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Hot Flashes in Men with Prostate Cancer: Prevalence, Severity, and Psychosocial Correlates

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by

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Note to Reader

Note to Reader: The original of this document contains color that is necessary for understanding the data. The original dissertation is on file with the USF library in Tampa, Florida.

Table of Contents

List of Tables

List of Figures

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ABSTRACT

The present study evaluated the prevalence, severity, and psychosocial correlates of hot flashes in men receiving androgen deprivation therapy for prostate cancer. Seventy-two men completed a detailed packet of questionnaires prior to the initiation of treatment and again three-months later. Results indicated that the extent to which hot flashes interfered with patients' daily functioning significantly contributed to changes in depressive symptoms. Changes in fatigue were found to mediate the relationship between hot-flash related interference and depressive symptomatology, suggesting that increases in fatigue were responsible for the concurrent increases in symptoms of depression. The coping strategy of catastrophizing moderated the relationship between hot flash-related interference and cancer-related distress, such that levels of cancer-related distress in men reporting greater use of catastrophizing were dependent upon levels of hot flash-related interference. Men who did not engage in catastrophizing reported uniformly low levels of cancer-related distress regardless of the extent to which hot flashes interfered with daily functioning. Expected relationships between hot flashes and sexual functioning or masculine self-image were not confirmed. These findings provide valuable information regarding the experience of hot flashes in this population. Results indicate that reduction

of fatigue may lead to reductions in depressive symptoms, while reducing patients' use of catastrophizing may alleviate cancer-related distress.

Although hot flashes are a commonly recognized side effect of hormonal therapy for prostate cancer, limited research exists to describe the psychosocial impact of this gender-inconsistent experience. Other side effects of prostate cancer treatment, such as sexual, urinary, and bowel impairment have received greater attention in terms of their impact on daily functioning and quality of life. The purpose of the current investigation is to identify the psychosocial correlates of hot flashes in men with prostate cancer undergoing hormonal therapy and to identify potential mediators and moderators of the relationship between hot flashes and psychological distress. The introduction begins with background information on the role of hormonal therapy in the treatment of prostate cancer. This section includes information about the prevalence of hot flashes in men with prostate cancer and a brief explanation of how hot flashes can be induced by hormonal therapy. A review of the literature that has assessed the common side effects of hormonal treatment follows. Much of this research has focused on the role of hormonal therapy in producing decrements in sexual functioning and overall quality of life. Because relatively little research has been conducted on hot flashes in men with prostate cancer, discussion will then turn to research that has investigated the impact of hot flashes in women with breast cancer. Correlates and predictors of hot flashes in this population will be highlighted as they may apply to men with prostate cancer. The introduction concludes with a discussion of variables that might serve as mediators and moderators of the relationship between hot flashes and psychological distress.

Hot flashes and hormonal therapy

Although hot flashes are typically regarded as a naturally occurring symptom of female menopause, men treated with hormonal therapy for prostate cancer also experience hot flashes. A significant number of men undergoing this form of treatment have reported experiencing hot flashes, with estimates ranging from 57% (Potosky et. al., 2001) to 74% (Spetz, Hammar, Lindberg, et. al., 2001). Because hot flashes and their associated distress are prevalent in this patient population, it is important to understand the phenomenon and the factors associated with it. A hot flash has been defined as, "a transient episode of flushing, sweating, and a sensation of heat, often accompanied by palpitations and a feeling of anxiety, and sometimes followed by chills" (Kronenberg, 1994, p. 320). This experience may vary from person to person in terms of frequency, severity, and duration. Hot flashes are a consequence of reductions in estradiol, which can result from natural menopause, removal of the ovaries or testes, or use of hormone agonists or antagonists (Fitzpatrick & Santen, 2002). Lutenizing hormone-releasing hormone (LHRH) agonists are the most frequently used of these agents and have revolutionized the treatment of advanced prostate cancer. Use of these hormonal agents causes a chain of events in the body that eventually leads to a decrease in testosterone production (Hellerstedt & Pienta, 2002). This accomplishes the goal of slowing the growth of the cancer, but also produces several unwanted effects, including hot flashes.

The purpose of hormonal therapy in men with prostate cancer is to decrease the production of testosterone by the testes or to block the action of testosterone on the prostate cells. This can be accomplished surgically, by removal of the testes (orchiectomy) or medically, by injecting drugs that prevent production of testosterone by

the testes. Hormonal therapy is not a cure for prostate cancer, but rather a means of slowing its growth and reducing the size of the tumor. Hormonal therapy, or androgen deprivation therapy as it is often referred to, is used to treat patients with varying stages of disease. In the early stages of a prostate cancer diagnosis, hormonal therapy may be prescribed in men with large prostate glands as a means of reducing the size of the prostate in preparation for brachytherapy or radiation. At the later stages it can be used to treat men considered to be "biochemical failures," in that the first line treatment (prostatectomy, radiation, or brachytherapy) did not completely eliminate the cancerous cells (Dreicer, 2002). This is evidenced by a steady rise in patients' PSA values, which is considered to be indicative of progressive disease. Because of the minimal burden on the patient, as compared to prostatectomy or radiation, this form of treatment is often attractive to those patients and clinicians who would prefer to take a slightly more active role than the passive option of "watchful waiting."

Side effects and related psychosocial sequelae of hormonal therapy

Existing research with men receiving androgen deprivation therapy has focused mainly on the prevalence of, and bother associated with, the side effects of this form of treatment. Recognized side effects include loss of libido and erectile dysfunction, hot flashes, gynecomastia, weight gain, osteoporosis, anemia, changes in mood and cognitive function, fatigue, and diminished quality of life (Chen & Petrylak, 2004). The following section will review the recent literature that examines the relationship between use of androgen deprivation therapy and quality of life. Research focusing specifically on the role of hot flashes in men is somewhat sparse. The few studies conducted have been

largely descriptive in nature and have not attempted to systematically explore the psychosocial correlates of hot flashes.

Spetz and colleagues (2001) compared survival and quality of life outcomes in men with metastatic prostate cancer randomly assigned to receive injections of polyestradiol phosphate (a semi-synthetic estrogen) or undergo complete androgen ablation via bilateral orchiectomy or injection of LHRH agonists. This investigation is notable for its focus on hot flashes and the use of randomization to treatment groups. At a follow-up assessment (median time = two years) 74% of patients in the androgen ablation group were experiencing hot flashes compared to 30% of patients in the polyestradiol phosphate group. Men in the androgen ablation group also reported experiencing significantly more distress as a result of the hot flashes. Within the two-year follow up period, half the men receiving polyestradiol phosphate were no longer experiencing hot flashes, yet all the men on androgen ablation were still experiencing hot flashes to some degree. These findings indicate that hot flashes are not a transient side effect, as was once believed.

The Prostate Cancer Outcomes Study (PCOS) is a large-scale survey of newly diagnosed prostate cancer patients. Using a subset of these data, Potosky and colleagues (2001) compared quality of life outcomes for men receiving primary androgen deprivation via surgical castration (orchiectomy) versus chemical castration (LHRH agonists). These men did not receive any other form of treatment within the first 12 months of their diagnosis. Data were collected at six and 12 months after treatment. The rate of hot flashes did not differ significantly between the two treatment groups, with 57% of men treated with LHRH agonists and 68% of men treated with an orchiectomy

reporting this side effect. Although there were no differences between the two groups in self-reported sexual functioning, significant overall declines were observed in several domains. Of the men who reported normal pretreatment sexual functioning, 69% were impotent after treatment. Additionally, 51% of the men with some interest in sex prior to treatment reported a complete lack of interest afterwards and 73% ceased to engage in sexual activity completely.

An overall weakness of the PCOS is the use of retrospective reports of baseline (i.e., pretreatment) functioning. Participants were contacted six months after diagnosis, at which time they were instructed to recall their health status as it was prior to treatment. Although steps were taken to examine recall accuracy (Legler, Potosky, Gilliland, Eley, & Stanford, 2000), the potential for recall bias cannot be eliminated completely. Additionally, the study had an overall response rate of 62%, with non-responders being more likely to be nonwhite and of lower socioeconomic status than responders (Potosky et al, 1999). Therefore, generalization to nonwhite and lower socioeconomic status patients must be made with caution. Finally, it is unclear whether patients chose these therapies because of personal preferences or were advised to do so under the guidance of their oncologists. Without random assignment, the potential confounding influence of variables other than treatment on the experience side effects cannot be ruled out.

Another analysis based on data from the PCOS compared men receiving androgen deprivation therapy as their primary form of treatment with men receiving no treatment, otherwise known as "watchful waiting" (Potosky et. al., 2002). Findings indicated that among men who reported normal sexual functioning at baseline, men who had received androgen deprivation therapy reported less interest in sex, more breast swelling, and a

greater number of hot flashes one year after treatment compared to those followed by watchful waiting. Men receiving androgen deprivation therapy also reported higher levels of physical discomfort due to prostate cancer, as well as more physical limitations and greater bother attributed to the disease. As with the previous study, methodological limitations included retrospective recall of baseline functioning, differential response rates for age and SES, and non-random assignment to treatment groups. Another confounding variable was cancer severity. It should be noted that receipt of androgen deprivation therapy was associated with several indicators of more advanced disease, including higher Gleason scores, higher PSA values, and a higher level of staging. The greater discomfort and poorer physical functioning reported by androgen-deprived men may have been partially due to the prostate cancer itself rather than the treatment received by these men.

Other research in this area has yielded similar findings regarding the adverse side effects of androgen deprivation therapy. Herr and O'Sullivan (2000) surveyed a group of men with rising PSA's after local therapy. This sample was obtained by recruiting from attendees at a prostate cancer support group. These men had been offered the choice of immediate androgen deprivation therapy (either orchiectomy or administration of LHRH agonists) or observation with deferred androgen deprivation therapy. Men who had chosen to receive immediate androgen deprivation therapy reported greater fatigue, worse physical functioning, greater psychological distress, greater sexual problems, and lower overall quality of life than men who chose observation. Further comparisons revealed that men who opted for androgen deprivation therapy using LHRH agonists reported a greater number of problems than did the men who had an orchiectomy. Specifically, they

reported a lower overall quality of life, greater psychological distress, a greater number of cancer-related intrusive thoughts, and greater fatigue. Hot flashes were not assessed. When considering the results of this study it is important to keep in mind that the sample used was self-selected. Participants were recruited from a prostate cancer educational support group conducted by the authors. The ways in which these men may differ from prostate cancer patients not attending a support group is unknown. Additionally, these men were not randomly assigned to receive androgen deprivation therapy, but were able to choose which treatment to receive. The possibility exists that some of the observed differences may reflect characteristics of the men themselves rather than the impact of the treatment they chose.

Androgen deprivation therapy is also used to treat prostate cancer patients with metastatic disease. Despite the fact that the disease is more widespread, these men report similar problems. Herr, Kornblith, and Ofman (1993) assessed patients with metastatic disease who chose to receive or defer hormonal therapy. Patients who chose hormonal therapy reported less sexual interest and enjoyment, increased fatigue, and a greater number of physical symptoms at a six-month follow-up assessment. Although the battery of questionnaires used included an item assessing hot flashes, the results for this item were not reported. Because of the nonrandom nature of the study, these results must be interpreted with caution.

Fowler and colleagues (2002) compared quality of life in men treated with androgen deprivation after prostatectomy and men treated with prostatectomy alone. Treatment side effects examined included urinary incontinence, erectile dysfunction, and loss of libido. Men treated with androgen deprivation reported less ability to have sexual

intercourse and fewer days of feeling sexual drive than men treated with prostatectomy alone. Analyses regarding quality of life were performed both with and without men with metastatic disease in order to examine the role of the recurrence itself. Results of both analyses were similar. Men who had received androgen deprivation therapy reported that cancer and its treatment had a bigger negative effect on their lives, reported more concerns about body image, and reported more worries about death and dying than men who did not receive androgen deprivation therapy. Additionally, they reported worse scores on indices of mental health, general health, and activity. Weaknesses of this study included the use of questionnaires that had not been previously validated, a cross-sectional design, and non-random assignment to treatment groups.

Other research suggests that compared to other forms of treatment, androgen deprivation therapy may be associated with more longstanding declines in health-related quality of life. Lubeck, Grossfeld, and Carroll (2001) evaluated several aspects of quality of life in men treated with prostatectomy, radiation, androgen deprivation therapy, or surveillance as part of the Cancer of the Prostate Strategic Urologic Endeavor (CaPSURE). Similar to the PCOS, CaPSURE is a national longitudinal study of men with prostate cancer. The timing of the first assessment varied based upon the time of enrollment in the study. For some men this was prior to the initiation of any type of therapy, for others it was some time afterwards. Sexual, urinary, and bowel function were assessed, but evaluation of hot flashes was not within the scope of this study. Of the many areas of heath-related quality of life assessed, men on androgen deprivation therapy experienced significant declines in sexual function and sexual bother only. As compared to men in the other three treatment group, men receiving androgen deprivation therapy

group had the highest percentage of patients with advanced disease. The researchers also analyzed a subset of the data from men who had completed the questionnaires before and after initiation of androgen deprivation therapy. Significant decrements were found in sexual functioning six months after treatment began. Strengths of this investigation included the use of well-established tools to assess both general and health-related quality of life. The lack of randomization to treatment conditions prohibits firm conclusions regarding the changes in quality of life due solely to treatment.

In an attempt to provide information regarding the prevalence, severity, and correlates of fatigue in men receiving hormonal therapy, Stone and colleagues (2000) assessed 62 men with prostate cancer prior to and three months after initial receipt of an LHRH analogue. At the three-month assessment, 66% of patients reported an increase in fatigue, with 42% of men reporting an increase of 10 points or more (on a scale ranging from 9-63). Seventeen percent of men met the criteria corresponding to "severe" fatigue. Although there was a strong relationship between fatigue and psychological distress at the baseline assessment, the increase in fatigue was not associated with a concurrent increase in distress. Pre-treatment measures of fatigue accounted for 32% of the variance in fatigue score at the three-month follow-up. None of the other variables assessed (quality of life, functional abilities, psychological distress, nutritional status, other symptom severity) were significant predictors of fatigue levels three months after the initial injection.

In an investigation focusing on rates of depression in men receiving androgen deprivation therapy, Pirl and colleagues (2002) reported a prevalence rate of 12.8% as assessed by the Structured Clinical Interview for the DSM-IV (SCID). Similarly, 13.3%

of patients reported symptoms consistent with a mild to moderate level of depression on the Beck Depression Inventory (BDI). In this sample, rates did not differ by disease stage, method of androgen deprivation (orchiectomy vs. GnRH agonist), androgen dependence, or whether or not the patient was also receiving chemotherapy. Not surprisingly, a prior history of depression was associated with reports of current depressive symptomology. Because history of depressive symptoms was assessed retrospectively, fluctuations in level of distress due to changes in hormonal states could not be determined. Greater levels of depressive symptoms were correlated with increased fatigue and lower levels of functioning. Although this study had a small sample size (N = 45), it highlights the need for appropriate attention devoted to assessment and diagnosis of depression in this patient population.

In a sample of Japanese patients treated with androgen deprivation therapy, approximately 58% reported experiencing hot flashes, of which 38% chose to pursue treatment for this troubling side effect (Nishiyama, et. al., 2004). Patients with and without hot flashes differed in terms of physical well-being, social/family well-being, health-related quality of life, and overall quality of life. Men with hot flashes reported more problems in each of these areas. This study suffered from several methodological limitations, including a small sample size (N=55), cross-sectional data, and a heterogeneous sample; however, it was the only study found that attempted to evaluate changes in quality of life due to hot flashes.

The findings reviewed above outline many of the decrements in quality of life that are associated with hormonal therapy for prostate cancer. Men receiving this form of treatment often report declines in sexual functioning and interest, increased fatigue, hot

flashes, and declines in overall perceived physical health. They also report a significant amount of psychological distress and declines in several aspects of quality of life. Compared to men treated with prostatectomy, men treated with hormonal therapy report greater concerns over body image, worry about death and dying, and distress due to prostate cancer. Although hot flashes are a recognized side effect of this form of treatment, relatively little attention has been paid to their psychosocial impact.

Psychosocial factors associated with hot flashes in women with breast cancer

Within the field of oncology, much of the research on hot flashes and their impact on quality of life has been conducted in women with breast cancer. In addition to naturally occurring menopause, women with breast cancer may be susceptible to hot flashes due to surgically-induced menopause via removal of the ovaries (oophorectomy) or chemotherapy-induced menopause. Some of the research on hot flashes in women with breast cancer will be discussed as it may also pertain to men with prostate cancer.

Based on structured telephone interviews conducted with postmenopausal women with breast cancer, Carpenter and colleagues (1998) found that 65% reported hot flashes. More severe hot flashes were associated with a higher body mass index (BMI), younger age, and use of tamoxifen (an anti-estrogenic agent). Comparisons were also made between women with and without hot flashes on quality of life variables. Although none of the comparisons reached the criterion set for statistical significance, there was a trend for women with hot flashes to report poorer mental and physical quality of life. A similar trend was found for differences between women with no hot flashes or mild hot flashes and those with severe hot flashes. With the exception of tamoxifen use, the psychosocial correlates listed above may also be applicable to men with prostate cancer.

Stein and colleagues (2000) explored the medical, psychosocial, and demographic correlates of hot flashes in a sample of women currently undergoing breast cancer treatment. In terms of psychosocial variables, women experiencing hot flashes reported higher levels of fatigue, greater interference of fatigue with quality of life, poorer sleep quality, and poorer physical health. More severe hot flashes were associated with greater fatigue, poorer physical health, a greater impact of fatigue on quality of life, and higher levels of global and somatic symptoms of fatigue. In order to determine the contribution of hot flash prevalence to the variability in psychosocial and quality of life outcomes, multiple regression analyses were conducted. After accounting for relevant medical, demographic, and treatment variables, hot flashes accounted for an additional 11% of the variance in physical health, an additional 15% of the variance in sleep quality, and an additional 9% of the variance in fatigue. These findings suggest that hot flashes play a significant role in regards to the development and impact of fatigue.

Carpenter, Johnson, Wagner, and Andrykowski (2002) took this line of research a step further with the addition of an age-matched comparison group of healthy women. Women with breast cancer were significantly more likely to be experiencing hot flashes than women without breast cancer. Women with breast cancer also reported significantly greater hot flash severity and bother compared to the healthy women. Among breast cancer survivors, greater severity of hot flashes was associated with higher levels of mood disturbance, negative affect, and interference of hot flashes with quality of life.

Hot flashes have also been assessed using objective assessment methods. In a small pilot study, Carpenter and colleagues (2004) assessed 15 breast cancer survivors and 15 healthy women matched on age, race, and menopausal status. Hot flashes were

measured using sternal skin conductance monitoring during two 24-hour periods one week apart. There was a trend towards a greater number of daytime hot flashes for breast cancer survivors as compared to their healthy counterparts, but this difference did not reach the criterion set for significance. When measured objectively, frequency of hot flashes failed to correlate with sleep duration and global sleep quality. Although this investigation suffered from a small sample size, it highlights the discrepant results obtained using objective measurement of hot flashes.

Although information gathered from research conducted with women with breast cancer may not directly relate to men with prostate cancer, it suggests several domains that may be affected by hot flashes. Psychosocial variables associated with the hot flash experience include higher levels of fatigue, higher levels of fatigue interference with quality of life, poorer sleep quality, higher levels of mood disturbance, greater negative affect, poorer mental and physical quality of life, and greater interference of hot flashes with quality of life.

Potential mediators and moderators of the relationship between hot flashes and emotional distress

The literature reviewed suggests that the experience of hot flashes in both men and women is associated with some degree of psychological distress (Carpenter, et. al., 1998; Carpenter, et. al., 2002; Fowler, et. al., 2002; Herr & O'Sullivan, 2000; Pirl, et. al., 2002; Spetz, et. al., 2001). The current study will test the hypothesis that a similar relationship between hot flashes and psychological distress is present in men with prostate cancer receiving androgen deprivation therapy. Since the experience of hot flashes is also associated with other adverse symptoms and states, it should be possible to

explore whether the experience of these adverse symptoms and states mediate the relationship between hot flashes and psychological distress. Sleep disturbance, fatigue, and sexual dysfunction in particular, would appear to merit study as potential mediators for two reasons. First, there is evidence to suggest that the experience of hot flashes is associated with sleep problems and fatigue (Stein et. al., 2000), as well as sexual dysfunction (Carpenter et. al., 2002). Second, there is evidence to suggest that the experience of sleep problems, fatigue (Broeckel et. al., 1998; Stone et. al., 2000), and sexual problems (Potosky et. al., 2001), are associated with psychological distress.

In addition to examining potential mediators of the relationship between hot flashes and psychological distress, the present study will also examine potential moderators of the relationship between hot flashes and distress. That is, the current study will seek to identify variables that may interact with the experience of hot flashes to produce greater psychological distress. Of particular interest are masculine self-image and the coping process of catastrophizing.

