Cancer Specific Stress and Insomnia Severity
among
Breast Cancer Patients
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Abstract
Cancer Specific Stress and Insomnia Severity
Among Breast Cancer Patients
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Objective: Living with cancer can lead to significant stress that impacts multiple dimensions of an individual’s life (Dunn et al., 2006). Insomnia symptoms are one such adverse consequence of stress related to cancer (Palesh et al., 2006). This is particularly apparent among individuals with breast cancer, with an estimated 37% to 63% endorsing symptoms of insomnia (Davidson, MacLean, Brundage, & Schulze, 2002, Fortner, Stepanski, Wang, Kasprowicz, & Durrence, 2002; Koopman, Nouriani, Erickson, Anupindi, Butler, Bachmann, et al., 2002; Savard, Simard, Blanchet, Ivers, & Morin, 2001). Many predisposing, precipitating, and perpetuating factors are likely to contribute to insomnia among individuals with breast cancer (Savard & Morin, 2001). Additionally, mindfulness has been proposed as having an association with insomnia and related factors (Lundh, 2000). In an attempt to develop a more in depth understanding of specific predisposing, precipitating, and perpetuating factors associated with insomnia among breast cancer patients, a survey study was conducted. Methods: Fifty six breast cancer patients receiving treatment at The Cancer Institute of New Jersey at Cooper University Hospital were recruited to participate in this survey study. Results: Forty eight percent of breast cancer patients reported a clinically significant level of insomnia symptoms. A history of sleep difficulties was the only predisposing factor that accounted for a significant amount of variance in insomnia symptoms. In reference to precipitating
factors, cancer specific stress contributed to the variance in insomnia symptoms above and beyond a history of sleep difficulties. Dysfunctional beliefs and attitudes about sleep did not emerge as a significant perpetuating factor. Mindfulness was not found to moderate relationships involving insomnia symptoms among breast cancer patients.

**Discussion**: Findings from the present study suggest that insomnia symptoms are prevalent among individuals with breast cancer. In addition, specific predisposing (history of sleep difficulties) and precipitating (cancer specific stress) factors were found to predict insomnia symptoms among our sample. Given that the relationship between cancer specific stress and insomnia symptoms among individuals with breast cancer is a novel finding, research should aim to confirm results and explore this unique relationship.
CHAPTER 1: INTRODUCTION

Cancer is a widespread health concern that affects millions of individuals in the United Stated (American Cancer Society, 2006). Although a diagnosis of cancer was once synonymous with a grim prognosis, medical advances have allowed individuals to survive far beyond once held expectations. As survivorship increases, more individuals are living with cancer, and therefore, living with the stress of cancer. Not surprisingly, cancer can significantly reduce an individual’s quality of life (QoL; Dunn et al., 2006). Individuals with cancer have higher levels of stress (Kreitler, Peleg, & Ehrenfeld, 2007), including the increase in stress that is specifically associated with cancer, such as the cancer diagnosis and treatments implemented to treat cancer. In addition to cancer specific stress (Parker Baile, Moor, & Cohen, 2003), levels of general perceived stress (Kreitler et al., 2007), psychological variables such as depression and anxiety (Frick, Tyroller, & Panzer, 2006), and demographic variables such as age (Parker et al., 2003), have been associated with QoL among individuals with cancer. Sleep quality has also been identified as a correlate of QoL among cancer patients, with several studies finding that individuals with cancer who reported poorer sleep quality were more likely to indicate poorer QoL (Fortner, Stepanski, Wang, Kasprowicz, & Durrence, 2002; for review, see Kvale & Shuster, 2006; Schubert et al., 2002). Given this relationship, an understanding of insomnia and factors that contribute to sleep difficulties may aid in developing ways to understand and potentially improve the overall well-being of individuals with cancer.

The well established relationship between compromised sleep and decreased QoL (Fortner et al., 2002; for review, see Kvale & Shuster, 2006; Mystakidou et al., 2007;
Schubert et al., 2002) further highlights the importance of investigating sleep among individuals with cancer. In addition, the prevalence of insomnia (difficulty initiating sleep, maintaining sleep or nonrestorative sleep; DSM-IV-TR; American Psychiatric Association, 2000; Edinger et al., 2004) is higher among individuals with cancer, with an estimated 19% to 63% of individuals with cancer reporting insomnia or insomnia symptoms (for review, see Kvale & Shuster, 2006) compared to an estimated 30% to 48% of the general population (Ohayon, 2002). The prevalence of insomnia symptoms among individuals with breast cancer specifically is estimated to be 37% to 63% (Davidson, MacLean, Brundage, & Schulze, 2002; Fortner et al., 2002; Koopman et al., 2002; Savard, Simard, Blanchet, Ivers, & Morin, 2001). When Davidson and colleagues (2002) compared prevalence of insomnia symptoms by type of cancer, individuals with breast and lung cancer endorsed significantly more symptoms of insomnia relative to individuals with other forms of cancer. Given that breast cancer is the most common non-skin cancer among women in the United States (Ries et al., 2008) and insomnia symptoms among individuals with breast cancer is prevalent (Davidson et al., 2002; Fortner et al., 2002; Koopman et al., 2002; Savard et al., 2001) an investigation into symptoms of insomnia among individuals with breast cancer is fitting. However, only a few studies have systematically or empirically explored insomnia symptoms among individuals with breast cancer (Bardwell et al., 2006; Savard et al., 2001).

