effects of cognitive processing at high levels of perceived stress. The Beta coefficient within the brackets are the coefficients for direct relationship between the two variables, while the Beta coefficient outside of the brackets are the coefficients for the relationship between the two variables in the overall mediation model.



* $p < .05$

** $p < .01$

Figure 6. Post-hoc analyses investigating the effects of cognitive processing at low levels of perceived stress. The Beta coefficient within the brackets are the coefficients for direct relationship between the two variables, while the Beta coefficient outside of the brackets are the coefficients for the relationship between the two variables in the overall mediation model.



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