Because hot flashes are typically a female experience, men with a strong masculine self-image may be more distressed by the experience than those who are less stereotypical in the way they define themselves. This idea is partially supported by research suggesting that strong adherence to the dominant form of masculinity in the United States may pose serious health risks for men (Sabo, 2000; Sabo & Gordon, 1995). In contrast to other side effects of prostate cancer treatment, such as impotence or incontinence, hot flashes are not an experience had by other aging men and are likely to be considered as something only women experience. Therefore, men with strong masculine self-concepts may be particularly distressed by hot flashes. Although there has

been a limited amount of research regarding the role of masculinity in coping with prostate cancer, some studies have explored this construct.

Galbraith, Ramirez, and Pedro (2001) compared health-related quality of life, health status, and masculinity in men undergoing various forms of treatment for prostate cancer. These men were in one of four treatment groups: watchful waiting, conventional radiation, proton-beam radiation, and a combination of conventional and proton-beam radiation. Masculinity was assessed using the Bem Sex Role Inventory. Participants rated how true each characteristic was of them, and also rated how *important* each characteristic was to them, in order to assess the importance of sex-role identity. Over the 18-month study period, no differences in masculinity were found among the four groups. Masculinity was significantly positively associated with general health and sexual symptoms at the baseline assessment; however, there was no relationship between masculine identity and health-related quality of life. This study did not include men treated with hormonal agents; consequently the association between hot flashes and masculinity was not explored.

Using freelists, single pilesorts, and other idiographic data collection techniques, Stansbury, Mathewson-Chapman, and Grant (2003) evaluated veterans' schemas regarding masculinity and the relative importance given to gender attributes. Participants were men with prostate cancer and a comparison sample made up of other hospital patients (without prostate cancer), employees, and volunteers. Relative to the comparison group, men with prostate cancer showed a tendency toward reduced emphasis on domestic power, sexuality, and physical aspects of masculinity. The authors hypothesize that this trend may reflect a reformulation of their concept of masculinity by reducing the

importance of characteristics that may no longer apply to them. They acknowledge, however, that to confirm this statement, these analyses must be conducted longitudinally (i.e., while patients are going through treatment), in order to document a shift in conceptualization. The authors also propose that men who fail to revise their masculine concept will have a more difficult time adapting to the consequences of prostate cancer treatment. They suggest that men who retain their image of masculine physicality are at the highest risk for stress, depression, and interpersonal difficulties. Although this study provided more theoretical insight than empirically supported conclusions, it affirms the notion that a man's conceptualization of masculinity may affect his reaction to the consequences of prostate cancer treatment.

The second proposed moderator of the relationship between hot flashes and distress is catastrophizing. In times of stress, people who catastrophize often assume that the worst will happen and feel helpless and unable to stop thinking about the stressful experience (Sullivan, Bishop, & Pivik, 1995). It is hypothesized that men who experience more severe hot flashes and also score highly on a measure of catastrophizing potential will report higher levels of distress. Although catastrophizing has been linked to a variety of deleterious health outcomes, it has never been examined in relation to the frequency or severity of hot flashes. Reviewed below are several key findings in the oncology literature regarding catastrophizing and other adverse symptoms.

Five studies can be identified that have examined the relationship between catastrophizing and pain ratings in cancer patients. Of these five studies, three assessed women with breast cancer (Bishop & Warr, 2003; Gaston-Johansson et. al., 1999; Jacobsen & Butler, 1996), one assessed cancer patients with chronic pain (Lin, 1998),

and the fifth assessed lung cancer patients (Wilkie & Keefe, 1991). Three of these studies found evidence in support of a relationship between greater use of catastrophizing and worse pain (Jacobsen & Butler, 1996; Lin, 1998; Wilkie & Keefe, 1991). Each study utilized different methods of evaluating pain and catastrophizing. Although this evidence is far from definitive, it provides some support for a relationship between catastrophizing and cancer-related pain.

Catastrophizing has also been found to be associated with fatigue in cancer patient populations. Broeckel, Jacobsen, Horton, Balducci, and Lyman (1998) investigated the role of psychosocial variables in predicting fatigue severity in a sample of women who had completed chemotherapy for breast cancer. Along with menopausal symptom severity and sleep quality, the tendency to engage in catastrophizing was a significant correlate of fatigue severity. In multiple regression analyses, catastrophizing accounted for 14% of the variance in fatigue severity after accounting for menopausal symptom severity.

Taking this line of work a step further, Jacobsen, Azzarello and Hann (1999) explored the associations between catastrophizing and fatigue, quality of life, and emotional distress in breast cancer patients. In this sample, a higher level of catastrophizing was associated with more severe fatigue, greater depressive symptoms, higher levels of state anxiety, and poorer quality of life. Catastrophizing was also found to account for unique variance in depression, anxiety, and mental health after accounting for levels of fatigue intensity.

There is also evidence to suggest that the impact of catastrophizing on fatigue severity may be specific to the type of treatment received. Jacobsen, Andrykowski, and

Thors (2004) found a significant treatment by catastrophizing interaction in a sample of 80 breast cancer patients. In this study, level of catastrophizing predicted subsequent levels of fatigue severity and disruptiveness among women who had received radiation therapy, but not for women who had undergone chemotherapy. These results indicate that catastrophizing contributed more to fatigue severity among patients who received the less inherently fatiguing of the two forms of treatment. Based on this pattern of results, it was concluded that for the chemotherapy patients, the intensely fatiguing nature of the treatment superseded the impact of any psychological variables.

Taken together, the findings in the oncology literature suggest that individuals who catastrophize about the symptoms of their illness or side effects of treatment report higher levels of those symptoms and side effects, and may also experience more distress as a result. Although the findings presented above are specific to pain and fatigue, the relationships found may be equally applicable to hot flashes.

As reviewed above, hot flashes are a prominent side effect of hormonal treatment for prostate cancer. Unlike other side effects of this type of treatment, hot flashes in men have received relatively little attention in the psychosocial literature. Because hot flashes are a relatively unusual experience for men, it is important to understand the potential psychosocial sequelae. The current study hopes to draw attention to this phenomenon by providing information regarding the prevalence and severity of hot flashes in men receiving hormonal therapy. In order to understand how hot flashes may result in psychological distress, potential mediating and moderating relationships will be explored.

Rationale and Aims

The aim of the current investigation is to examine the frequency, severity, and psychosocial correlates of hot flashes in men treated with hormonal therapy for prostate cancer. Toward this end, hot flashes and relevant psychosocial variables (described below) were assessed in a group of men treated with hormonal therapy for prostate cancer. These variables were assessed prior to the initiation of hormonal treatment and again three months later. Hot flash prevalence, severity, and interference were also assessed six weeks after the baseline assessment. In addition to characterizing the frequency and severity of hot flashes over a three-month period following initiation of hormonal therapy, the current study addressed the following hypotheses:

Hypothesis Set 1: Relationship of hot flashes to depressive symptomatology and cancer-related, distress

1A. A worse experience of hot flashes (frequency, severity, score, and/or hot flash-related interference) over the three-month period will be associated with a greater increase in cancer-related distress as measured by the Impact of Events Scale (IES).

1B. A worse experience of hot flashes over the three-month period will be associated with a greater increase in depressive symptomatology as measured by the Center for Epidemiological Studies – Depression Scale (CES-D).

Hypothesis Set 2: Relationship of hot flash experience to sexual dysfunction, fatigue, and sleep disturbance

2A. A worse experience of hot flashes over the three-month period will be associated with a greater increase in fatigue as measured by the Fatigue Symptom Inventory (FSI).

2B. A worse experience of hot flashes over the three-month period will be associated with a greater increase in sleep disturbance as measured by the Pittsburgh Sleep Quality Index (PSQI).

2C. A worse experience of hot flashes over the three-month period will be associated with a greater increase in sexual dysfunction as measured by the sexual domain summary score from the Expanded Prostate Cancer Index Composite (EPIC).

Hypothesis Set 3: Relationship of sexual dysfunction, sleep disturbance, and fatigue to depressive symptomatology and cancer-related distress

3A. Greater increases in fatigue over the three-month period will be associated with greater increases in cancer-related distress.

3B. Greater increases in fatigue over the three-month period will be associated with greater increases in depressive symptomatology.

3C. Greater increases in sexual problems over the three-month period will be associated with greater increases in cancer-related distress.

3D. Greater increases in sexual problems over the three-month period will be associated with greater increases in depressive symptomatology.

3E. Greater increases in sleep disturbance over the three-month period will be associated with greater increases in cancer-related distress.

3F. Greater increases in sleep disturbance over the three-month period will be associated with greater increases in depressive symptomatology.

Based on the outcome of the first sets of hypotheses, we explored whether sexual dysfunction, sleep disturbance, and/or fatigue mediated the expected relationship between hot flashes and cancer-related distress and depressive symptomatology.

Hypothesis Set 4: Moderating effects of masculine self-image in the relationship between hot flashes and depressive symptomatology and cancer-related distress

4A. Masculine self-image (pre-treatment) as measured by the Bem Sex Role Inventory – Short Form (BSRISF) will moderate the relationship between hot flash experience and cancer-related distress.

4B. Masculine self-image (pre-treatment) will moderate the relationship between hot flash experience and depressive symptomatology.

For each of these hypotheses it was anticipated that the combination of higher levels of masculine self-image and a worse experience of hot flashes would be associated with higher levels of cancer-related distress and depression.

Hypothesis Set 5: Moderating effects of catastrophizing in the relationship between hot flashes and depressive symptomatology and cancer-related distress

5A. Catastrophizing potential (pre-treatment) as measured by the Hot Flash Catastrophizing Scale (HFCS) will moderate the relationship between hot flash experience and cancer-related distress.

5B. Catastrophizing potential (pre-treatment) will moderate the relationship between hot flash experience and depressive symptomatology.

For each of these hypotheses it was anticipated that the combination of higher levels of catastrophizing and worse hot flashes would be associated with higher levels of cancer-related distress and depression.

Method

Participants

Participants were men treated at the H. Lee Moffitt Cancer Center (HLMCC) and James A. Haley Veteran's Hospital (JAHVAH). To be eligible for participation, these patients must 1) have been diagnosed with prostate cancer; 2) have been scheduled to receive hormonal therapy (partial or complete androgen blockade) for a period of three months; 3) have no clinical evidence of metastatic disease or have asymptomatic newly diagnosed metastatic disease; 4) have no prior experience with hormonal therapy; 6) be greater than 18 years of age; 7) be able to speak and read English; 8) have at least a sixth grade education; and 9) be able to give informed consent.

Procedure

Eligible patients were identified with the assistance of oncologists treating these patients and computerized medical records. Patients were approached during a clinic visit prior to the initiation of hormonal treatment. Men who agreed to participate were asked to sign an informed consent form (see Appendix A) and were given a packet of questionnaires assessing demographic characteristics, fatigue, hot flashes, depressive symptomatology, and other psychosocial variables. These questionnaires were completed within one week of the patient's first hormonal treatment and served as a baseline measure for the variables of interest. Approximately six weeks after this initial assessment, participants were telephoned at home. At this point, they were asked to report on the frequency and severity of hot flashes within the previous two weeks, as well as the

degree to which the hot flashes had interfered with several life domains. Participants were asked to complete another packet of questionnaires approximately three months after the initial baseline visit. For participants with a scheduled appointment at this time, these assessments were completed in clinic. For those who were not scheduled to come to HLMCC or JAHVAH, this was completed either by mail or telephone.

Measures

Demographic data. Demographic information was obtained through a self-report questionnaire. Variables assessed include age, height, weight, race/ethnicity, marital status, employment status, annual household income, and educational level. This information was collected at the baseline assessment (see Appendix E).

Disease and treatment variables. The HLMCC computerized patient database and medical charts were reviewed to obtain information on date of cancer diagnosis, disease stage, recent PSA values, and other relevant disease and treatment characteristics. Participants were also asked to provide a self-rating of their performance status (Wingard, Curbow, Baker, & Piantadosi, 1991; see Appendix E).

Hot flashes. Hot flash frequency and severity were assessed using methods similar to those used by Carpenter and colleagues (1998) in their evaluation of hot flashes in postmenopausal women treated for breast cancer. Specifically, participants were asked if they had experienced hot flashes in the previous two weeks. If the participant responded affirmatively, he was be asked to estimate the number of hot flashes experienced over the past two weeks and to rate their severity using a four-point scale (1 = mild; 4 = very severe). This information was collected at the first assessment and at the six-week and three-month follow-up assessments. As in prior research (Sloan et. al.,

2001), a total hot flash score was calculated by multiplying hot flash frequency by hot flash severity. This method is preferred because it takes into account both frequency and severity, providing an outcome measure that is sensitive to changes in either variable (see Appendix F). Data collected at the first assessment were used to confirm that men were not experiencing hot flashes prior to initiation of hormonal therapy. Men reporting hot flashes at the baseline assessment were eliminated from analyses in order to provide a homogenous sample in terms of experience with the variable of interest.

Hot flash interference. The Hot Flash Related Daily Interference Scale (HFRDIS; Carpenter, 2001; see Appendix G) is a ten-item scale that assesses the level at which hot flashes interfere with a variety of daily activities and overall quality of life. Interference is rated on an 11-point scale (0 = do not interfere; 10 = completely interfere). Reliability, convergent validity, construct validity, and sensitivity to change over time have been shown in both breast cancer survivors and healthy comparison women (Carpenter, 2001). This measure was included at all three data collection points (baseline, six-week follow-up, three-month follow-up). In the present study, hot flash-related interference was evaluated as a predictor of changes in sleep, mood, and sexuality. Items assessing the degree to which hot flashes interfere with each of these three constructs are also included in the standard version of the HFRDIS. To eliminate the potential confounding influence of this construct overlap, these three items were eliminated from the version of the HFRDIS used in the present study. The internal consistency reliability estimate for the seven-item version of this measure was comparable to that of the original 10-item measure (alpha = .98).

Fatigue. The Fatigue Symptom Inventory (FSI; Hann et al, 1998; see Appendix H) is a 14-tem scale that assesses the frequency, severity, and disruptiveness of fatigue. Frequency is measured in two ways: the number of days fatigue was experienced in the past week and the portion of the day on average the respondents felt fatigued. Most, least, and average fatigue severity in the past week are measured on 11-point scales (0 = not at all fatigued; 10 = as fatigued as I could be). Disruptiveness with quality of life in seven different domains is also evaluated. These domains are assessed on separate 11-point scales (0 = no interference; 10 = extreme interference). Responses to these seven items are summed to provide a total interference score. Previous research has demonstrated the reliability and validity of the FSI with individuals diagnosed with cancer (Hann et al., 1998; Jacobsen et. al., 1999). For the purposes of the current study, the highest level of fatigue in the past week was used as the outcome of interest. Fatigue was assessed at baseline and three-month follow-up assessments.

Sleep quality. The Pittsburgh Sleep Quality Index (PSQI; Bussye et. al., 1988; see Appendix I) is a 19-item scale designed to assess sleep patterns, quality, and disturbances in the past month. For the purposes of the current study, a subset of seven items was used and the timeframe of interest was reduced to the past week in order to be consistent with the other measures given. The measure can be used to describe seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The PSQI has shown acceptable reliability and validity when administered to both healthy and chronically ill individuals. It has also been used in studies evaluating the impact of hot flashes in women with breast cancer (Stein et. al., 2000; Weitzner et. al., 2002). For the current study, the

primary outcome of interest was the item that assessed sleep quality. This was assessed using a four-point scale (0 = very good; 3 = very bad). Habitual sleep efficiency was also calculated and used as an additional outcome measure in exploratory analyses. These indices of sleep were assessed at the baseline and three-month follow-up assessments.

Depressive symptomatology. The Center for Epidemiological Studies – Depression Scale (CES-D; Radloff, 1977; see Appendix J) is a 20-item measure of depressive symptomatology. Respondents rate how frequently they have experienced each depressive symptom in the past week on a 4-point scale (0 = rarely or none of the time; 3 = most or all of the time). Items are summed to produce scores ranging from zero to 60. The CES-D has good internal consistency with alphas of .85 for the general population and .90 for a psychiatric population (Radloff, 1977). The validity of the CES-D has been demonstrated with a wide range of populations, including cancer patients (Beeber, Shea, & McCorkle, 1998; Hann, Winter, & Jacobsen, 1999). Depressive symptomatology was assessed at the baseline (alpha = .86) and three-month follow-up (alpha = .91) assessments with good reliability estimates at each time point.

Cancer-related distress. The Impact of Events Scale (IES; Horowitz, Wilner, Alvarez, 1979; see Appendix K) consists of 18 items designed to measure subjective distress related to a particular event. For the purposes of the current investigation, participants were asked to respond to each item in regards to their cancer and its treatment. Item content reflects both intrusive thoughts and avoidant responses. These subscales can be evaluated independently or a total distress score can be calculated by summing all 18 responses. Total distress score was used in the current investigation. Respondents were asked to indicate how frequently each comment was true for them

during the past week using a four-point scale (0 =not at all; 1=rarely; 3=sometimes; 5 = often). Previous research has supported the use of the IES as a measure of cancer-related distress in a sample of breast cancer patients (Thewes, Meiser, & Hickie, 2001). Both internal consistency (alpha = .91 for total scale) and test-retest reliability (r = .80 for total scale) were acceptable in their sample. Cancer-related distress was assessed at the baseline (alpha = .87) and three-month follow-up (alpha = .92) assessments with good internal consistency estimates at each time point.

Masculine self-image. The Bem Sex-Role Inventory – Short Form (BSRISF; Bem, 1981; see Appendix L) is a 30-item adaptation of Bem's original inventory designed to investigate masculinity and femininity as independent dimensions of sex role identity. Respondents are asked to rate themselves as to how well stereotypically masculine (e.g. defend my own beliefs, independent, assertive) and feminine adjectives (e.g. affectionate, understanding, warm) describe them. Rankings are made on a seven-point scale (1 = never to almost never true; 7 = always or almost always true). Internal consistency reliability for the entire scale is generally considered acceptable with estimates ranging from alpha = .75 to alpha = .87. A recent study confirmed the validity of the BSRI (Holt, 1998), suggesting that despite recent shifts in gender roles, this instrument remains a valid measure of sex role stereotypes. Gender role was measured at both the baseline and three-month follow-up assessments. Total masculine self-image was the outcome of interest. Estimates of internal consistency reliability were strong at both the baseline (α = .84) and three-month follow-up (α = .89) assessments.

Catastrophizing. The Hot Flash Catastrophizing Scale (HFCS; see Appendix M) was developed for use in the current study by modifying the instructions and item content

of the Fatigue Catastrophizing Scale (FCS; Jacobsen et. al., 1999). The scale consists of ten items that are designed to assess tendencies to engage in negative self-statements and overly negative thoughts about the future (i.e. "I would tell myself that I didn't think I could bear the hot flashes any longer."). At the baseline assessment, participants were asked to indicate on a five-point scale (1 = never true; 5 = all of the time true) how often they thought each item would be true for them if they were to experience hot flashes. The instructions for the baseline assessment were worded such that participants were asked to respond to each item by imagining how they might react if they were to experience hot flashes. Since the majority of participants had not experienced a hot flash at the first assessment, they were provided with a commonly cited definition to use as a guide (Kronenberg, 1994). Internal consistency for this measure in the current study was good (alpha = .93). At the three-month follow-up assessment, participants were asked to respond to a slightly different version of the scale that asked them to indicate how they were currently responding to hot flashes (see Appendix N). Participants who were not experiencing hot flashes did not complete this measure. Internal consistency reliability for this version was also good (alpha = .93). Although catastrophizing about hot flashes has not been investigated, catastrophizing about fatigue has been positively associated with fatigue severity and negatively associated with quality of life in breast cancer patients (Broeckel et. al., 1998; Jacobsen et. al., 1999) and catastrophizing about cancer pain has been found to be positively associated with pain intensity in cancer patients (Jacobsen & Butler, 1996; Lin, 1998; Wilkie & Keefe, 1991). A total score was derived by taking the mean of the 10 ratings.

Quality of life. The Expanded Prostate Cancer Index Composite (EPIC; Wei, Dunn, Litwin, Sandler, & Sanda, 2000; see Appendix O) is a 22-item measure designed to measure quality of life issues in men with prostate cancer. It was adapted from the University of California–Los Angeles Prostate Cancer Index (UCLA-PCI; Litwin et. al., 1998) and was expanded to include specific items assessing irritative and obstructive voiding symptoms, hematuria, additional bowel symptoms, and hormonal symptoms. The EPIC yields four domain-specific summary scores: urinary, bowel, sexual, and hormonal. Items are rated using a Likert scale format, with the range of response options dependent upon the item. Multi-item scale scores can be transformed linearly to a 0 to 100 scale, with higher scores reflecting better health-related quality of life (HRQOL). Each of the four domain summary scores exhibit good internal consistency (all alphas > .82) and test-retest reliability (all r > .80) over a two-week to three-month period. For the purposes of the current study, the sexual domain summary score will be used as the outcome of interest. Quality of life was measured at the baseline (alpha = .93) and three-month follow-up (alpha = .87) assessments with good reliability estimates at each point.

Results

Participant characteristics

A total of 103 men were invited to participate in the current study. Of those, four (4%) declined participation, five (5%) were determined to be ineligible, and ten (10%) were dropped from the study because they did not return their baseline questionnaires within the allowable time frame. Of the remaining 84 men, four withdrew between the baseline and three-month follow-up assessments. Data from the remaining 80 men (78% of those approached) were retained to evaluate the proposed hypotheses. For purpose of comparison, the 23 men who did not complete the study were grouped together as non-participants. Participants and non-participants were compared on demographic and clinical variables to see if the two groups differed in a systematic fashion. No significant ($p < .05$) differences were found with regard to any of the demographic or clinical characteristics assessed. Significance tests for all variables compared can be found in Table 1.

The 80 men who comprised the final sample ranged from 48 to 90 years of age ($M = 72.74$, $SD = 9.89$). They were predominantly Caucasian (88%) and currently married (78%). The majority had at least a partial college education or specialized training (71%), were retired (73%), and reported an annual household income of under $40,000 (73%). See Table 2 for complete demographic information for this sample.

Table 1

Comparison of demographic and clinical variables between study participants and non-participants.

Variable	*Participants (N = 80)*	*Non-participants (N = 23)*	*statistic*	*p value*
	n	*n*		
Age	72.74 (9.89)	72.65 (10.58)	t = -0.04	.971
Ethnicity			$\chi^2 = 1.67$	.196
Hispanic	9	5		
Not Hispanic	71	18		
Race			$\chi^2 = 1.44$	.487
White/Caucasian	70	22		
Black/African-American	7	1		
Other	3	0		
Recruitment Site			$\chi^2 = 0.31$	.578
MCC	23	8		
JAHVAH	57	15		
Time Since Diagnosis (years)	2.99 (4.45)	2.32 (3.65)	t = -0.65	.515
Baseline PSA (ng/ml)	22.80 (111.80)	22.18 (33.53)	t = -0.04	.965
LHRH Agonist Used			$\chi^2 = 0.12$	.734
Leuprolide	19	6		
Goserelin	61	16		
Treatment Category			$\chi^2 = 0.12$	.944
Primary treatment	22	7		
Adjuvant treatment	31	9		
Biochemical failure	27	7		

Table 2

Demographic characteristics of the study sample

Variable	*N = 80*
Age (Mean, SD)	72.74 (9.89)
Ethnicity	
Hispanic	9 (11.3%)
Not Hispanic	71 (88.8%)
Race	
White/Caucasian	70 (87.5%)
Black/African American	7 (8.8%)
Other	3 (3.7%)
Marital Status	
Single, never married	2 (2.5%)
Married	62 (77.5%)
Divorced	6 (7.5%)
Widowed	10 (12.5%)
Education	
7^{th} grade or less	1 (1.3%)
Junior High School (7^{th}, 8^{th}, & 9^{th} grade)	4 (5.0%)
Partial High School (10^{th} or 11^{th})	10 (12.5%)
High School Graduate	12 (15.0%)
Partial College or Specialized Training	30 (37.5%)
College or University Graduate	14 (17.5%)
Graduate or professional training	9 (11.3%)
Employment status	
Full-time at job	11 (13.8%)
Part-time at job	5 (6.3%)
Disabled	4 (5.0%)
Seeking work	2 (2.5%)
Retired	58 (72.5%)
Total household income	
Less than $ 10,000	10 (12.8%)
$10,000 - $19,999	22 (28.2%)
$20,000 - $ 39,999	26 (33.3%)
$40,000 - $59,999	13 (16.7%)
$60,000 - $100,000	6 (7.7%)
Greater than $100,000	1 (1.3%)
Did not report	2 (2.5%)

Time since prostate cancer diagnosis ranged from day of enrollment in the study to 18.33 years (M = 2.99, SD = 4.45). Twenty-seven of the men were classified as biochemical failures (38%) meaning that lab results indicated a steadily rising PSA despite prior treatment. Of the remaining participants, 22 of the men received an LHRH-agonist as their primary form of treatment (24%), and the remaining 31 men (39%) were receiving this form of treatment in addition to or in preparation for another form of treatment (e.g., prostatectomy or external-beam radiation). Average PSA values at the time of recruitment ranged from 0.6 ng/mL to over 1000 ng/mL (M=22.80, SD = 111.80). Three-month follow-up PSA values were available for 67 of the 80 men (84%). At this time point, average PSA values ranged from below 0.1 ng/mL (undetectable) to 97.40 ng/mL (M=2.34, SD=11.88). Twelve (15%) of the men were prescribed an antiandrogen agent (bicalutamide) prior to initiation of LHRH-agonists. At the three-month follow-up assessment, only two of the participants reported that they had sought medication or herbal remedies to alleviate hot flashes. See Table 3 for complete clinical and treatment characteristics for this sample.

Table 3

Clinical characteristics of the study sample

Variable	*N = 80*
Years since diagnosis (Mean, SD)	2.99 (4.45)
LHRH agonist	
Leuprolide (Lupron®/ Eligard®)	19 (23.8%)
Goserelin (Zoladex®)	61 (76.3%)
Gleason score at diagnosis	
2	1 (1.5%)
5	4 (5.9%)
6	26 (38.2%)
7	24 (35.3%)
8	11 (16.2%)
9	1 (1.5%)
10	1 (1.5%)
Unknown	12 (15.0%)
Prior treatment	
Prostatectomy only	7 (8.8%)
Brachytherapy only	3 (3.8%)
External beam radiotherapy only	8 (10.0%)
Combination	9 (11.3%)
None	53 (66.3%)
Concurrent treatment	
External beam radiotherapy	18 (22.5%)
Other drugs (i.e. Zometa)	3 (3.8%)
None	59 (73.8%)
Prostate Specific Antigen (PSA (ng/ml)	
Baseline (Mean, SD)	22.8 (111.80)
3-Month Follow-Up (Mean, SD)	2.34 (11.88)
Karnofsky (performance status rating)	
1: Able to carry on normal activity or do work with no physical complaints or problems.	17 (21.3%)
2: Able to carry on normal activity or do work even with minor physical complaints.	28 (35.0%)
3: Able to carry on normal activity or do work with effort because of physical problems.	20 (25.0%)
4: Unable to carry on normal activity but cares for self.	5 (6.3%)
5: Unable to carry on normal activity and requires occasional help from others, but is able to care for most of their personal needs.	8 (10%)
Karnofsky (performance status rating)	
6: Requires considerable help from others and requires frequent medical care.	2 (2.5%)
7: Disabled and requires special care and help.	0 (0.0%)

Participants' experience of hot flashes

At the baseline assessment, eight of the participants reported experiencing hot flashes in the previous two weeks. These men had experienced one to four hot flashes (M=2.13, SD=0.99), with an average severity rating of 2.13 (SD=0.64) on a four-point scale (1 = mild; 4 = very severe). In order to maintain a homogenous sample in terms of initial experience with hot flashes, these eight men were dropped from the remainder of the analyses. Of the remaining 72 men, two could not be reached to complete the six-week follow-up assessment, but were able to complete the three-month assessment. Of the 70 men who completed the midpoint assessment, 38 reported experiencing hot flashes six-weeks after initiation of hormone deprivation therapy (54%). These men reported an average severity rating of 1.76 (SD=0.82), which most closely corresponds to a moderate level. The number of hot flashes reported at this time period ranged from one to 154 (M=42.05, SD=46.11) in the previous two weeks. By the three-month follow-up, 50 men (69%) were reporting hot flashes. The average severity rating had risen to 1.96 (SD=0.76), with the number of hot flashes reported ranging from two to 266 (M=47.26, SD=51.37) in the previous two weeks. In order to evaluate change in hot flash variables across time, paired t-tests were performed. Significant increases in hot flash frequency were noted between the baseline and the midpoint follow-up, $t(70)=4.80$, $p < .0001$, between the midpoint and three-month follow-up, $t(70)=2.50$, $p < .02$, and between the baseline and three-month follow-up, $t(72)=5.80$, $p <.0001$. Perceived severity of hot flashes also increased between the baseline assessment and the midpoint follow-up, $t(70)=7.49$, $p < .0001$, between the midpoint and three-month follow-ups, $t(70) = 4.53$, $p < .0001$, and between the baseline and three-month follow-up, $t(72) = 10.46$, $p <.0001$.

Preliminary analyses

Post-hoc power analyses were conducted for both univariate and multivariate analyses based upon the sample size of 72. With regard to univariate procedures, power to detect a medium effect for correlational analyses was .75 ($p < .05$, two-tailed; $r = .30$; Cohen, 1988). Previous research suggests that effects of this magnitude are common with regard to relationship between adverse symptom states (e.g. pain, fatigue) and psychological distress. The same sample size was applied to power analysis for multiple regression analyses with the following assumptions: 1) baseline and follow-up measures of psychological distress would be correlated at $r = .55$ or $r^2 = .30$; and 2) the addition of hot flashes would account for an additional 6% of variability (small to medium effect; Cohen, 1988) in the outcome of interest (depression or distress) above and beyond the variance accounted for by baseline values. Power to detect an increment of this magnitude is .70 with 72 cases.

Prior to analyzing the proposed hypotheses, Spearman rank-order correlations were computed in order to identify potentially confounding relationships of demographic and clinical variables with predictor variables, outcome variables, and proposed mediators or moderators (see Table 4). First, correlations between predictor variables (hot flash frequency, hot flash severity, hot flash score, and hot flash-related interference) and demographic and clinical variables were examined. Two significant associations were noted. Karnofsky Performance Status (a measure of functional impairment) was negatively associated with hot flash frequency, such that increased frequency of hot flashes was associated with a lesser degree of impairment ($r(72) = -.25$, $p < .04$). Additionally, the LHRH-agent administered was negatively associated with hot flash-

Table 4

Correlations between Demographic and Clinical Variables and Predictor Variables

	HF Severity		*HF Frequency*	
Variable	*r*	*p*	*r*	*p*
Demographic Variables				
Age (years)	-.08	.50	-.14	.23
Ethnicity (Hispanic vs. Non-Hispanic)	.10	.38	.03	.83
Race (Hispanic vs. Non-Hispanic)	.20	.09	.21	.08
Marital Status (married vs. unmarried)	.04	.69	.02	.88
Education (HS or less vs. Beyond HS)	-.03	.79	-.004	.97
Employment (working vs. not working)	.12	.32	.13	.26
Annual Income (under $40,000 vs. over $40,000)	.03	.79	.07	.58
Clinical Variables				
Time since diagnosis	-.05	.67	.04	.75
LHRH agonist (leuprolide vs. goserelin)	-.16	.17	-.16	.19
Gleason score at diagnosis	.09	.49	.02	.90
Karnofsky Performance Status at baseline	-.17	.16	-.25	.04*
Baseline PSA	.07	.58	.08	.48
Follow-up PSA	-.14	.30	-.06	.65

	HF Score		*HF-Related Interference*	
Variable	*r*	*p*	*r*	*p*
Demographic Variables				
Age (years)	-.13	.29	-.08	.48
Ethnicity (Hispanic vs. Non-Hispanic)	.05	.67	.08	.51
Race (Hispanic vs. Non-Hispanic)	.15	.22	.09	.47
Marital Status (married vs. unmarried)	.02	.86	-.06	.60
Education (HS or less vs. Beyond HS)	-.004	.98	.06	.60
Employment (working vs. not working)	.13	.27	-.12	.30
Annual Income (under $40,000 vs. over $40,000)	.07	.55	.02	.88
Clinical Variables				
Time since diagnosis	.02	.85	-.13	.27
LHRH agonist (leuprolide vs. goserelin)	-.17	.14	-.23	.05*
Gleason score at diagnosis	.03	.83	.01	.93
Karnofsky Performance Status at baseline	-.22	.06	.003	.99
Baseline PSA	.09	.43	-.08	.50
Follow-up PSA	-.07	.59	-.07	.57

related interference, such that receipt of leuprolide was associated with greater interference due to hot flashes ($r(72) = -.23$, $p < 05$).

Next, relationships among the outcome variables (depressive symptomatology and cancer-related distress) and demographic and clinical variables were examined. Participants endorsing a greater number of depressive symptoms were less likely to be working (r (72) = -.26, $p < .03$), and reported a greater degree of impairment in daily functioning (r (72) = .24, $p <.04$). Relationships with remaining demographic and clinical variables were not significant (Table 5).

Table 5
Correlations between Demographic and Clinical Variables and Outcome Variables

	Depressive Symptomatology		*Cancer-related Distress*	
Variable	*r*	*p*	*r*	*p*
Demographic Variables				
Age (years)	.004	.97	-.21	.08
Ethnicity (Hispanic vs. Non-Hispanic)	-.15	.22	.02	.88
Race (Caucasian vs. Non-Caucasian)	-.15	.20	-.01	.91
Marital Status (unmarried vs. married)	-.13	.29	-.06	.64
Education (HS or less vs. Beyond HS)	-.03	.80	.12	.32
Employment (not working vs. working)	-.26	.03*	.01	.94
Annual Income (< $40,000 vs. > $40,000)	-.18	.14	.05	.65
Clinical Variables				
Time since diagnosis	-.09	.80	.14	.24
LHRH agonist (leuprolide vs. goserelin)	.18	.12	-.08	.52
Gleason score at diagnosis	.14	.29	.06	.63
Karnofsky Performance Status at baseline	.29	.01*	-.09	.44
Baseline PSA	-.17	.17	-.14	.24
Follow-up PSA	-.03	.80	-.11	.42

Finally, correlations between the proposed mediators (most fatigue, sleep quality, sexual functioning) and moderators (masculine gender role and catastrophizing potential) and demographic and clinical variables were examined. Of the potential mediating variables, higher levels of most fatigue was associated with unmarried status (r (70) = -.23, $p < .05$) and poorer sleep quality was associated with a greater degree of impairment in daily functioning (r (72) = .24, $p < .04$). Remaining correlations between demographic and clinical characteristics and proposed mediating variables can be found in Table 6.

Table 6

Correlations between Demographic and Clinical Variables and Potential Mediating Variables

	Most Fatigue		*Sleep Problems*		*Sexual Functioning*	
Variable	*r*	*p*	*r*	*p*	*r*	*p*
Demographic Variables						
Age (years)	.04	.77	.03	.79	-.09	.48
Ethnicity (Hispanic vs. Non-Hispanic)	.14	.26	-.18	.13	.12	.32
Race (Caucasian vs. Non-Caucasian)	-.04	.76	-.09	.46	.03	.79
Marital Status (unmarried vs. married)	-.23	.05*	-.03	.77	-.05	.69
Education (HS or less vs. Beyond HS)	.02	.88	-.09	.44	.14	.26
Employment (not working vs. working)	-.15	.22	-.02	.87	.07	.56
Annual Income (< $40,000 vs. > $40,000)	.13	.29	-.10	.40	.07	.60
Clinical Variables						
Time since diagnosis	-.14	.22	-.07	.54	-.13	.28
LHRH agonist (leuprolide vs. goserelin)	.09	.48	.07	.54	-.09	.48
Gleason score at diagnosis	.14	.29	.13	.32	.06	.64
Karnofsky Performance Status at baseline	.19	.11	.24	.04*	.01	.93
Baseline PSA	-.15	.23	-.13	.27	.21	.09
Follow-up PSA	-.23	.08	-.13	.33	.22	.10

Of the potential relationships with proposed moderating variables, greater levels of catastrophizing potential was associated with a longer time since diagnosis (r (71) = .35, $p < .008$), higher levels of masculine gender role were associated with having an annual income of over $40,000 ($r$ (72) = .31, $p < .008$), longer time since diagnosis (r (72) = .35, $p < .003$), a lesser degree of impairment in daily functioning (r (72) = -.34, $p < .004$), and being prescribed leuprolide rather than goserelin (r (72) = -.31, $p < .003$). A complete listing of these and other relationships can be found in Table 7.

Table 7

Correlations between Demographic and Clinical Variables and Potential Moderating Variables

Variable	*Masculine Gender Role*		*Catastrophizing Potential*	
	r	*p*	*r*	*p*
Demographic Variables				
Age (years)	-.02	.86	-.02	.90
Ethnicity (Hispanic vs. Non-Hispanic)	-.10	.42	.02	.86
Race (Caucasian vs. Non-Caucasian)	.06	.64	-.08	.51
Marital Status (unmarried vs. married)	-.18	.13	.12	.33
Education (HS or less vs. Beyond HS)	.17	.16	.23	.06
Employment (not working vs. working)	.07	.59	.11	.36
Annual Income (< $40,000 vs. > $40,000)	.31	.008*	.19	.11
Clinical Variables				
Time since diagnosis	.35	.003*	.31	.008*
LHRH agonist (leuprolide vs. goserelin)	-.31	.008*	-.14	.26
Gleason score at diagnosis	-.21	.11	.05	.74
Karnofsky Performance Status at baseline	-.34	.004*	.03	.80
Baseline PSA	.01	.92	-.16	.19
Follow-up PSA	.07	.62	.04	.76

A variable was considered to be a potential confound if it was significantly associated with the predictor variable, the outcome variable, and the proposed mediating or moderating variable. Karnofsky Performance Status (KPS) met these criteria in the evaluation of sleep disturbance as a mediator of the relationship between hot flash frequency and depressive symptomatology. Two sets of regression analyses were conducted both with and without this potentially confounding variable. Neither yielded significant results (p>.10).

Descriptive statistics were analyzed in order to evaluate overall changes in psychosocial measures over the three-month study period. Significant declines in functioning were noted in several areas. Participants' scores on the CES-D significantly increased from baseline (M=9.01, SD=7.59) to the three-month follow-up (M=11.26, SD=10.11), $t(72)=2.32$, $p < .05$. Participants also reported a greater number of sleep problems between the baseline (M=0.88, SD=0.79) and follow-up assessments (M=1.09, SD=0.85), $t(72)=2.13$, $p < .05$. Declines in sexual functioning were also evident between baseline (M=35.13, SD=27.03) and three-month follow-up (M=18.43, SD=17.22), $t(68)=-5.59$, $p < .001$. A complete listing of these results can be found in Table 8.

Table 8

Descriptive and Univariate Statistics for Psychosocial Variables

Variable	*Range*	*Baseline*	*3 Month Follow-Up*	*t*	*p*
Depressive Symptomatology	0-48	9.01 (7.59)	11.26 (10.11)	2.32	.02*
Cancer-Related Distress	0-90	11.57 (11.39)	9.62 (11.98)	-1.38	.17
Sleep Problems	0-3	0.88 (0.79)	1.09 (0.85)	2.13	.04*
Sleep Efficiency	0-100	83.89 (14.24)	81.93 (15.06)	-1.00	.32
Most Fatigue	0-10	4.82 (3.30)	4.96 (3.04)	0.43	.67
Sexual Functioning	0-100	35.13 (27.03)	18.43 (17.22)	-5.59	.0001*
Catastrophizing	1-5	1.26 (0.45)	1.36 (06.0)	0.54	.59
Masculine Self-Image	10-70	50.79 (10.42)	49.31 (11.47)	-1.30	.20

Univariate correlations were also calculated in order to determine the associations among study variables at the baseline and follow-up assessments. These correlations can be found in Table 9.

Table 9

Correlation Matrix of Study Variables at Baseline and Three-Month Follow-Up

		1	*2*	*3*	*4*	*5*	*6*	*7*
1	HF freq T3	1.0						
2	HF sev T3	.71***	1.0					
3	HF score T3	.93***	.80***	1.0				
4	HFRDIS T3	.62***	.65***	.70***	1.0			
5	Catas T1	-.07	.04	-.09	-.07	1.0		
6	Catas T3	.55***	.56***	.63***	.83***	-.09	1.0	
7	BEM T1	.11	.11	.14	.12	.07	-.07	1.0
8	BEM T3	-.07	.03	-.01	-.07	.22	-.18	.61***
9	CES-D T1	-.03	.03	.02	.26*	.29**	.42**	-.23
10	CES-D T3	.17	.10	.20	.44***	.02	.69***	-.02
11	IES T1	.29**	.13	.21	.26	.37**	.28	-.09
12	IES T3	.26*	.21	.24*	.30**	.44***	.33*	-.06
13	PSQI T1	.13	.05	.14	.26*	.06	.32*	.03
14	PSQI T3	.35**	.38***	.41***	.51***	.02	.50***	.04
15	FSI T1	.15	-.02	.11	.24*	-.14	.34**	-.10
16	FSI T2	.17	.15	.22	.42***	-.08	.46***	-.02
17	Sex Fxn T1	.10	.04	.05	-.03	-.06	-.01	.001
18	Sex Fxn T3	-.02	.003	.0006	-.01	-.07	-.01	.14

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

Table 9

(continued)

		8	*9*	*10*	*11*	*12*	*13*	*14*
8	BEM T3	1.0						
9	CES-D T1	-.13	1.0					
10	CES-D T3	-.12	.60***	1.0				
11	IES T1	-.03	.39***	.33**	1.0			
12	IES T3	.09	.53***	.46***	.62***	1.0		
13	PSQI T1	-.02	.46***	.30*	.15	.33**	1.0	
14	PSQI T3	-.14	.39***	.45***	.14	.26*	.60***	1.0
15	FSI T1	-.13	.37**	.37**	.19	.18	.42***	.22
16	FSI T2	-.09	.25*	.47***	.07	.22	.34**	.44***
17	Sex Fxn T1	.18	.01	-.009	-.02	.04	-.12	-.02
18	Sex Fxn T3	.10	-.15	-.07	-.19	-.18	-.10	-.03

Table 9

(continued)

		15	*16*	*17*	*18*
15	FSI T1	1.0			
16	FSI T2	.45***	1.0		
17	Sex Fxn T1	-.15	-.08	1.0	
18	Sex Fxn T3	.009	-.13	.45***	1.0

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

Relationship between hot flashes and distress

The first set of hypotheses proposed that a worse experience of hot flashes would be significantly associated with an increase in psychological distress. Before evaluating the relationship between hot flashes and changes in distress, univariate correlations between hot flashes and distress at the three-month follow-up were examined. Of the four hot flash indices (frequency, severity, score, and interference), only hot flash-related interference was significantly associated with depressive symptomatology, $r(70) = .44$, $p < .0001$. Hot flash frequency, $r(70) = .27$, $p < .03$, hot flash score, $r(70) = .24$, $p < .04$, and hot flash-related interference, $r(70) = .31$, $p < .009$, were all significantly correlated with cancer-related distress at this time point. A complete listing of correlations among these variables can be found in Table 10.

Table 10

Correlations between Hot Flash Variables and Psychological Distress Variables at Three-Month Follow-Up

Variable	*CES-D score*		*IES score*	
	r	*p*	*r*	*p*
Hot Flash Variables				
Hot Flash Frequency	.17	.16	.27	.03*
Hot Flash Severity	.10	.40	.21	.07
Hot Flash Score	.20	.10	.24	.04*
Hot Flash-Related Interference	.44	.0001*	.31	.009*

Analyses were then conducted to test the hypothesis that men reporting worse experiences with hot flashes would experience greater increases in psychological distress over the three-month study period. Specifically, baseline levels of distress were entered

on the first step in hierarchical regression analyses in order to create a residualized change score. Each of the hot flash variables was then entered on the second step in four separate regression equations. As shown in Table 11, depressive symptomatology measured prior to initiation of androgen-deprivation therapy accounted for 36% of the variance in depressive symptomatology measured at the three-month follow-up ($p <$ .0001). Hot flash-related interference accounted for an additional 8% of the remaining variance in this variable ($p = .002$). Although none of the remaining hot flash variables met the criteria set for significance ($p < .05$), hot flash frequency (p=.0533) and hot flash score (p=.0530) both approached significance, each accounting for an additional 3% of the variance in depressive symptomatology when evaluated independently.

Table 11

Regression Analyses of Hot Flash Variables on Depressive Symptomatology at Three-Month Follow-Up

Variable	β	R^2 *change*	*Cumulative* R^2	*p value*
Equation #1				
1. Baseline CES-D Score	.52		.36	.0001*
2. Hot Flash-Related Interference	.30	.08	.44	.0020*
Equation #2				
1. Baseline CES-D Score	.61		.36	.0001*
2. Hot Flash Frequency	.19	.03	.39	.0533
Equation #3				
1. Baseline CES-D Score	.60		.36	.0001*
2. Hot Flash Severity	.08	.01	.37	.3958
Equation #4				
Baseline CES-D Score	.60		.36	.0001*
Hot Flash Score	.19	.03	.39	.0530

To better understand the relative contributions of each measure of hot flash experience, exploratory regression analyses were conducted, entering all four of the hot flash variables simultaneously. Hot flash-related interference entered the model first, accounting for 8% of the variance in changes in depressive symptomatology ($p = .002$). None of the remaining three measure of hot flash experience accounted for additional variance in changes in depression (p's > .05).

Identical procedures were followed in order to determine the ability of hot flashes to predict changes in cancer-related distress over the three-month study period. As shown in Table 12, baseline reports of cancer-related distress accounted for 39% of the variance in cancer-related distress measured three months later ($p < .0001$). None of the four measures of hot flash experience accounted for significant proportions of the remaining variance (p's > .10).

Table 12

Regression Analyses of Hot Flash Variables on Cancer-Related Distress at Three-Month Follow-Up

Variable	β	R^2 *change*	*Cumulative* R^2	*p value*
Equation #1				
1. Baseline IES Score	.58		.39	.0001*
2. Hot Flash-Related Interference	.15	.02	.41	.1185
Equation #2				
1. Baseline IES Score	.59		.39	.0001*
2. Hot Flash Frequency	.10	.01	.39	.3358
Equation #3				
1. Baseline IES Score	.60		.39	.0001*
2. Hot Flash Severity	.14	.02	.40	.1510
Equation #4				
1. Baseline IES Score	.60		.39	.0001*
2. Hot Flash Score	.11	.01	.40	.2366

Relationship between hot flashes and fatigue, sleep problems, and sexual functioning

The second set of hypotheses proposed that a worse experience of hot flashes would be associated with greater increases in fatigue, poorer sleep quality, and greater declines in sexual functioning over the three-month study period. As with the first set of hypotheses, univariate relationships between each of the variables at the final assessment point were examined prior to conducting hierarchical regression analyses (see Table 13).

Table 13

Correlations between Hot Flash Variables and Fatigue, Sleep Problems, and Sexual Functioning at Three-Month Follow-Up

Variable	*Most Fatigue*		*Sleep Problems*		*Sexual Functioning*	
	r	*p*	*r*	*p*	*r*	*p*
Hot Flash Frequency	.17	.15	.35	.003*	-.02	.86
Hot Flash Severity	.15	.22	.39	.0008*	.003	.98
Hot Flash Score	.22	.06	.41	.0004*	.0006	.99
Hot Flash-Related Interference	.42	.0004*	.51	.0001*	-.01	.94

Ratings of most fatigue at the three-month follow-up were significantly associated with hot flash-related interference, $r(70)=.42$, $p < .0001$, but were not significantly associated with any of the remaining hot flash variables. In order to test the hypothesis that men reporting worse experiences with hot flashes would also experience greater increases in fatigue, hierarchical regression analyses were conducted using the same procedures as described above. As shown in Table 14, baseline levels of most fatigue measured prior to initiation of androgen-deprivation therapy accounted for 21% of the variance in ratings of most fatigue three months later ($p < .0001$). Hot flash-related interference accounted for an additional 10% of the variance in ratings of most fatigue ($p < .003$). None of the three remaining hot flash variables accounted for a significant portion of the remaining variance.

Table 14

Summary of Regression Analyses of Most Fatigue at Three-Month Follow-Up

Variable	β	R^2 *change*	*Cumulative* R^2	*p value*
Equation #1				
1. Baseline Most Fatigue	.37		.21	.0001*
2. Hot Flash-Related Interference	.32	.10	.32	.0032*
Equation #2				
1. Baseline Most Fatigue	.44		.21	.0001*
2. Hot Flash Frequency	.11	.01	.22	.3365
Equation #3				
1. Baseline Most Fatigue	.46		.21	.0001*
2. Hot Flash Severity	.16	.03	.23	.1465
Equation #4				
1. Baseline Most Fatigue	.43		.21	.0001*
2. Hot Flash Score	.17	.03	.23	.1139

Poorer sleep quality was associated with hot flash frequency, $r(72)= .35$, $p < .003$, hot flash severity, $r(72)= .39$, $p < .0008$, hot flash score, $r(72)= .41$, $p < .0004$, and hot flash-related interference $r(72)= .51$, $p < .0001$. Hierarchical regression analyses were then conducted to evaluate the ability of hot flashes to predict decreases in sleep quality. As shown in Table 15, baseline levels of sleep problems accounted for 36% of the variance in sleep quality three months after initiation of androgen deprivation therapy ($p < .0001$). Each of the four measures of hot flash experience accounted for additional variance in ratings of sleep quality at the three-month follow-up assessment when evaluated independently (p's $< .0004$). Hot flash-related interference and hot flash severity accounted for the largest amounts, each accounting for 13% additional variance, followed by hot flash score (11%), and hot flash frequency (8%). For exploratory

purposes, the ability of hot flash variables to predict changes in habitual sleep efficiency was also evaluated using regression analyses. None of the four indices of hot flash experience explained additional variance in sleep efficiency at the three month-follow up above and beyond baseline levels of sleep efficiency (p's > .05).

Table 15
Summary of Regression Analyses of Sleep Problems at Three-Month Follow-Up

Variable	β	R^2 *change*	*Cumulative* R^2	*p value*
Equation #1				
1. Baseline Sleep Problems	.50		.36	.0001*
2. Hot Flash-Related Interference	.38	.13	.49	.0001*
Equation #2				
1. Baseline Sleep Problems	.56		.36	.0001*
2. Hot Flash Frequency	.28	.08	.44	.0035*
Equation #3				
1. Baseline Sleep Problems	.58		.36	.0001*
2. Hot Flash Severity	.36	.13	.49	.0001*
Equation #4				
1. Baseline Sleep Problems	.55		.36	.0001*
2. Hot Flash Score	.33	.11	.47	.0004*

Sexual functioning was not significantly associated with any of the four indices of hot flash experience in correlational analyses (p's > .05). Baseline levels of sexual functioning accounted for 20% of the variance in sexual functioning three months later (p < .0001); however, none of the hot flash variables accounted for additional variance (see Table 16).

Table 16

Summary of Regression Analyses of Sexual Functioning at Three-Month Follow-Up

Variable	β	R^2 *change*	*Cumulative* R^2	*p value*
Equation #1				
1. Baseline Sexual Functioning	.45		.20	.0001*
2. Hot Flash-Related Interference	.006	.000	.20	.9928
Equation #2				
1. Baseline Sexual Functioning	.45		.20	.0001*
2. Hot Flash Frequency	-.03	.001	.20	.8094
Equation #3				
1. Baseline Sexual Functioning	.45		.20	.0001*
2. Hot Flash Severity		.000	.20	.9911
Equation #4				
1. Baseline Sexual Functioning	.45		.20	.0001*
2. Hot Flash Score	.005	.000	.20	.9644

Relationship between Fatigue, Sleep Problems, Sexual Functioning and Psychological Distress

The third set of hypotheses proposed that men experiencing greater increases in fatigue, sleep problems, and sexual impairment would report greater increases in depressive symptomatology and cancer-related distress. As with the previous two sets of hypotheses, univariate correlations will be presented first (Table 17) followed by the results of hierarchical regression analyses.

Table 17

Correlations between Psychological Distress Variables and Fatigue, Sleep Problems, and Sexual Functioning at Three-Month Follow-Up

Variable	*Depressive Symptomatology*		*Cancer-related Distress*	
	r	*p*	*r*	*p*
Most Fatigue	.47	.0001*	.22	.07
Sleep Problems	.45	.0001*	.26	.03*
Sexual Functioning	-.07	.56	-.18	.14

Ratings of depressive symptomatology at the three-month follow-up assessment were significantly correlated with ratings of most fatigue, $r(70)=.47$, $p < .0001$, and sleep problems at the same time point, $r(72)=.45$, $p < .0001$. Sexual functioning was not associated with depressive symptomatology ($p > .05$).

In order to evaluate this set of hypotheses, baseline levels of depressive symptomatology and baseline levels of the variable of interest (most fatigue, sleep problems, sexual functioning) were forced into the equation on the first step. Participants' rating of the variable of interest at the follow-up assessment was then entered on the second step, in order to determine the unique contribution of change occurring during the three-month study period. Taken together, ratings of depressive symptomatology and most fatigue made prior to initiation of androgen deprivation therapy accounted for 39% of the variance in depressive symptomatology three months later ($p < .0001$). Ratings of most fatigue at the three-month follow-up accounted for an additional 9% of the variance in depressive symptomatology at this same point ($p < .0016$).

In a separate regression equation, baseline depressive symptomatology and baseline sleep quality accounted for 36% of the variance in depressive symptomatology

three months later ($p < .0001$). The addition of sleep quality measured at the three-month follow-up accounted for an additional 7% of the variance ($p < .0064$). Post-treatment ratings of sexual functioning did not account for additional variance in post-treatment levels of depressive symptomatology when examined in this fashion ($p > .05$). These results are shown in Table 18.

Table 18

Regression Analyses of Potential Mediators on Depressive Symptomatology at Three-Month Follow-Up

	β	R^2 *change*	*Cumulative* R^2	*p value*
Equation #1				
1. Baseline CES-D Score	.50			.0001*
Baseline Most Fatigue	.04		.39	.0854
2. 3-Month Most Fatigue	.33	.09	.48	.0016*
Equation #2				
1. Baseline CES-D Score	.54			.0001*
Baseline Sleep Problems	-.14		.36	.7776
2. 3-Month Sleep Problems	.33	.07	.43	.0064*
Equation #3				
1. Baseline CES-D Score	.62			.0001*
Baseline Sexual Functioning	-.04		.37	.8327
2. 3-Month Sexual Functioning	.05	.002	.37	.6356

Similar procedures were used in order to determine the relative contribution of changes in fatigue, sleep quality, and sexual functioning to changes in cancer-related distress. Initially, univariate correlations were examined. As shown in Table 17, cancer-related distress was significantly associated with sleep quality three months after initiation of androgen deprivation therapy, such that higher levels of cancer-related

distress was associated with poorer sleep quality, $r(72)=.26$, $p < .03$. The relationship between cancer-related distress and most fatigue approached significance, $r(70)=.22$, $p=.07$. Sexual functioning was not a significant correlate of cancer-related distress ($p > .05$).

Taken together, baseline ratings of cancer-related distress and most fatigue accounted for 39% of the variance in cancer-related distress at the three-month follow-up assessment ($p < .0001$). Levels of most fatigue at the three-month follow up accounted for an additional 3% of the variance in baseline levels of cancer-related distress; however, this did not meet the criteria set for significance ($p = .07$). Neither sleep problems nor sexual functioning accounted for additional variance in cancer-related distress after accounting for baseline levels ($p's > .05$). These results appear in Table 19.

Table 19

Regression Analyses of Potential Mediators on Cancer-Related Distress at Three-Month Follow-Up

	β	R^2 *change*	*Cumulative* R^2	*p value*
Equation #1				
1. Baseline IES Score	.62			.0001*
Baseline Most Fatigue	-.03		.39	.5613
2. 3-Month Most Fatigue	.19	.03	.42	.0731
Equation #2				
1. Baseline IES Score	.58			.0001*
Baseline Sleep problems	.21		.44	.0098*
2. 3-Month Sleep problems	.06	.002	.45	.6190
Equation #3				
1. Baseline IES Score	.59			.0001*
Baseline Sexual Functioning	.09		.37	.6254
2. 3-Month Sexual Functioning	-.10	.008	.38	.3891

Tests of Mediation

In order to test for mediation, three conditions must be met (Baron and Kenney, 1986). First, the predictor variable must be associated as hypothesized with the outcome variable (Figure 1; Path c). It was hypothesized that a worse hot flash experience would be associated with greater increases in depressive symptomatology and cancer-related distress over the three-month period. The predictor variable of interest, hot flashes, was measured in four ways (frequency, severity, score, and interference). As can be seen in Tables 11, of the four indices of hot flash experience, only hot flash-related interference was significantly associated with changes in depressive symptomatology. None of the four hot flash variables accounted for significant variance in changes in cancer-related distress (see Table 12). Based upon these results and application of the criterion, hot flash-related interference will serve as the sole predictor variable and depressive symptomatology will serve as the outcome variable.

The second condition requires that the predictor variable is associated as hypothesized with the mediator (Figure 1; Path a). Three potential mediators were evaluated: changes in sleep problems, most fatigue, and sexual functioning. It was hypothesized that greater hot flash-related interference would be associated with decreases in sleep quality and sexual functioning, and increases in levels of most fatigue over the three month period. Regression analyses indicate that hot flash-related interference accounted for significant variance in both most fatigue (Table 14) and sleep quality (Table 15) after accounting for baseline levels of each variable. Hot flash-related interference failed to account for significant variance in changes in sexual functioning

(Table 16). Consequently, only most fatigue and sleep quality met this criterion for mediation.

The third condition requires that the mediator is associated as hypothesized with the outcome variable (Figure 1; Path b). It was hypothesized that greater increases in most fatigue and greater decreases in sleep quality and sexual functioning would be associated with greater increases in depressive symptomatology over the three-month period. As shown in Table 18, changes in both sleep problems and most fatigue emerged as significant contributors to changes in depressive symptomatology.

Based on the findings outlined above, changes in most fatigue and sleep quality were evaluated as potential mediators of the relationship between hot flash-related interference and depressive symptomatology. In order to be considered a mediator, inclusion of these variables in regression analyses must significantly reduce or eliminate the relationship between the predictor variable (hot flash-related interference) and the outcome variable (depressive symptomatology).

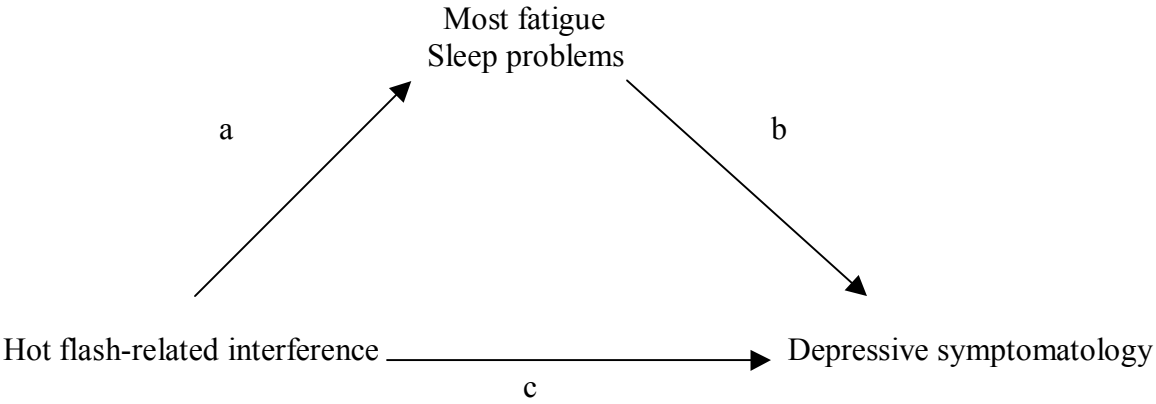

Figure 1. Model of the Relationship between Hot–Flash-Related Interference and Depressive Symptomatology as Mediated by Most Fatigue and Sleep Problems

As shown in Table 20, after accounting for changes in most fatigue, hot flash-related interference failed to account for a significant proportion of the variance in

change in depressive symptomatology *(p* = .06). A test of the indirect effect of hot flash-related interference on changes in depression via changes in most fatigue was assessed using the Sobel (1982) test as described by Baron and Kenny (1986). Results indicated that this reduction was due to a significant mediation effect of fatigue on hot flash-related interference ($z = 1.97$, $p < .05$).

Table 20

Evaluation of Changes in Most Fatigue and Sleep Problems as Mediators of the Relationship between Hot Flash-Related Interference and Changes in Depression

	β	R^2 *change*	*Cumulative* R^2	*p value*
Equation #1				
1. Baseline CES-D Score	.47			.0001*
Baseline Most Fatigue	.04			.7246
Three-Month Most Fatigue	.26		.47	.0147*
2. Hot Flash-Related Interference	.19	.03	.50	.0553
Equation #2				
1. Baseline CES-D Score	.51			.0001*
Baseline Sleep Problems	-.12			.3104
Three-Month Sleep Problems	.21		.43	.1037
2. Hot Flash-Related Interference	.23	.04	.46	.0334*

Similar analyses were repeated entering changes in sleep quality as the potential mediator. Hot flash-related interference remained a significant predictor of changes in depression after controlling for changes in sleep quality, accounting for 4% of the variance in this variable ($p = .03$). Prior to including this variable in the regression equation, hot flash-related interference accounted for 8% of the variance in changes in depression. Therefore, the inclusion of sleep quality represents a 50% reduction in variance accounted for by hot flash-related interference. The follow-up Sobel test

confirms that sleep quality did not completely mediate the relationship between hot flash-related interference and depressive symptomatology ($z = 1.49$, $p > .10$).

Tests of Moderation

The final two sets of hypotheses proposed that catastrophizing potential and masculine self-image would moderate the relationship between hot flashes and psychological distress. Specifically, it was proposed that the combination of higher levels of catastrophizing and a worse hot flash experience would be associated with higher levels of cancer-related distress and depression. Additionally, it was anticipated that the combination of higher levels of masculine self-image and a worse hot flash experience would be associated with higher levels of cancer-related distress and depression.

In order to determine if either masculine self-image or catastrophizing potential moderated the relationship between hot flashes and depression, hierarchical regression analyses were conducted. In each equation, baseline levels of depression were entered first in order to create a residualized change score. This was followed by one of the four hot flash variables, then by either catastrophizing potential or masculine self-image, and then by the appropriate interaction term. Each of the predictor variables and potential moderating variables were centered in order to reduce multicollinearity (Aiken & West, 1991). In this study, each of the hot flash variables, catastrophizing potential, and masculine self-image were centered by subtracting the mean of the respective variable from each participant's score on that variable. As shown in Tables 21 and 22, neither masculine self-image nor catastrophizing potential were significant moderators of the relationship between hot flashes and depressive symptomatology.

Table 21

Evaluation of Masculine Self-Image as a Moderator of the Relationship between Hot Flash Experience and Depressive Symptomatology

	β	R^2 change	Cumulative R^2	p value
1. Baseline Depression	.65			.0001*
Hot Flash Frequency (A)	.15			.1203
Masculine Self-Image (B)	.08		.40	.4114
2. A x B	-.11	.01	.41	.2552
1. Baseline Depression	.64			.0001*
Hot Flash Severity (A)	.06			.5449
Masculine Self-Image (B)	.09		.38	.3606
2. A x B	-.16	.03	.40	.0948
1. Baseline Depression	.65			.0001*
Hot Flash Score (A)	.17			.0710
Masculine Self-Image (B)	.07		.40	.5122
2. A x B	-.14	.02	.42	.1565
1. Baseline Depression	.54			.0001*
HF-Related Interference (A)	.32			.0014*
Masculine Self-Image (B)	.03		.45	.7211
2. A x B	-.17	.03	.48	.0650

Table 22

Evaluation of Catastrophizing Potential as a Moderator of the Relationship between Hot Flash Experience and Depressive Symptomatology

	β	R^2 change	Cumulative R^2	p value
1. Baseline Depression	.65			.0001*
Hot Flash Frequency (A)	.15			.1711
Catastrophizing Potential (B)	-.16		.41	.1212
2. A x B	-.04	.001	.42	.7443
1. Baseline Depression	.64			.0001*
Hot Flash Severity (A)	.09			.3713
Catastrophizing Potential (B)	-.17		.39	.1071
2. A x B	.02	.0003	.39	.8535
1. Baseline Depression	.64			.0001*
Hot Flash Score (A)	.15			.1812
Catastrophizing Potential (B)	-.15		.41	.1418
2. A x B	-.03	.0007	.41	.7768
1. Baseline Depression	.54			.0001*
HF-Related Interference (A)	.30			.0215*
Catastrophizing Potential (B)	-.10		.45	.3575
2. A x B	.04	.0009	.46	.7387

Comparable regression analyses were then conducted to determine if either masculine self-image or catastrophizing potential moderated the relationship between hot flashes and cancer-related distress. As shown in Table 23, masculine self-image did not moderate the relationship between hot flash experience and cancer-related distress (p's > .05).

Table 23

Evaluation of Masculine Self-Image as a Moderator of the Relationship between Hot Flash Experience and Cancer-Related Distress

	β	R^2 change	Cumulative R^2	p value
1. BL Cancer-Related Distress	.58			.0001*
Hot Flash Frequency (A)	.12			.2305
Masculine Self-Image (B)	.01		.39	.9460
2. A x B	.11	.01	.41	.2637
1. BL Cancer-Related Distress	.59			.0001
Hot Flash Severity (A)	-.01			.1437
Masculine Self-Image (B)	.14		.40	.9082
2. A x B	.04	.002	.40	.6473
1. BL Cancer-Related Distress	.59			.0001
Hot Flash Score (A)	.12			.2331
Masculine Self-Image (B)	.02		.40	.8414
2. A x B	.16	.02	.42	.1014
1. BL Cancer-Related Distress	.58			.0001*
HF-Related Interference (A)	.13			.1951
Masculine Self-Image (B)	.03		.41	.7570
2. A x B	.14	.02	.43	.1634

A different pattern of results emerged when evaluating catastrophizing potential as a moderator. Each of the four indices of hot flashes (frequency, severity, score, and interference) was evaluated as an independent predictor of distress. As shown in Table 24, there were significant main effects for hot flash-related interference ($\beta = .38$, $t = 3.69$, $p < .0005$) and catastrophizing potential ($\beta = .42$, $t = 4.16$, $p < .0001$).

Table 24

Evaluation of Catastrophizing Potential as a Moderator of the Relationship between Hot Flash Experience and Cancer-Related Distress

	β	R^2 change	Cumulative R^2	p value
1. BL Cancer-Related Distress	.47			.0001*
Hot Flash Frequency (A)	.27			.0175*
Catastrophizing Potential (B)	.31		.46	.0024*
2. A x B	.21	.03	.49	.0510
1. BL Cancer-Related Distress	.51			.0001*
Hot Flash Severity (A)	.12			.2201
Catastrophizing Potential (B)	.27		.46	.0124*
2. A x B	-.07	.004	.46	.4948
1. BL Cancer-Related Distress	.47			.0001*
Hot Flash Score (A)	.28			.0115*
Catastrophizing Potential (B)	.32		.47	.0018*
2. A x B	.20	.03	.49	.0621
1. BL Cancer-Related Distress	.40			.0001*
HF-Related Interference (A)	.38			.0005*
Catastrophizing Potential (B)	.42		.48	.0001*
2. A x B	.32	.07	.55	.0024*

In addition, the interaction between hot flash-related interference and catastrophizing was also significant ($\beta = .32$, $t = 3.16$, $p < .0024$). In order to interpret this significant interaction, three simple lines of the regression of cancer-related distress (y) on hot flash interference (x) as a function of three values of catastrophizing potential (see Figure 2). These three values correspond to one standard deviation above the mean, the mean, and one standard deviation below the mean.

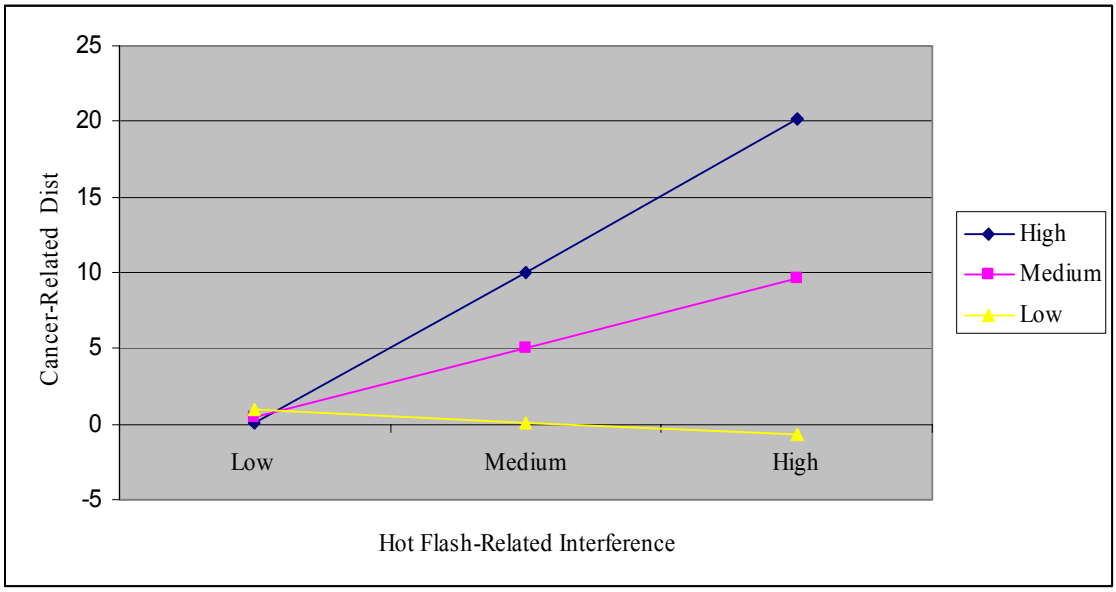

Figure 2. Effect of Hot Flash-Related Interference on Cancer-Related Distress by Catastrophizing Potential

The slope of the cancer-related distress scores was significantly different from zero for high (slope = .63, $t = 2.68$, $p < .01$) and mean levels (slope = .29, $t = 2.90$, $p < .01$) of catastrophizing potential, but not for low levels (slope = -.05, $t = 0.47$, $p > .05$). These results suggest that catastrophizing potential moderates the relationship between hot flash-interference and cancer-related distress. Specifically, men who did not anticipate that they would catastrophize in response to hot flashes exhibited uniformly low levels of cancer-related distress, regardless of the level of interference in daily activities due to hot flashes. In contrast, men with greater potential to engage in catastrophizing in response to hot flashes exhibited low levels of distress with low levels of hot flash-related interference, but high levels of distress with high levels of hot flash-related interference.

Discussion

The goal of the current study was to increase our understanding of men's experience of hot flashes while receiving androgen deprivation therapy for prostate cancer. Hot flashes are an unusual experience for most men and little is known about their impact on psychological functioning and quality of life. The current study hypothesized that the experience of hot flashes in this population would lead to increased distress. Results were partially consistent with this hypothesis. The degree to which hot flashes interfered with patients' ability to engage in their daily activities predicted increases in depressive symptomatology over the three-month study period; however, none of the four hot flash variables (frequency, severity, score, interference) were successful in predicting changes in cancer-related distress.

In addition to reports of increased psychological distress, it was expected that men reporting a worse experience of hot flashes would also report greater sleep disturbance, fatigue, and sexual dysfunction. All four indices of hot flash experience predicted increased sleep disturbance. Hot flash-related interference was the only variable to predict increases in levels of most fatigue. There was no evidence to support the hypothesis that a worse experience of hot flashes lead to increased sexual dysfunction.

In an effort to further understand the relationship between hot flashes and distress, we evaluated potential mediators of this relationship. Results partially supported the hypothesized mediational models. That is, increases in fatigue were found to mediate the relationship between hot flash-related interference and depressive symptomatology;

however, this variable did not mediate the relationship between hot flashes and cancer-related distress. Sexual dysfunction did not mediate any of the proposed relationships.

The final set of hypotheses proposed that catastrophizing potential and masculine self-image would serve as moderators of the relationship between hot flash experience and psychological distress. These hypotheses were partially supported. Catastrophizing potential was found to moderate the relationship between hot flash-related interference and cancer-related distress. For men who reported high levels of catastrophizing potential, subsequent levels of cancer-related distress were dependent upon the degree to which hot flashes interfered with functioning. Men who reported low levels of catastrophizing potential experienced low levels of cancer-related distress regardless of the degree to which hot flashes interfered with their daily functioning.

The following discussion will place these findings in context with the existing literature and highlight the ways in which they further our understanding of the psychological impact of hot flashes in men. Potential clinical implications of these findings will be discussed in relation to the treatment of hot flashes. Finally, limitations of the current study will be outlined along with suggestions for future research.

These findings add to the growing body of research documenting a relationship between receipt of androgen deprivation therapy and psychological distress (Fowler, et. al., 2002; Herr & O'Sullivan, 2000; Pirl, et. al., 2002). To date, most studies conducted with men on androgen deprivation therapy have not attempted to differentiate among the constellation of side effects that occur as a result of this form of treatment. Of particular interest in the current study was the impact of hot flashes on increases in distress over the three-month period following the initiation of androgen deprivation therapy. Although

other studies have found strong relationships between frequency and/or severity of hot flashes and measures of psychological distress in women with breast cancer, (Carpenter et. al., 1998; Carpenter, et. al., 2002), these relationships were not as well defined in men with prostate cancer. In the present study, ratings of hot flash-related interference emerged as the sole significant predictor of increases in depression. This suggests that the extent to which hot flashes interfere with patients' daily functioning may be more important to evaluate than the frequency or severity of hot flashes in identifying men at risk for depression. Since the studies conducted to date have not typically examined this relationship in a longitudinal fashion, it is difficult to make direct comparisons to previous literature. Of relevance are cross-sectional studies showing that hot flash-related interference is positively correlated with negative affect and mood disturbance in women with breast cancer (Carpenter, 2001) and poorer quality of life in men with prostate cancer (Nishiyama, et. al, 2004).

As noted previously, changes in sexual functioning failed to account for significant variance in either depression or cancer-related distress. In comparison, hot flash-related interference accounted for significant variance in depressive symptomatology over the three month study period. Taken together, these findings suggest that interference due to hot flashes may play a larger role in the development and maintenance of depressive symptoms than sexual problems. Along with hot flashes, sexual dysfunction is considered to be one of the more prevalent and upsetting side effects for men receiving androgen deprivation therapy (Fowler, et. al., 2002; Herr & O'Sullivan, 2000; Potosky, et. al., 2001 Potosky, et. al., 2002); however the origins of sexual dysfunction in this population are likely to be multifactorial. Prior treatments for

prostate cancer (i.e. prostatectomy, radiation), comorbid health conditions, and side effects from various medications are all potential contributors to the development of sexual dysfunction. Impairment in sexual functioning may pre-date the initiation of androgen deprivation therapy for many of these men; therefore the current study may not have captured the initial distress associated with this loss in functioning.

Results of the current study provide evidence in support of potential mechanisms by which hot flash-related interference contributes to increases in depression. Level of fatigue reported by these men mediated the relationship between hot flashes and depression. No other studies can be identified that have attempted to explore potential mediators of the relationship between hot flashes and distress in men or women. However, consistent with the current results, fatigue has been linked to hot flashes in cross-sectional studies of women with breast cancer (Carpenter, et. al., 2004; Stein, et. al. 2000).

The impact of hot flash-related interference on cancer-related distress does appear to differ as a function of use of catastrophizing as a coping tool. Results suggest that the cancer-related distress of men reporting greater use of catastrophizing appears to increase as hot flash-related interference increases. Men low in expected use of catastrophizing exhibit consistently low levels of cancer-related distress regardless of hot flash-related interference. These findings are line with the body of literature supporting a strong association between use of catastrophizing and increased ratings of pain (Sullivan, Thorn, Haythornthwaite, et. al., 2001). Prospective ratings of catastrophizing have been found to predict subsequent ratings of pain in response to dental procedures and in individuals with arthritis (Keefe, et.al., 1989; Sullivan, Bishop, & Pivik, 1995; Sullivan & Neish,

1999). A similar pattern has been found in relation to the experience of fatigue in cancer patient populations. In women with breast cancer, catastrophizing has been found to predict more severe fatigue in response to radiation therapy (Jacobsen, Andrykowski, & Thors, 2004). Taken together, these findings support the notion that reliance on catastrophizing as a coping mechanism can lead to a more intense experience of symptoms.

Although this study represents an advance over much of the previous cross-sectional research on hot flashes in prostate cancer patients, certain limitations should be considered when evaluating the results. First, because this is the initial study to longitudinally evaluate the role of hot flashes in the development of distress, the results should be considered preliminary and in need of replication. Because the sample size was relatively small, the ability of these results to generalize to the broad population of prostate cancer patients is unknown. Despite the small sample size, however, the demographic make-up was fairly diverse in terms of ethnicity and income.

Second, the present study used subjective ratings of hot flash presence, frequency, and severity. The fact that these self-report ratings of hot flashes were made retrospectively introduces an element of recall bias. Although some investigations utilize daily diaries in order to combat this problem (Carpenter, et. al., 2001; Sloan, et. al., 2001), non-adherence and missing data were of significant concern with this population. Although objective physiological assessment tools such as sternal skin conductance monitoring can be used to measure hot flashes (Carpenter, Andrykowski, Freedman, & Munn, 1999; Carpenter, Monahan, & Azzouz, 2004; Coyne, 2005), this form of assessment is not without its limitations. A recent report by the National Institutes of

Health points out that sternal skin conductance monitoring fails to capture important information such as perceived severity and interference with daily activities (Miller & Li, 2004). This method also poses considerable burden on research participants, requiring frequent home visits by study personnel to adjust the equipment and read the data, as well as potential discomfort with electrodes.

It should also be noted that the hot flash variables (predictors), distress variables (outcomes), and potential mediators and moderators were assessed concurrently; therefore, causal relationships among these variables cannot be conclusively determined. Incorporation of daily diaries or real-time data collection technology (e.g. palm-sized data recording devices) would more accurately allow for evaluation of the temporal relationship between hot flashes, fatigue, and psychological distress. This type of repeated assessment would more clearly demonstrate the relationship between the onset of hot flashes and subsequent development of fatigue and depression.

A third limitation of the current study was the heterogeneity of the sample in terms of stage of illness, time since diagnosis, and treatment history. These men were at different stages of their disease trajectory and therefore may not have been responding to the onset of a new set of side effects in the same manner. Men who had been living with a prostate cancer diagnosis for a number of years may have been less distressed by hot flashes, as they may have had time to adjust to the limitations imposed by prostate cancer and its treatment. Despite this apparent diversity, time since diagnosis did not prove to be a significant correlate of psychological distress or any of the hot flash variables.

Studies have shown that hot flashes do not generally subside as time since treatment increases (Karling, Hammar & Varenhorst, 1994; Spetz, et. al., 2001);

therefore, it is important to recognize the impact of this treatment-related side effect and to develop appropriate and effective remedies. Preliminary evidence lends support to the use of pharmacological agents in reducing hot flashes in men, including megestrol acetate, a synthetic progesterone (Loprinzi, et. al., 1994), as well as anti-depressants such as paroxetine (Loprinzi, et. al., 2004) and venlafaxine (Quella, et. al., 1999). Despite their apparent success in reducing the incidence of hot flashes, these medications come with their own set of side effects; including nausea, dry mouth, decreased appetite, and constipation. Furthermore, a well documented placebo effect in hot flash studies estimates a 20-30% reduction in hot flash score with four weeks of a placebo (Sloan, et. al., 2001). The substantial placebo effect and potentially aversive side effects from pharmacological agents speak to the need for behavioral interventions designed to reduce hot flashes.

Results of the present study suggest several additional avenues for clinical intervention. Fatigue and catastrophizing, in particular, appear to be promising areas of exploration. Results of mediation analysis suggest that reducing fatigue would significantly decrease or eliminate the relationship between hot flash-related interference and increased symptoms of depression. Routine physical activity has long been regarded as an effective method of enhancing mood, sleep quality, and overall quality of life. A recent study has examined the utility of exercise in a prostate cancer population (Segal, Reid, Courneya, et. al., 2003). In a sample of in men receiving androgen deprivation, participation in a 12-week resistance exercise program led to improvements in symptoms of fatigue and quality of life relative to a wait list control condition. This initial investigation lends further support to the beneficial qualities of physical activity;

however, a highly structured program such as this may not be feasible in many outpatient settings. Future studies should explore the efficacy of less intensive interventions that would generalize to a broader range of settings.

Results further indicate that use of catastrophizing may determine the amount of cancer-related distress experienced by the patient. This has several implications for clinical practice. Assessment of catastrophizing may be useful in identifying prostate cancer patients at risk for developing high levels of cancer-related distress while receiving androgen deprivation therapy. This can be accomplished by having the patient complete a brief 10-item measure prior to the initiation of treatment. Patients identified as prone to catastrophizing may benefit from a brief psycho-educational intervention designed to promote use of more adaptive coping responses. Results of a recent randomized controlled trial incorporating both active physical treatment and cognitive-behavioral treatment was effective in reducing pain catastrophizing in a sample of patients with nonspecific chronic low back pain (Smeets, Vlaeyen, Kester, & Knottnerus, 2006). Change in pain catastrophizing was found to mediate the reduction of disability, pain complaints, and pain intensity. Similar interventions designed to reduce hot flash catastrophizing may result in lower levels of cancer-related distress.

The findings presented here represent an important first step towards understanding the role of hot flashes in the development of psychological distress in men receiving androgen deprivation therapy for prostate cancer. Prevalence rates of depression in this population are thought to be around 12-13% (Pirl, et. al., 2002). Therefore, it is important to understand the factors that contribute to and maintain these symptoms. The extent to which hot flashes interfere with the patient's ability to engage in

routine daily activities appears to be the most significant factor in determining increases in depressive symptomatology. Results of mediation analyses suggest that increased fatigue partially explains the relationship between hot flash-related interference and symptoms of depression in men receiving this form of treatment for prostate cancer. Furthermore, the coping strategy of catastrophizing appears to moderate the relationship between hot flash-related interference and increases in cancer-related distress. Additional research is needed to realize the potential of these findings in clinical populations.

References

Aaronson, N.K., Ahmedzai, S., Bergman B., Bullinger M., & Cull, A. (1993). The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. *Journal of the National Cancer Institute, 85*, 365-376.

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

Beeber, L., Shea, J., & McCorkle, R. (1998). The Center for Epidemiologic Studies Depression Scale as a measure of depressive symptoms in newly diagnosed patients. *Journal of Psychosocial Oncology, 16*, 1-20.

Bem, S.L. (1981). *Bem Sex Role Inventory: Professional manual*. Palo Alto, CA: Consulting Psychologists Press.

Bishop, S.R. & Warr, D. (2003). Coping, catastrophizing and chronic pain in breast cancer. *Journal of Behavioral Medicine, 26*, 265-281.

Broeckel, J.A., Jacobsen, P.B., Horton, J., Balducci, L., Lyman, G.H. (1998). Characteristics and correlates of fatigue after adjuvant chemotherapy for breast cancer. *Journal of Clinical Oncology, 16*, 1689-96.

Bussye, D.J., Reynolds, C.F., Monk, T.H., Berman, S.R., & Kupfer, D.J., (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*, 193-213.

Carpenter, J.S. (2001). The hot flash related daily interference scale: A tool for assessing the impact of hot flashes on quality of life following breast cancer. *Journal of Pain and Symptom Management, 22*, 979-989.

Carpenter, J.S., Andrykowski, M.A., Cordova, M., Cunningham, L., Studts, J., McGrath, P., Kenady, D., Sloan, D., & Munn, R. (1998). Hot flashes in postmenopausal women treated for breast carcinoma. *Cancer, 82*, 1682-1691.

Carpenter, J.S., Andrykowski, M.A., Freedman, R.R., Munn, R. (1999). Feasibility and psychometrics of an ambulatory hot flash monitoring device. *Menopause, 6*, 209-215.

Carpenter, J.S., Elam, J. Ridner, S.H., Carney, P.H., Cherry, G.J., Cucullu, H.L. (2004). Sleep, fatigue, and depressive symptoms in breast cancer survivors and matched healthy women experiencing hot flashes. *Oncology Nursing Forum, 31*, 591-598.

Carpenter, J.S., Johnson, D.H., Wagner, L.J., & Andrykowski, M.A. (2002). Hot flashes and related outcomes in breast cancer survivors and matched comparison women. *Oncology Nursing Forum, 29*, E16-25.

Carpenter, J.S., Monahan, P.O., & Azzouz, F. (2004). Accuracy of subjective hot flush reports compared with continuous sternal skin conductance monitoring. *Obstetrics and Gynecology, 104*, 1322-1326.

Cella, D.F., Tulsky, D.S., Gray, G., Sarafian, B., Linn, E., Bonomi, A., et. al., (1993). The Functional Assessment of Cancer Therapy scale: development and validation of the general measure. *Journal of Clinical Oncology, 11*, 570-579.

Chang, V.T., Hwang, S.S., Feuerman, M., Kasimis, B.S., Thaler, H.T. (2000). The Memorial Symptom Assessment Scale Short Form (MSAS-SF): validity and reliability. *Cancer, 89*, 1162-1171.

Chen, A.C. & Petrylak, D.P. (2004). Complications of androgen deprivation therapy in men with prostate cancer. *Current Oncology Reports, 6*, 209-215.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd edition). Hillsdale, NJ: Erlbaum.

Coyne, J.C. (2005). Hot flashes among prostate cancer patients undergoing androgen deprivation therapy: Psychosocial and quality of life issues.

Dreicer, R. (2002). Controversies in the systemic management of patients with evidence of biochemical failure following radical prostatectomy. *Cancer Treatment Reviews, 28*, 189-194.

Fitzpatrick, L.A. & Santen, R.J. (2002). Hot flashes: The old, the new, and what is really true? *Mayo Clinic Proceedings, 77*, 115—1158.

Fowler, F.J., Collins, M.M., Corkery, E.W., Elliot, D.B., & Barry, M. J. (2002). The impact of androgen deprivation on quality of life after radical prostatectomy for prostate carcinoma. *Cancer, 95*, 287-295.

Galbraith, M.E., Ramirez, J.M., & Pedro, L.W. (2001). Quality of life, health outcomes, and identity for patients with prostate cancer in five different treatment groups. *Oncology Nursing Forum, 28*, 551-560.

Gaston-Johansson, F., Ohly, K.V., Fall-Dickson, J.M., Nanda, J.P., & Kennedy, M.J. (1999). Pain, psychological distress, health status, and coping in patients with breast cancer scheduled for autotransplantation. *Oncology Nursing Forum, 26*, 1337-1345.

Green, H.J., Pakenham, K.I., Headley, B.C., Yaxley, J., Nicol, D.L., MacTaggart, P.N., Swanson, C., Watson, R.B., & Gardiner, R.A. (2002). Altered cognitive function in men treated for prostate cancer with luteinizing hormone-releasing hormone analogues and cyproterone acetate: a randomized controlled trial. *BJU International, 90*, 427-432.

Hann, D., Winter, K., & Jacobsen, P. (1999). Measurement of depressive symptoms in cancer patients: Evaluation of the Center for Epidemiological Studies Depression Scale (CES-D). *Journal of Psychosomatic Research, 46*, 437-443.

Harder, H., Cornelissen, J.J., Van Gool, A.R., Duivenvoorden, H.J., Eijkenboom, W.M.H., & van den Bent, M.J. (2002). Cognitive functioning and quality of life in long-term adult survivors of bone marrow transplantation. *Cancer, 95(1)*, 183-192.

Hellerstedt, B.A. & Pienta, K.J. (2002). The current state of hormonal therapy for prostate cancer. *CA Cancer J Clin, 52*, 154-179.

Herr, H.W., Kornblith, A.B., Ofman, U. (1993). A comparison of the QOL of patient with metastatic prostate cancer who received or did not receive hormonal therapy. *Cancer, 71*, 1143-1150.

Herr, H.W. & O'Sullivan, M. (2000). Quality of life of asymptomatic men with nonmetastatic prostate cancer on androgen deprivation therapy. *The Journal of Urology, 163*, 1743-1746.

Holt, C.L. & Ellis, J.B. (1998). Assessing the current validity of the Bem Sex-Role Inventory. *Sex Roles: A Journal of Research, 39*, 929-941.

Horowitz, M., Wilner, N., & Alvarez, W. (1979). Impact of event scale: a measure of subjective stress. *Psychosomatic Medicine, 41*, 209-218.

Jacobsen, P.B., Andrykowski, M.A., & Thors, C.L. (2004). Relationship of catastrophizing to fatigue among women receiving treatment for breast cancer. *Journal of Consulting and Clinical Psychology, 72*, 355-361.

Jacobsen, P.B., Azzarello, L.M., & Hann, D.M. (1999). Relation of catastrophizing to fatigue severity in women with breast cancer. *Cancer Research Therapy & Control, 8*, 155-164.

Jacobsen P.B. & Butler, R.W. (1996). Relation of cognitive coping and catastrophizing to acute pain and analgesic use following breast cancer surgery. *Journal of Behavioral Medicine, 19*, 17-29.

Karling, P., Hammar, M., & Varenhorst, E. (1994). Prevalence and duration of hot flushes after surgical or medical castration in men with prostatic carcinoma. *The Journal of Urology, 152*, 1170-1173.

Keefe, F.J., Brown, G.K., Wallston, K.A., & Caldwell, D.S. (1989). Coping with rheumatoid arthritis: Catastrophizing as a maladaptive strategy. *Pain, 37*, 51–56.

Kronenberg, F. (1994). Hot flashes: phenomenology, quality of life, and search for treatment options. *Experimental Gerontology, 29*, 319-36.

Legler, J., Potosky, A.L., Gilliland, F.D., Eley, J.W., & Stanford, J.L. (2000). Validation study of retrospective recall of disease-targeted function: results from the prostate cancer outcomes study. *Medical Care, 38*, 847-857.

Lin, C.C. (1998). Comparison of the effects of perceived self-efficacy on coping with chronic cancer pain and coping with chronic low back pain. *Clinical Journal of Pain, 14*, 303-310.

Litwin, M.S., Hays, R.D., Fink, A., Ganz, P.A., Leake, B., Boork, R.H. (1998). The UCLA Prostate Cancer Index: development, reliability, and validity of a health-related quality of life measure. *Medical Care, 36*, 1002-1012.

Loprinzi, C.L., Barton, D.L., Carpenter, L.A., Sloan, J.A., Novotny, P.J., Gettman, M.T., & Christensen, B.J. (2004). Pilot evaluation of paroxetine for treating hot flashes in men. *Mayo Clinic Proceedings, 79*, 1247-1251.

Loprinzi, C.L., Michalak, J.C., Quella, S.K., O'Fallon, J.R., Hatfield, A.K., Nelimark, R.A., Dose, A.M., Fischer, T., Johnson, C., Klatt, N.E., Bate, W.W., Rospond, R.M., & Oesterling, J.E. (1994). Megestrol acetate for the prevention of hot flashes. *New England Journal of Medicine, 331*, 347-352.

Lubeck, D.P., Grossfeld, G.D., & Carroll, P.R. (2001). The effect of androgen deprivation therapy on health-related quality of life in men with prostate cancer. *Urology, 58*, 94-100.

Miller, H.G. & Li, R.M. (2004). Measuring hot flashes: summary of a National Institutes of Health workshop. *Mayo Clinic Proceedings, 79*, 777-781.

Nishiyama, T. Kanazawa, S., Wantanabe, R., Terunuma, M., & Takahashi, K. (2004). Influence of hot flashes on quality of life in patients with prostate cancer treated with androgen deprivation therapy. *International Journal of Urology, 11*, 735-741.

Pirl, W.F., Siegel, G.I., Goode, M.J., & Smith, M.R. (2002). Depression in men receiving androgen deprivation therapy for prostate cancer: A pilot study. *Psycho-Oncology, 11*, 518-523.

Portenoy, R.K., Thaler, H.T., Kornblith, A.B., McCarthy Lepore, J., Friedlander-Klar, H., Kiyasu, E., Sobel, K., Coyle, N., Kemeny, N., Norton, L., & Scher, H. (1994). The Memorial Symptom Assessment Scale: an instrument for the evaluation of symptom prevalence, characteristics, and distress. *European Journal of Cancer, 30A*, 1326-1336.

Potosky, A.L., Harlan, L.C., Stanford, J.L., Gilliland, F.D., Hamilton, A.S., Albertsen, P.C., Eley, J.W., Liff, J.M., Deapen, D., Stephenson, R.A., Legler, J., Ferrans, C.E., Talcott, J.A., & Litwon, M.S. (1999). Prostate cancer practice patterns and quality of life: The prostate cancer outcomes study. *Journal of the National Cancer Institute, 91*, 1719-1724.

Potosky, A.L., Knopf, K., Clegg, L.X., Albertsen, P.C., Stanford, J.L., Hamilton, A.S., Gililand, F.D., Eley, J.W., Stephenson, R.A., & Hoffman, R.M. (2001). Quality-of-life outcomes after primary androgen deprivation therapy: Results from the prostate cancer outcomes study. *Journal of Clinical Oncology, 19*, 3750-3757.

Potosky, A.L., Reeve, B.B., Clegg, L.X., Hoffman, R.M., Stephenson, R.A., Albertsen, P.C., Gilliland, F.D., & Stanford J.L. (2002). Quality of life following localized prostate cancer treated initially with androgen deprivation therapy or no therapy. *Journal of the National Cancer Institute, 94*, 430-437.

Quella, S.K., Loprinzi, C.L., Sloan, J., Novotny, P., Perez, E.A., Burch, P.A., Antolak, S.J., Pisansky, T.M. (1999). Pilot evaluation of venlafaxine for the treatment of hot flashes in men undergoing androgen ablation therapy for prostate cancer. *Journal of Urology, 162*, 98-102.

Radloff, L.S. (1977). The CES-D Scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 119-135.

Sabo, D. (2000). Men's health studies: Origins and trends. *Journal of American College Health, 49*, 133-142.

Sabo, D. & Gordon, D.F. (1995). *Men's Health and Illness: Gender, Power, and the Body*. Thousand Oaks, CA: Sage Publications, Inc.

Segal, R.J., Reid, R.R., Courneya, K.S., Malone, S.C., Parliament, M.B., Scott, C.G., Venner, P.M., Quinney, H.A., Jones, L.W., D'Angelo, S., Wells, G.A. (2003). Resistance exercise in men receiving androgen deprivation therapy for prostate cancer. *Journal of Clinical Oncology, 21*, 1653-1659.

Sloan, J.A., Loprinzi, C.L., Novotny, C.L., Barton, D.L., Lavasseur, B.I., & Windschitl, H. (2001). Methodologic lessons learned from hot flash studies. *Journal of Clinical Oncology, 19*, 4280-4290.

Smeets, R.J., Vlaeyen, J.W., Kester, A.D., & Knottnerus, J.A. (2006). Reduction of pain catastrophizing mediates the outcome of both physical and cognitive-behavioral treatment in chronic low back pain. *The Journal of Pain, 7*, 261-271.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), *Sociological Methodology* (pp. 290-312). Washington DC: American Sociological Association.

Spetz, A.C., Hammar, M., Lindberg, B., Spangberg, A., Varenhorst, E. & The Scandinavian Prostatic Cancer Group-5 Trial Study. (2001). Prospective evaluation of hot flashes during treatment with parenteral estrogen or complete androgen ablation for metastatic carcinoma of the prostate. *The Journal of Urology, 166*, 517-520.

Stansbury, J.P., Mathewson-Chapman, M., Grant, K.E. (2003). Gender schema and prostate cancer: veterans' cultural model of masculinity. *Medical Anthropology, 22,* 175-204.

Stein, K.D., Jacobsen, P.B., Hann, D.M, Greenberg, H., & Lyman, G. (2000). Impact of hot flashes on quality of life among postmenopausal women being treated for breast cancer. *Journal of Pain and Symptom Management, 19*, 436-445.

Stone, P., Hardy, J., Huddart, R., A'Hern, R., Richards, M. (2000). Fatigue in patients with prostate cancer receiving hormone therapy. *European Journal of Cancer, 36*, 1134-1141.

Sullivan, M.J.L., Bishop, S.R., & Pivik, J. (1995). The Pain Catastrophizing Scale: Development and validation. *Psychological Assessment, 7*, 524-532.

Sullivan M.J.L. & Neisch, N. (1999). The effects of disclosure on pain during dental hygiene treatment: the moderating role of catastrophizing. *Pain, 79,* 155–163.

Sullivan, M.J.L., Thorn, B., Haythornthwaite, J.A., Keefe, F., Martin, M., Bradley, L.A., Lefebvre, J.C. (2001). Theoretical perspectives on the relation between catastrophizing and pain. *The Clinical Journal of Pain, 17*, 52-64.

Thewes, B., Meiser, B., & Hickie, I.B. (2001). Psychometric properties of the Impact of Event Scale amongst women at increased risk for hereditary breast cancer. *Psycho-Oncology, 10*, 459-468.

Wei, J.T., Dunn, R.L., Litwin, M.S., Sandler, H.M., & Sanda, M.G. (2000). Development and validation of the Expanded Prostate Cancer Index Composite (EPIC) for comprehensive assessment of health-related quality of life in men with prostate cancer. *Urology, 56*, 899-905.

Weitzner, M.A., Moncello, J., Jacobsen, P.B., & Minton, S. (2002). A pilot trial of paroxetine for treatment of hot flashes and associated symptoms in women with breast cancer. *Journal of Pain and Symptom Management, 23*, 337-345.

Wilkie, D.J. & Keefe, F.J. (1991). Coping strategies of patients with lung cancer-related pain. *Clinical Journal of Pain, 7*, 292-299.

Wingard, J.R., Curbow, B., Baker, F., & Piantadosi, S. (1991). Health, functional status, and employment of adult survivors of bone marrow transplantation. *Annals of Internal Medicine, 114,* 113-118.

Appendices

Appendix A: Informed Consent for Moffitt Cancer Center

Informed Consent

Social and Behavioral Sciences
University of South Florida

Information for People Who Take Part in Research Studies

The following information is being presented to help you decide whether or not you want to take part in a minimal risk research study. Please read this carefully. If you do not understand anything, ask the person in charge of the study.

Title of Study: Characteristics and correlates of hot flashes in men with prostate cancer
Principal Investigator: Paul B. Jacobsen, Ph.D.
Study Location(s): H. Lee Moffitt Cancer Center
You are being asked to participate because you have been diagnosed with prostate cancer and are being treated with hormonal therapy.

General Information about the Research Study

The purpose of this research study is to determine the prevalence and severity of hot flashes experienced by men being treated with hormonal therapy. We would also like to understand the impact these hot flashes may have on various aspects of your quality of life.

Plan of Study

You will be asked to complete a packet of questionnaires prior to starting hormonal therapy. Two weeks after you begin treatment, you will be asked to respond to some questions regarding the prevalence and severity of the hot flashes you may be experiencing. One month after you have started treatment, you will be asked to complete a second packet of questionnaires, similar in content to the first packet. The second two assessments may be completed in clinic or on the telephone.

Payment for Participation

You will not be paid for your participation in this study.

Benefits of Being a Part of this Research Study

By taking part in this study, you will increase our knowledge regarding the experience of hot flashes in men with prostate cancer.

Risks of Being a Part of this Research Study

There are no unpleasant or harmful side effects from participating in this study.

Confidentiality of Your Records

Your privacy and research records will be kept confidential to the extent of the law. Authorized research personnel, employees of the Department of Health and Human Services, and the USF Institutional Review Board may inspect the records from this research project.

The results of this study may be published. However, the data obtained from you will be combined with data from others in the publication. The published results will not include your name or any other information that would personally identify you in any way.

Your name will not appear on any research form except for this informed consent form and a master list, which will be maintained in a locked research file.

Volunteering to Be Part of this Research Study

Your decision to participate in this research study is completely voluntary. You are free to participate in this research study or to withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive, if you stop taking part in the study. Your medical care will not be affected.

Questions and Contacts

- If you have any questions about this research study, contact Erin Winters, M.A. at 1-800-456-3434 x 6187
- If you have questions about your rights as a person who is taking part in a research study, you may contact the Division of Research Compliance of the University of South Florida at (813) 974-5638.

Consent to Take Part in This Research Study

By signing this form I agree that:

- I have fully read or have had read and explained to me this informed consent form describing this research project.
- I have had the opportunity to question one of the persons in charge of this research and have received satisfactory answers.
- I understand that I am being asked to participate in research. I understand the risks and benefits, and I freely give my consent to participate in the research project outlined in this form, under the conditions indicated in it.
- I have been given a signed copy of this informed consent form, which is mine to keep.

_____	_____	_____
Signature of Participant	Printed Name of Participant	Date

Investigator Statement

I have carefully explained to the subject the nature of the above research study. I hereby certify that to the best of my knowledge the subject signing this consent form understands the nature, demands, risks, and benefits involved in participating in this study.

_____	_____	_____
Signature of Investigator Or authorized research investigator designated by the Principal Investigator	Printed Name of Investigator	Date

Apendix B: Informed Consent for James A. Haley Veterans' Hospital

Informed Consent for an Adult
University of South Florida, the IRB of record for the James A. Haley VA Hospital
Information for people who are being asked to take part in a research study
IRB Study #_103119___

Researchers at the James A. Haley VA Hospital study many topics. We want to learn more about how hormonal therapy for prostate cancer affects our patients. To do this, we need the help of people who agree to take part in a research study.

Person in charge of study: Raoul Salup, M.D.
Study staff who can act on behalf of the person in charge: Erin Winters, M.A., Sean Ransom, M.A., Babu Zachariah, M.D., Joyce Shaw, Paul Jacobsen, Ph.D.

Where the study will be done: James A. Haley Veterans' Hospital
Who is paying for it: Not applicable

Should you take part in this study?

This form tells you about this research study. You can decide if you want to take part in it. You do not have to take part. Reading this form can help you decide.
Before you decide:

Read this form.

- Talk about this study with the person in charge of the study or the person explaining the study. You can have someone with you when you talk about the study.
- Find out what the study is about.

You can ask questions:

- You may have questions this form does not answer. If you do, ask the person in charge of the study or study staff as you go along.
- You don't have to guess at things you don't understand. Ask the people doing the study to explain things in a way you can understand.

After you read this form, you can:

- Take your time to think about it.
- Have a friend or family member read it.
- Talk it over with someone you trust.

It's up to you. If you choose to be in the study, then you can sign the form. If you do not want to take part in this study, do not sign the form.

Why is this research being done?

The purpose of this study is to find out how the hot flashes associated with hormonal therapy affect the mood, energy level, sleep quality, sexual functioning, and daily activities of patients with prostate cancer.

Why are you being asked to take part?

We are asking you to take part in this study because you are scheduled to undergo hormonal therapy for treatment of prostate cancer. We are interested in understanding how the side effects associated with this form of treatment impact various aspects of your quality of life.

How long will you be asked to stay in the study?

You will be asked to spend about three months in this study. This consists of the period of time between the initial administration of hormonal therapy and your first clinical follow-up visit. You will be assessed prior to beginning hormonal therapy and again six weeks and three months after treatment has started.

How often will you need to come for study visits?

A study visit is one you have with the person in charge of the study or study staff. You will need to come for 2 study visits in all.

You will be asked to fill out a packet of questionnaires that will take 25-30 minutes to complete. You can either finish the questionnaires while you are at the VA, or you may take them home with you and return them by mail. Approximately six weeks after this initial assessment, you will be contacted at home by telephone and will be asked to report on prevalence and severity of the hot flashes you may be experiencing.

Most study visits will take about 30 minutes. Some may be longer.
At each visit, the person in charge of the study or staff will:

- Provide you with a packet of questionnaires. These questionnaires will assess basic demographic information (age, gender, marital status, etc), disease and treatment variables, hot flashes, hot flash interference, fatigue, sleep quality, psychological distress, masculine self-image, coping strategies, sexual functioning, treatment-related side effects, and cognitive functioning.
- In between the 2 study visits, a member of the research team will contact you at home. At this point, you will be asked to respond to questions regarding any hot flashes you may be experiencing, and how they are impacting your daily activities.

How many other people will take part?

About 65 people will take part in this study at James A. Haley VA Hospital. People will also take part at other study sites. A total of about 89 people will take part.

What other choices do you have if you decide not to take part?

If you decide not to take part in this study, that is okay. Your treatment will not be affected if you chose not to participate.

How do you get started?

If you decide to take part in this study, you will need to sign this consent form. You will fill out the first questionnaire packet before you are started on hormonal therapy.

What will happen during this study?

During the study, you will be asked to respond to a number of questions regarding hot flashes, your mood, sleep, physical functioning, and sexual functioning. You will fill out a questionnaire packet at the beginning of the study and the same packet again at the end of the study. These questionnaires will require approximately 25 to 30 minutes to complete. Six weeks after the start of your treatment, you will be contacted by telephone to respond to a few of these same questions. This telephone call will take approximately 5-10 minutes. The medical treatment you receive will be the same whether or not you chose to participate.

Here is what you will need to do during this study

Study participation requires completing two questionnaire packets and one brief telephone interview.

Will you be paid for taking part in this study?

We will not pay you for the time you volunteer in this study.

What will it cost you to take part in this study?

It will not cost you anything to take part in the study.

What are the potential benefits if you take part in this study?

Although there are no direct benefits to you, by taking part in this study, you will increase our knowledge regarding the experience of hot flashes in men with prostate cancer. What we learn may help others with this stage of prostate cancer.

What are the risks if you take part in this study?

Although we do not expect there to be any unpleasant or harmful side effects from participating in this study, you may experience some psychological discomfort from filling out some of the questionnaires.

What will we do to keep your study records from being seen by others?

Federal law requires us to keep your study records private. Participants will be assigned a three-digit code number that will be used on all study materials. Informed consent documents will be maintained in a locked research file in a secure area of the Moffitt Research Center building. Completed questionnaires will be stored in a different file, separated from any identifying information. Research data will be entered into a data analysis program. This data will be entered using the three-digit code number; no identifying information will be stored digitally. The privacy and research records of the participants will be kept confidential to the extent of the law.

However, certain people may need to see your study records. By law, anyone who looks at your records must keep them confidential. The only people who will be allowed to see these records are:

- The study staff.
- People who make sure that we are doing the study in the right way. They also make sure that we protect your rights and safety:
  - The USF Institutional Review Board (IRB) and its staff
  - The Department of Veterans Affairs (VA)
  - The United States Department of Health and Human Services (DHHS)

We may publish what we find out from this study. If we do, we will not use your name or anything else that would let people know who you are.

What happens if you decide not to take part in this study?

You should only take part in this study if you want to take part.

If you decide not to take part:

- You won't be in trouble or lose any rights you normally have.
- You will still get the same services you would normally have.
- You can still get your regular medical treatment.

What if you join the study and then later decide you want to stop?

If you decide you want to stop taking part in the study, tell the study staff as soon as you can.

- We will tell you how to stop safely. We will tell you if there are any dangers if you stop suddenly.
- If you decide to stop, you can go on getting your regular medical treatment.

Are there reasons we might take you out of the study later on?

Even if you want to stay in the study, there may be reasons we will need to take you out of it. You may be taken out of this study:

- If we find out it is not safe for you to stay in the study. For example, your health may get worse.
- If you are not coming for your study visits when scheduled.

You can get the answers to your questions.

If you have any questions about this study, call Dr. Raoul Salup at (813) 972-2000 x7579.
If you have questions about your rights as a person who is taking part in a study, call USF Research Compliance at (813) 974-5638.
You may also contact the James A. Haley VA Hospital Research Compliance Officer at (813) 972-2000 ext. 7872.

Signatures for Consent to Take Part in this Research Study

It's up to you. You can decide if you want to take part in this study.

I freely give my consent to take part in this study. I understand that this is research. I have received a copy of this consent form.

_____ _____
Signature of Person Taking Part in Study Date

_____
Printed Name of Person Taking Part in Study

_____ _____
Signature of Witness Date

_____
Printed Name of Witness

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he can expect. The person who is giving consent to take part in this study

- Understands the language that is used.
- Reads well enough to understand this form. Or is able to hear and understand when the form is read to him or her.
- Does not have any problems that could make it hard to understand what it means to take part in this study.
- Is not taking drugs that make it hard to understand what is being explained.

To the best of my knowledge, when this person signs this form, he or she understands:

- What the study is about.
- What needs to be done.
- What the potential benefits might be.
- What the known risks might be.
- That taking part in the study is voluntary.

_____ _____
Signature of person obtaining consent Date

_____
Printed name of person obtaining consent

Appendix C: Research Authorization for Moffitt Cancer Center

Characteristics and correlates of hot flashes in men with prostate cancer

H. Lee Moffitt Cancer Center and Research Institute

at the University of South Florida

RESEARCH AUTHORIZATION

We understand that information about you and your health is personal, and we are committed to protecting the privacy of that information. Because of this commitment, we must obtain your written authorization before we may use or disclose your protected health information for the research purposes described below. This form provides that authorization and helps us make sure that you are properly informed of how this information will be used or disclosed.

Research undertaken at the H. Lee Moffitt Cancer Center and Research Institute, Inc. or at any of its subsidiaries is undertaken jointly with the University of South Florida or other persons or entities under an organized health care arrangement. All persons or entities participating in such an organized healthcare arrangement are collectively referred to as the "Moffitt Cancer Center" in this form.

By signing this document you are permitting the Moffitt Cancer Center to use personal health information collected about you for research purposes internally within its organized health care arrangements. You are also allowing the Moffitt Cancer Center to disclose that personal health information to outside organizations or individuals that participate in this research study. Please read the information below carefully before signing this form.

USE AND DISCLOSURE COVERED BY THIS AUTHORIZATION

A representative of the Moffitt Cancer Center must answer these questions completely before providing this authorization form to you. DO NOT SIGN A BLANK FORM. You or your personal representative should read the descriptions below before signing this form.

Who will disclose, receive, and/or use the information? The workforce of the Moffitt Cancer Center is permitted by law to use and disclose your health information for treatment, payment and health care operations purposes. By signing below, you authorize the Moffitt Cancer Center to receive and obtain tests, results and your other personal health and related information arising from services or treatment provided to you by other health care providers in connection with this study. In addition to any uses

or disclosures made for treatment, payment and health care operations purposes, the following person(s), class(es) of persons, and/or organization(s) will be allowed to disclose, use, and receive the information for the research purposes set forth in this form, but they may only use and disclose the information to the other parties on this list, to you or your personal representative, or as permitted by law.

Every research site for this study, including the Moffitt Cancer Center, and including each site's research staff and medical staff

Every health care provider and other member of the Moffitt Cancer Center workforce who provides services to you in connection with this study

3. Any laboratories and other individuals and organizations that use your health information in connection with this study in accordance with the study's protocol

4. Any sponsor of the study, including the following research sponsors: None

5. The United States Food and Drug Administration, Department of Health and Human Services (DHHS) and any other federal, state or local governmental agency that regulates the research study

6. The designated research Protocol Review and Monitoring Committees and related staff of the Moffitt Cancer Center

7. The National Cancer Institute in evaluating the ongoing research of the Moffitt Cancer Center as a Comprehensive Cancer Center

8. The members and staff of any Institutional Review Board that has oversight responsibility for this study

9. The members and staff of the Moffitt Cancer Center's affiliated Privacy Board

10. Members of the study team, including the following Principal Investigator, co-investigators, sub-investigators and others listed on your research study Informed Consent

11. Study Coordinators, Research Nurses and Data Managers involved in the research

12. Members of the Moffitt Cancer Center's Clinical Trials Office/Clinical Research Operations

13. Contract Research Organization

14. Data Safety Monitoring Board and Staff

Additionally, the following person(s), classes of person(s), and/or organization(s) (as described below):

_____

_____

The entities and persons listed above may employ or pay various consultants and companies to help them understand, analyze and conduct this study. All of these people may not be known

now, but if you would like to have more specific information about this at any time during the study, you may ask the Principal Investigator and your questions will be answered.

The Moffitt Cancer Center cannot guarantee the privacy of your information, or block further use or distribution, after the information has left the Moffitt Cancer Center. The sponsor of this study may further disclose your information. If disclosed by the sponsor or any other person or entity, the information may no longer be covered by the federal privacy regulations.

What information will be used or disclosed? By signing below, you authorize the use and disclosure of your entire research record and any medical or other records held by the Moffitt Cancer Center, including, but not limited to, HIV/AIDS, mental health, substance abuse or genetic information, except for information that you expressly exclude below. The purpose for the uses and disclosures you are authorizing is to conduct the research project explained to you during the informed consent process and to ensure that the information relating to that research is available to all parties who may need it for research purposes.

- ❑ Exclude the information expressly listed below (if blank, then no information excluded):

_____

_____

_____

SPECIFIC UNDERSTANDINGS

By signing this research authorization form, you authorize the use and/or disclosure of your protected health information described above. Your information may also be used as necessary for your research-related treatment, to collect payment for your research-related treatment (when applicable), and to run the business operations of the Moffitt Cancer Center.

This information may be redisclosed if the recipient(s) described on this form is not required by law to protect the privacy of the information.

You have a right to refuse to sign this authorization. While your health care outside the study, the payment for your health care, and your health care benefits will not be affected if you do not sign this form, you will not be able to participate in the research described in this authorization and will not receive treatment as a study participant if you do not sign this form.

If you sign this authorization, you will have the right to revoke it at any time, except to the extent that the Moffitt Cancer Center has already taken action based upon your authorization or needs the information to complete analysis and reports of data for this research. Your revocation will apply prospectively only. All data collected prior to your decision to withdraw your authorization to use the data for research purposes - including documentation of your decision to withdraw - may still be used by the Principal Investigator and cannot be revoked. If medically necessary, the Principal Investigator or study staff may follow-up with you. If you have decided to withdraw your authorization to use the data for research purposes this follow-up information cannot be used or disclosed for research unless required by law.

This authorization will never expire unless and until you expressly revoke it in writing. To revoke this authorization, please write to Paul Jacobsen, Ph.D. at the Moffitt Cancer Center 12902 Magnolia Dr. Tampa, FL 33612.

By signing below, you acknowledge your receipt of a copy of this form.

SIGNATURE

I have read this form and all of my questions about this form have been answered. By signing below, I acknowledge that I have read and accept all of the above.

_____
Signature of Subject or Personal Representative

_____
Print Name of Subject or Personal Representative

_____
Date

_____
Description of Personal Representative's Authority

Appendix C: (Continued)

CONTACT INFORMATION

The contact information of the subject or personal representative who signed this form should be filled in below.

Address:
_____
_____
_____
_____

Telephone:
_____ (daytime)
_____ (evening)

Email Address (optional):
_____

THE SUBJECT OR HIS OR HER PERSONAL REPRESENTATIVE MUST BE PROVIDED WITH A COPY OF THIS FORM AFTER IT HAS BEEN SIGNED.

Appendix D: Research Authorization for James A. Haley Veterans' Hospital

Department of Veterans Affairs

Authorization for Release of Protected Health Information for Research Purposes

Title of Study: Characteristics and Correlates of Hot Flashes in Men with Prostate Cancer

You have been asked to be part of a research study under the direction of Raoul Salup, M.D. and his research team. The purpose of this study is to find out how the hot flashes associated with hormonal therapy affect the mood, energy level, sleep quality, sexual functioning, and daily activities of patients with prostate cancer.

By signing this document, you will authorize the Veterans Health Administration (VHA) to provide Raoul Salup, M.D. and his research team permission to use and disclose the following information about you:

The information that will be released includes information regarding the following conditions:

Demographic information
Medical treatment history

The research team may also need to disclose the information to others as part of the study process. The others may include the institutional review board.

If you do not sign this authorization, you will not participate in the study.

This authorization to use your information will expire at the end of the research study.

You can revoke this authorization, in writing, at any time. To revoke your authorization, you must write to the Release of Information Office at this facility or you can ask a member of the research team to give you a form to revoke the authorization. Your request will be valid when the Release of Information Office receives it. If you revoke this authorization, you will not be able to continue to participate in the study. This will not affect your right as a VHA patient to treatment or benefits outside the study.

If you revoke this authorization, Raoul Salup, M.D. and his research team can continue to use information about you that was collected before receipt of the revocation. The research team will not collect information about you after you revoke the authorization.

The VHA complies with the requirements of the Health Insurance Portability and Accountability Act of 1996 and its privacy regulations and all other applicable laws that protect your privacy. We will protect your information according to these laws. Despite

these protection, there is a possibility that your information could be used or disclosed in a way that it will no longer be protected. Our Notice of Privacy Practices (a separate document) provides more information on how we protect your information. If you do not have a copy of the Notice, the research team will provide one to you.

I have read this authorization form and have been given the opportunity to ask questions. If I have questions later, I understand I can contact Raoul Salup, M.D. I will be given a signed copy of this authorization form for my records. I authorize the use of my identifiable information as described in this form.

_____

Signature of Participant or Person Authorized
To Sign for Participant (Attach authority to sign,
e.g., Power of Attorney)

The Paperwork Reduction Act of 1995 requires us to notify you that this information collection is in accordance with the clearance requirements of section 3507 of the Act. We may not conduct or sponsor, and you are not required to respond to, a collection of information unless it displays a valid OMB number. We expect that the time expended by all individuals completing this form will average 2 minutes. This includes the time to read the instructions, gather the necessary facts and fill out the form. The purpose of this form is to specifically outline the circumstances under which we may disclose data.

The execution of this form does not authorize the release of information other than that specifically described. The information requested on this form is solicited under Title 38, U.S.C. The form authorizes release of information that you specify in accordance with the Health Insurance Portability and Accountability Act, 45 CFR Parts 160 and 164, 5 U.S.C. 552a, and 38 U.S.C. 5701 and 7332. Your disclosure of information requested on this form is voluntary. However if the information, including Social Security Number (SSN) (the SSN will be used to locate records for release) is not furnished completely and accurately, Department of Veterans Affairs will be unable to comply with the request.

Appendix E: General Background Information

1. Today's date: ☐☐/☐☐/☐☐ (month/day/year)

2. Birth date: ☐☐/☐☐/☐☐ (month/day/year)

3. Height: ☐ (ft) ☐☐ (in)

4. Weight: ☐☐☐ (pounds)

5. Which of the following best describes your ethnic background?
   - ☐ 1 Spanish/Hispanic/Latino
   - ☐ 2 Not Spanish/Hispanic/Latino

6. What is your race? (check one box)
   - ☐ 1 White/Caucasian
   - ☐ 2 Black/African American
   - ☐ 3 Asian/Pacific Islander
   - ☐ 4 American Indian/Alaska Native
   - ☐ 5 Other:_____

7. Marital status (check one box):
   - ☐ 1 Never married
   - ☐ 2 Currently married
   - ☐ 3 Separated
   - ☐ 4 Divorced
   - ☐ 5 Widowed

8. Current living arrangement (check one box):
   - ☐ 1 Live alone
   - ☐ 2 Live with spouse/partner
   - ☐ 3 Live with spouse/partner and children
   - ☐ 4 Live with children (no spouse/partner)
   - ☐ 5 Live with roommate who is not partner
   - ☐ 6 Live with parents
   - ☐ 7 Other (specify)_____

9. How long in current living arrangement (check one box):
   - ☐ 1 Less than 1 month
   - ☐ 2 One to 6 months
   - ☐ 3 Seven months to 2 years
   - ☐ 4 Two to 5 years
   - ☐ 5 More than 5 years

10. Level of school completed (check one box):

- ☐ 1 Less than 7th grade
- ☐ 2 Junior High School (7th, 8th, & 9th grade)
- ☐ 3 Partial high school (10th or 11th grade)
- ☐ 4 High School graduate
- ☐ 5 Partial college or specialized training
- ☐ 6 College or university graduate
- ☐ 7 Graduate professional training (graduate degree)

11. Current employment situation (check all that apply):

- ☐ 1 Full time at job
- ☐ 2 Part time at job
- ☐ 3 On leave with pay
- ☐ 4 On leave without pay
- ☐ 5 Disabled
- ☐ 6 Seeking work
- ☐ 7 Retired
- ☐ 8 Homemaker
- ☐ 9 Student

12. Which category best describes your usual occupation? If you are not currently employed, which category best describes your LAST job? (check one number):

- ☐ 1. Professional (e.g. teachers/professors, nurses, lawyers, physicians, & engineers)
- ☐ 2. Manager/Administrator (e.g., sales managers)
- ☐ 3. Clerical (e.g., secretaries, clerks or mail carriers)
- ☐ 4. Sales (e.g., sales persons, agents & brokers)
- ☐ 5. Service (e.g., police, cooks, waitress, or hairdressers)
- ☐ 6. Skilled Crafts, Repairer (e.g., carpenters)
- ☐ 7. Equipment or Vehicle Operator (e.g., truck drivers)
- ☐ 8. Laborer (e.g., maintenance factory workers)
- ☐ 9. Farmer (e.g., owners, managers, operators or tenants)
- ☐ 10. Member of the military
- ☐ 11. Homemaker (with no job outside the home)
- ☐ 12. Other (please describe)_____

13. Which category best describes your spouse's usual occupation? If your spouse is not currently employed, which category best describes his/her LAST job? (check one number)

- ☐ 1. Professional (e.g., teachers/professors, nurses, lawyers, physicians, & engineers)
- ☐ 2. Manager/Administrator (e.g., sales managers)
- ☐ 3. Clerical (e.g., secretaries, clerks or mail carriers)
- ☐ 4. Sales (e.g., sales persons, agents & brokers)
- ☐ 5. Service (e.g., police, cooks, waitress, or hairdressers)
- ☐ 6. Skilled Crafts, Repairer (e.g., carpenters)
- ☐ 7. Equipment or Vehicle Operator (e.g., truck drivers)
- ☐ 8. Laborer (e.g., maintenance factory workers)
- ☐ 9. Farmer (e.g., owners, managers, operators or tenants)
- ☐ 10. Member of the military
- ☐ 11. Homemaker (with no job outside the home)
- ☐ 12. Other (please describe)_____

14. What is your approximate annual gross income? (check one number) (Remember all information you provide will remain completely confidential)

☐ 1 Less than $ 10,000	☐ 4 $40,000 - $59,999
☐ 2 $10,000 - $19,999	☐ 5 $60,000 - $100,000
☐ 3 $20,000 - $ 39,999	☐ 6 Greater than $100,000

15. Approximate annual gross income for your household: (check one number) (Remember all information you provide will remain completely confidential)

☐ 1 Less than $ 10,000	☐ 4 $40,000 - $59,999
☐ 2 $10,000 - $19,999	☐ 5 $60,000 - $100,000
☐ 3 $20,000 - $ 39,999	☐ 6 Greater than $100,000

22. Which of the following best describes how you presently function?

- ☐ 1 I am able to carry on normal activity or do work and I have no physical complaints or problems.
- ☐ 2 I am able to carry on normal activity or do work even with minor physical complaints.
- ☐ 3 I am able to carry on normal activity or do work but it takes effort because of physical problems.
- ☐ 4 I am unable to carry on normal activity but I care for myself.
- ☐ 5 I am unable to carry on normal activity and I require occasional help from others, but I am able to care for most of my personal needs.
- ☐ 6 I require considerable help from others and I require frequent medical care.
- ☐ 7 I am disabled and I require special care and help.

Appendix F: Hot Flash Questionnaire

Please respond to the following questions in regards to the **past two weeks**. A hot flash is a short-lived episode of flushing, sweating, and a sensation of heat. It is often accompanied by heart palpitations and a feeling of anxiety and may sometimes be followed by chills.

1. Have you experienced hot flashes in the **past two weeks**?

   ☐ yes
   ☐ no (please go on to next page)

2. Approximately how many hot flashes have you experienced over the **past two weeks**? _____

3. Please rate the severity of your hot flashes on average over the **past two weeks**.

   ☐ Mild
   ☐ Moderate
   ☐ Severe
   ☐ Very severe

Appendix G: Hot Flash-Related Daily Interference Scale

Please check one box to describe how much DURING THE PAST WEEK hot flashes have INTERFERED with each aspect of your life. Higher numbers indicate more interference with your life. If you are not experiencing hot flashes or if hot flashes do not interfere with these aspects of your life, please mark zero to the right of each question.

	Do not interfere										Completely interfere
	0	1	2	3	4	5	6	7	8	9	10
1. Work (outside the home and housework)……	□	□	□	□	□	□	□	□	□	□	□
2. Social activities (time spent with family, friends,etc.)……	□	□	□	□	□	□	□	□	□	□	□
3. Leisure activities (time spent relaxing, doing hobbies, etc.)	□	□	□	□	□	□	□	□	□	□	□
4. Sleep……	□	□	□	□	□	□	□	□	□	□	□
5. Mood……	□	□	□	□	□	□	□	□	□	□	□
6. Concentration……	□	□	□	□	□	□	□	□	□	□	□
7. Relations with others……	□	□	□	□	□	□	□	□	□	□	□
8. Sexuality……	□	□	□	□	□	□	□	□	□	□	□
9. Enjoyment of life……	□	□	□	□	□	□	□	□	□	□	□
10. Overall quality of life……	□	□	□	□	□	□	□	□	□	□	□

Appendix H: Fatigue Symptom Inventory

For each of the following, check one box next to the number that best indicates how that item applies to you.

1. Rate your level of fatigue on the day you felt **most** fatigued during the past week:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10

Not at all fatigued — As fatigued as I could be

2. Rate your level of fatigue on the day you felt **least** fatigued during the past week:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10

Not at all fatigued — As fatigued as I could be

3. Rate your level of fatigue on the **average** during the past week:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10

Not at all fatigue — As fatigued as I could be

4. Rate your level of fatigue **right now**:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10

Not at all fatigued — As fatigued as I could be

5. Rate how much, in the past week, fatigue interfered with your **general level of activity**:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10

Not at all fatigued — As fatigued as I could be

6. Rate how much, in the past week, fatigue interfered with your **ability to bathe and dress yourself**:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10

No interference — Extreme interference

7. Rate how much, in the past week, fatigue interfered with your **normal work activity (includes both work outside the home and housework)**:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10
No interference — Extreme interference

8. Rate how much, in the past week, fatigue interfered with your **ability to concentrate**:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10
No interference — Extreme interference

9. Rate how much, in the past week, fatigue interfered with your **relations with other people**:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10
No interference — Extreme interference

10. Rate how much, in the past week, fatigue interfered with your **enjoyment of life**:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10
No interference — Extreme interference

11. Rate how much, in the past week, fatigue interfered with your **mood**:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10
No interference — Extreme interference

12. Indicate **how many days**, in the past week, you felt fatigued for any part of the day:

□0 □1 □2 □3 □4 □5 □6 □7
Days — Days

13. Rate **how much of the day**, on average, you felt fatigued in the past week:

□0 □1 □2 □3 □4 □5 □6 □7 □8 □9 □10
None of the day — The entire day

14. Indicate which of the following best describes the **daily pattern** of your fatigue in the past week:

□ 0	□ 1	□ 2	□ 3	□ 4
Not at all fatigued	Worse in the morning	Worse in the afternoon	Worse in the evening	No consistent daily pattern of fatigue

Appendix I: Pittsburgh Sleep Quality Index

The following questions relate to your usual sleep habits during the past week only. Your answers should indicate the most accurate reply for the majority of days and nights in the past week. Please answer all questions.

1. During the past week, when have you usually gone to bed at night?

   USUAL BED TIME _____

2. During the past week, how long (in minutes) has it usually taken you to fall asleep each night?

   NUMBER OF MINUTES _____

3. During the past week, when have you usually gotten up in the morning?

   USUAL GETTING UP TIME _____

4. During the past week, how many hours of actual sleep did you get a night? (This may be different than the number of hours you spend in bed.)

   HOURS OF SLEEP PER NIGHT _____

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past week, how often have you had trouble sleeping because you cannot get to sleep within 30 minutes?

   Not at all _____ A few (1-2) times _____ Several (3-5) times _____ Every night or almost every night _____

6. During the past week, how would you rate your sleep quality overall?

   Very good _____ Fairly good _____ Fairly bad _____ Very bad _____

7. During the past week, how often have you taken medicine (prescribed or "over the counter") to help you sleep?

   Not at all _____ A few (1-2) times _____ Several (3-5) times _____ Every night or almost every night _____

Appendix J: Center for Epidemiological Studies-Depression Scale

For each statement below, make an **"X"** in the box which best describes how often you felt or behaved this way-- **DURING THE PAST WEEK, INCLUDING TODAY.**

DURING THE PAST WEEK:	None of the time	A little of the time	A moderate amount of the time	All of the time
1. I was bothered by things that usually didn't bother me…….	☐	☐	☐	☐
2. I didn't feel like eating; my appetite was poor……..	☐	☐	☐	☐
3. I felt that I could not shake off the blues even with help from family or friends……	☐	☐	☐	☐
4. I felt that I was just as good as other people…….	☐	☐	☐	☐
5. I had trouble keeping my mind on what I was doing…….	☐	☐	☐	☐
6. I felt depressed……...	☐	☐	☐	☐
7. I felt that everything I did was an effort…….	☐	☐	☐	☐
8. I felt hopeful about the future……	☐	☐	☐	☐
9. I thought my life had been a failure...	☐	☐	☐	☐
10. I felt fearful……..	☐	☐	☐	☐
11. My sleep was restless……..	☐	☐	☐	☐
12. I was happy. ……..	☐	☐	☐	☐
13. I talked less than usual. ……...	☐	☐	☐	☐
14. I felt lonely. …….	☐	☐	☐	☐
15. People were unfriendly……	☐	☐	☐	☐

Appendix J: (Continued)

	None of the time	A little of the time	A moderate amount of the time	All of the time
16. I enjoyed life……	□	□	□	□
17. I had crying spells. ……..	□	□	□	□
18. I felt sad. ……..	□	□	□	□
19. I felt that people disliked me. ……..	□	□	□	□
20. I could not “get going.”……	□	□	□	□

Appendix K: Impact of Events Scale

Below is a list of comments made by people about stressful events. For each item, put an "X" in the box that indicates how frequently these comments were true for you DURING THE PAST WEEK INCLUDING TODAY ABOUT YOUR CANCER AND ITS TREATMENT. If they did not occur during that time, please mark the "not at all" column.

	Not at all	Rarely	Sometimes	Often
1. Thought about it when I didn't mean to...	☐	☐	☐	☐
2. I avoided letting myself get upset when I thought about it or was reminded of it..	☐	☐	☐	☐
3. I tried to remove it from memory……	☐	☐	☐	☐
4. I had trouble falling asleep or staying asleep, because of pictures or thoughts about it that came into my mind……	☐	☐	☐	☐
5. I had waves of strong feelings about it…..	☐	☐	☐	☐
6. I had dreams about it…….	☐	☐	☐	☐
7. I stayed away from reminders of it……	☐	☐	☐	☐
8. I felt as if it was not real……	☐	☐	☐	☐
9. I tried not to talk about it……...	☐	☐	☐	☐
10. Pictures about it popped into my mind….	☐	☐	☐	☐
11. Other things kept making me think about it…….	☐	☐	☐	☐
12. I was aware that I had a lot of feelings about it, but I didn't deal with them…….	☐	☐	☐	☐
13. I tried not to think about it……	☐	☐	☐	☐
11. Any reminder brought back feelings about it…….	☐	☐	☐	☐
15. My feelings about it were kind of numb..	☐	☐	☐	☐

	Not at all	Rarely	Sometimes	Often
16. I avoided talking about cancer, even if it was on my mind…….	□	□	□	□
17. Thoughts about cancer popped into my mind……	□	□	□	□
18. I tried to avoid even saying the word "cancer"……	□	□	□	□

Appendix L: Bem Sex Role Inventory – Short Form

Listed below, you will find a number of personality characteristics. Use those characteristics to describe yourself. Check the box corresponding to how true each of these characteristics is. **Please do not leave any characteristic unmarked.**

	Never or almost never true	Usually not true	Sometimes, but infrequently true	Occasionally true	Often true	Usually true	Always or almost always true
1. Defend my own beliefs……	☐	☐	☐	☐	☐	☐	☐
2. Affectionate…	☐	☐	☐	☐	☐	☐	☐
3. Conscientious	☐	☐	☐	☐	☐	☐	☐
4. Independent…	☐	☐	☐	☐	☐	☐	☐
5. Sympathetic…	☐	☐	☐	☐	☐	☐	☐
6. Moody……	☐	☐	☐	☐	☐	☐	☐
7. Assertive……	☐	☐	☐	☐	☐	☐	☐
8. Sensitive to needs of others……..	☐	☐	☐	☐	☐	☐	☐
9. Reliable……	☐	☐	☐	☐	☐	☐	☐
10. Strong personality…	☐	☐	☐	☐	☐	☐	☐
11. Understanding							
12. Jealous…….	☐	☐	☐	☐	☐	☐	☐
13. Forceful……	☐	☐	☐	☐	☐	☐	☐
14. Compassionate……..	☐	☐	☐	☐	☐	☐	☐

Appendix L: (Continued)

	Never or almost never true	Usual-ly not true	Some-times, but infreq-uently true	Occasi onally true	Often true	Usually true	Always or almost always true
15. Truthful……	☐	☐	☐	☐	☐	☐	☐
16. Have leadership abilities….	☐	☐	☐	☐	☐	☐	☐
17. Eager to sooth hurt feelings….	☐	☐	☐	☐	☐	☐	☐
18. Secretive…	☐	☐	☐	☐	☐	☐	☐
19. Willing to take risks…	☐	☐	☐	☐	☐	☐	☐
20. Warm……	☐	☐	☐	☐	☐	☐	☐
21. Adaptable…	☐	☐	☐	☐	☐	☐	☐
22. Dominant…	☐	☐	☐	☐	☐	☐	☐
23. Tender……	☐	☐	☐	☐	☐	☐	☐
24. Conceited…	☐	☐	☐	☐	☐	☐	☐
25. Willing to take a stand	☐	☐	☐	☐	☐	☐	☐
26. Love child-ren	☐	☐	☐	☐	☐	☐	☐
27. Tactful……	☐	☐	☐	☐	☐	☐	☐
28. Aggressive…	☐	☐	☐	☐	☐	☐	☐
29. Gentle……	☐	☐	☐	☐	☐	☐	☐
30. Conventional	☐	☐	☐	☐	☐	☐	☐

Appendix M: Hot Flash Catastrophizing Scale (Baseline)

Instructions: The following statements describe different thoughts people have when they experience hot flashes. **A hot flash is a short-lived episode of flushing, sweating, and a sensation of heat. It is often accompanied by heart palpitations and a feeling of anxiety and may sometimes be followed by chills.** For each statement, please check the box that indicates ***how you imagine you might respond if you were to experience hot flashes***. Mark only one response for each item and try to answer every item.

	Never true	Some of the time true	One half of the time true	Most of the time true	All of the time true
1. I would feel like I just wanted to get up and run away.	☐	☐	☐	☐	☐
2. I would imagine the hot flashes becoming even more intense and exhausting.	☐	☐	☐	☐	☐
3. I would begin thinking of all the possible things that could go wrong in association with the hot flashes.	☐	☐	☐	☐	☐
4. I would tell myself that I don't think I could bear the hot flashes.	☐	☐	☐	☐	☐
5. I would find myself worrying about possibly dying.	☐	☐	☐	☐	☐
6. I would expect the worst.	☐	☐	☐	☐	☐
7. I would think that my hot flashes were pretty awful.	☐	☐	☐	☐	☐
8. I would find myself concentrating on how terrible the hot flashes actually felt.	☐	☐	☐	☐	☐
9. I would find it virtually impossible to keep my mind off my hot flashes	☐	☐	☐	☐	☐
10. I would begin to worry that something might be seriously wrong with me.	☐	☐	☐	☐	☐

Appendix N: Hot Flash Catastrophizing Scale (3 Month Follow-Up)

Instructions: The following statements describe different thoughts people have when they experience hot flashes. **If you have experienced hot flashes in the past two weeks, please respond to the items below. If you have NOT experienced hot flashes, you may go on to the next page.** For each statement, please check the box that indicates ***how you have felt in the past two weeks.*** Mark only one response for each item and try to answer every item.

	Never true	Some of the time true	One half of the time true	Most of the time true	All of the time true
1. I felt like I just wanted to get up and run away.	☐	☐	☐	☐	☐
2. I imagine the hot flashes becoming even more intense and exhausting.	☐	☐	☐	☐	☐
3. I think of all the possible things that could go wrong in association with the hot flashes.	☐	☐	☐	☐	☐
4. I tell myself that I can't bear the hot flashes.	☐	☐	☐	☐	☐
5. I find myself worrying about possibly dying.	☐	☐	☐	☐	☐
6. I expect the worst.	☐	☐	☐	☐	☐
7. I think that my hot flashes are pretty awful.	☐	☐	☐	☐	☐
8. I find myself concentrating on how terrible the hot flashes actually feel.	☐	☐	☐	☐	☐
9. I find it virtually impossible to keep my mind off my hot flashes	☐	☐	☐	☐	☐
10. I worry that something might be seriously wrong with me.	☐	☐	☐	☐	☐

Appendix O: Expanded Prostate Cancer Index Composite

This questionnaire is designed to measure Quality of Life in patients with Prostate cancer. To help us get the most accurate measurement, it is important that you answer all questions honestly and completely.

This section is about your urinary habits. Please consider ONLY THE LAST 4 WEEKS.

1. Over the **past 4 weeks**, how often have you leaked urine? (Check only one box)

   - ☐ More than once a day
   - ☐ About once a day
   - ☐ More than once a week
   - ☐ About once a week
   - ☐ Rarely or never

2. Which of the following best describes your urinary control **during the last 4 weeks**? (Check one box)

   - ☐ No urinary control whatsoever
   - ☐ Frequent dribbling
   - ☐ Occasional dribbling
   - ☐ Total control

3. How many pads or adult diapers <u>per day</u> did you usually use to control leakage **during the last 4 weeks**? (Check one box)

   - ☐ None
   - ☐ 1 pad per day
   - ☐ 2 pads per day
   - ☐ 3 or more pads per day

4. How big a problem, if any, has each of the following been for you **during the last 4 weeks**? (Check one box on each line)

	No problem	Very small problem	Small problem	Moderate problem	Big problem
a. Dripping or leaking urine……..	☐	☐	☐	☐	☐
b. Pain or burning on urination……	☐	☐	☐	☐	☐
c. Bleeding with urination……	☐	☐	☐	☐	☐

	No problem	Very small problem	Small problem	Moderate problem	Big problem
d. Weak urine stream Or incomplete emptying	□	□	□	□	□
e. Waking up to urinate……	□	□	□	□	□
f. Need to urinate frequently during the day...	□	□	□	□	□

5. Overall, how big a problem has your urinary function been for you during the last 4 weeks?

□ No problem
□ Very small problem
□ Small problem
□ Moderate problem
□ Big problem

This next section is about your bowel habits and abdominal pain. Please consider **ONLY THE LAST 4 WEEKS.**

6. How big a problem, if any, has each of the following been for you? (check one box on each line)

	No problem	Very small problem	Small problem	Moderate problem	Big problem
a. Urgency to have a bowel movement…..	□	□	□	□	□
b. Increased frequency of bowel movements	□	□	□	□	□
c. Watery bowel movements……..	□	□	□	□	□
d. Losing control of your stools…….	□	□	□	□	□
e. Bloody stools…….	□	□	□	□	□
f. Abdominal/pelvic/rectal pain……..	□	□	□	□	□

7. Overall, how big a problem have your bowel habits been for you **during the last 4 weeks**? (Check one box)

- ☐ No problem
- ☐ Very small problem
- ☐ Small problem
- ☐ Moderate problem
- ☐ Big problem

This next section is about your **current** sexual function and sexual satisfaction. Many of the questions are very personal, but they will help us understand the important issues that you face everyday. Remember, THIS SURVEY INFORMATION IS COMPLETETLY CONFIDENTIAL. Please answer honestly about **THE LAST 4 WEEKS ONLY.**

8. How would you rate each of the following **during the last 4 weeks**? (Check one box on each line)

	Very poor to none	Poor	Fair	Good	Very good
a. Your level of sexual desire?	☐	☐	☐	☐	☐
b. Your ability to have an erection	☐	☐	☐	☐	☐
c. Your ability to reach orgasm (climax)?	☐	☐	☐	☐	☐

9. How would you describe the usual QUALITY of your erections **during the last 4 weeks**? (Check one box)

- ☐ None at all
- ☐ Not firm enough for any sexual activity
- ☐ Firm enough for masturbation and foreplay only
- ☐ Firm enough for intercourse

10. How would you describe the FREQUENCY of your erections **during the last 4 weeks**? (Check one box)

- ☐ I NEVER had an erection when I wanted one
- ☐ I had an erection LESS THAN HALF the time I wanted one
- ☐ I had an erection ABOUT HALF the time I wanted one
- ☐ I had an erection MORE THAN HALF the time I wanted one
- ☐ I had en erection WHENEVER I wanted one

11. How often have you awakened in the morning or night with an erection **during the last 4 weeks**?

- ☐ Never
- ☐ Less than once a week
- ☐ About once a week
- ☐ Several times a week
- ☐ Daily

12. **During the last 4 weeks**, how often did you have <u>any</u> sexual activity?

- ☐ Not at all
- ☐ Less than once a week
- ☐ About once a week
- ☐ Several times a week
- ☐ Daily

13. **During the last 4 weeks**, how often did you have sexual intercourse?

- ☐ Not at all
- ☐ Less than once a week
- ☐ About once a week
- ☐ Several times a week
- ☐ Daily

14. Overall, how would you rate your ability to function sexually **during the last 4 weeks**? (Check one box)

- ☐ Very poor
- ☐ Poor
- ☐ Fair
- ☐ Good
- ☐ Very good

15. How big a problem **during the last 4 weeks**, if any, has each of the following been for you? (Check one box on each line)

	No problem	Very small problem	Small problem	Moderate problem	Big problem
a. Your level of sexual desire……..	☐	☐	☐	☐	☐
b. Your ability to have an erection…….	☐	☐	☐	☐	☐

	No problem	Very small problem	Small problem	Moderate problem	Big problem
c. Your ability to reach orgasm……..	☐	☐	☐	☐	☐

16. Overall, how big a problem has your sexual function or lack of sexual function been for you **during the last 4 weeks**? (Check one box)

- ☐ No problem
- ☐ Very small problem
- ☐ Small Problem
- ☐ Moderate problem
- ☐ Big problem

This next section is about your hormonal function. Please consider **ONLY THE LAST 4 WEEKS.**

17. **Over the last 4 weeks**, how often have you experienced hot flashes? (Check one box)

- ☐ More than once a day
- ☐ About once a day
- ☐ More than once a week
- ☐ About once a week
- ☐ Rarely or never

18. How often have you had breast tenderness **during the last 4 weeks**? (Check one box)

- ☐ More than once a day
- ☐ About once a day
- ☐ More than once a week
- ☐ About once a week
- ☐ Rarely or never

19. **During the last 4 weeks**, how often have you felt depressed? (Check one box)

- ☐ More than once a day
- ☐ About once a day
- ☐ More than once a week
- ☐ About once a week
- ☐ Rarely or never

20. **During the last 4 weeks**, how often have you felt a lack of energy? (Check one box)

- ☐ More than once a day
- ☐ About once a day
- ☐ More than once a week
- ☐ About once a week
- ☐ Rarely or never

21. How much change in your weight have you experienced **during the last 4 weeks**, if any? (Check one box)

- ☐ Gained 10 pounds or more
- ☐ Gained less than 10 pounds
- ☐ No change in weight
- ☐ Lost less than 10 pounds
- ☐ Lost 10 pounds or more

22. How big a problem, **during the last 4 weeks**, if any, has each of the following been for you? (Check one box on each line)

	No problem	Very small problem	Small problem	Moderate problem	Big problem
a. Hot flashes ……	☐	☐	☐	☐	☐
b.					
b. Breast tenderness/ enlargement……..	☐	☐	☐	☐	☐
c. Loss of body hair…..	☐	☐	☐	☐	☐
d. Feeling depressed….	☐	☐	☐	☐	☐
e. Lack of energy…….	☐	☐	☐	☐	☐
f. Change in body weight	☐	☐	☐	☐	☐

About the Author

Erin Winters graduated summa cum laude with a Bachelor's degree in Psychology from James Madison University in 1999. After completing her undergraduate studies, she went on to continue her education in the Clinical Psychology program at the University of South Florida (USF). She received her Master's degree from USF in 2002 after successfully defending her thesis entitled, "Development and Validation of the Stress-Related Growth Questionnaire for Persons with Cancer." In keeping with her interest in psychosocial oncology, she remained active in several research projects investigating the psychological impact of various forms of cancer treatment. She received her Ph.D. in Clinical Psychology from USF in 2006 and continues to conduct both research and clinical work in the field of health psychology with the VA Boston Healthcare System.