In one theoretical article, Savard and Morin (2001) explored factors associated with insomnia among individuals with a variety of cancer types. In order to conceptualize the psychological and physiological factors associated with the onset and maintenance of insomnia among individuals with cancer, Savard and Morin (2001)
utilized the three-factor model proposed by Spielman and colleagues (Spielman, Caruso, & Glovinsky, 1987; Spielman & Glovinsky, 1991). This model was originally developed to provide a foundation for conceptualizing insomnia within the general population (for review, see Perlis, Jungquist, Smith, & Posner, 2005). According to the three-factor model, predisposing factors are those that increase the likelihood of developing insomnia, such as gender, age, and psychological variables. Precipitating factor(s), such as the stress associated with cancer, bring about an episode of insomnia. Perpetuating factors such as dysfunctional beliefs and attitudes about sleep, maintain the insomnia. The interplay of factors contributes to the development and maintenance of insomnia (Spielman et al., 1987; Spielman & Glovinsky, 1991). For example, having a history of depression may predispose an individual to insomnia, stress associated with having breast cancer may precipitate an acute insomnia, and dysfunctional beliefs and attitudes about sleep may perpetuate insomnia, leading to a chronic condition. Together, these factors create a cycle of dysfunction. Savard and Morin (2001) applied the three-factor model developed by Spielman and colleagues (1987; 1991) to individuals with cancer, to better understand insomnia within this population. Therefore, a better understanding of cancer specific stress is important in understanding insomnia, including symptoms of insomnia, within a breast cancer population. Exploring which unique factors are associated with insomnia symptoms, may aid in developing a better understanding of insomnia among individuals with breast cancer.

In addition to the three-factor model proposed by Spielman and colleagues (Spielman, Caruso, & Glovinsky, 1987; Spielman & Glovinsky, 1991), Lundh (2000; 2005) presented a model of insomnia that includes aspects of mindfulness. The concepts
of mindfulness, that is - when thoughts and experiences are brought into the present moment in a nonjudgmental fashion (Baer, 2003; Hayes, Follette, & Linehan, 2004), are proposed to have a theoretical relationship with insomnia (Lundh, 2000; Lundh, 2005). Lundh’s (2000; 2005) theories have an underpinning in Acceptance and Commitment Therapy theory, a mindfulness based theory. Acceptance and Commitment Therapy theory provides a shift in how one views psychopathology and functioning, incorporating aspects of mindfulness into the formulation. Based on this model (Lundh, 2000; Lundh 2005), insomnia is incompatible with mindfulness (Baer, 2003; Hayes, Follette, & Linehan, 2004). Lundh (2005) suggests that mindfulness enables cognitive deactivation thereby decreasing cognitive rumination and arousal which allow for better sleep quality (i.e. less likelihood of insomnia symptoms). Moreover, the level of mindfulness would theoretically influence the impact that stress (precipitating factor) has on an individual. If one were to have an accepting and nonjudgmental disposition, theoretically, one would have less of a psychological and physiological response to the stressor. Given that cancer specific stress is likely to be at the fulcrum of precipitating insomnia within a cancer population, placing an individual who is predisposed into a state of acute insomnia (Savard & Morin, 2001; Spielman et al., 1987; Spielman & Glovinsky, 1991), the relationship between mindfulness, symptoms of insomnia, and cancer specific stress is of interest.

Research in Mindfulness-Based Stress Reduction (MBSR) suggests that greater mindfulness is associated with decreased stress and better sleep quality, specifically among cancer populations to include breast cancer populations (Carlson & Garland, 2005; Carlson, Speca, Patel, & Goodey, 2003). Mindfulness-Based Stress Reduction
interventions have found that mindfulness based treatment decreases stress and improves sleep among cancer patients (For review, see Smith, 2005) suggesting further exploration into these relationships is theoretically appropriate.

In the context of cancer, the hypothesis that mindfulness is related to insomnia has been indirectly evaluated. Several studies among cancer patients, including individuals with breast cancer, found that sleep quality improved following completion of MBSR interventions (Carlson & Garland, 2005; Carlson et al., 2003). Mindfulness-Based Stress Reduction, like ACT, focuses on facilitating the practice of mindfulness (for review, see Bear, 2003). Moreover, MBSR is a structured treatment modality utilized to decrease stress, by means of psycho-education, mindfulness mediation, and hatha yoga (Kabat-Zinn et al., 1992). The treatment normally lasts 8 weeks and often includes one full day retreat (Kabat-Zinn et al., 1992). Despite the primary goal being stress reduction, MBSR has been shown to be efficacious in the reduction of numerous symptoms for a variety of maladies among individuals with medical conditions such as fibromyalgia and cancer (for review, see Baer, 2003).

Several studies suggest that MBSR improves sleep quality among individuals with cancer (Carlson & Garland, 2005; Carlson et al., 2003). Interestingly, the mechanism of change suggested in Carlson and colleagues studies (2003; 2005) has not been empirically evaluated in reference to the relationship between mindfulness, stress related to cancer, and symptoms of insomnia. Further investigations are required to identify whether mindfulness is a factor directly related to stress and symptoms of insomnia. Increased engagement in mindfulness practice is associated with improved sleep and decreased level of stress (Carlson & Garland, 2005; Carlson et al., 2003; Ong,
Shapiro, & Manber, 2008) potentially via cognitive deactivation (Lundh, 2005). However, MBSR studies look at the practice of mindfulness meditation and not the trait of mindfulness that is proposed as a potential factor associated with insomnia by Lundh (2005). In addition, other factors in MBSR treatments utilized in the aforementioned studies by Carlson and colleagues (2003, 2005), such as participation in a study or psycho-education, may be attributable to improvements in sleep quality (i.e. decrease in symptoms associated with insomnia). Given that Carlson and colleagues (2003; 2005) did not conduct randomized controlled trials, additional factors such as regression to the mean, that is – the propensity for extreme scores to regress toward the mean of a distribution on second administration of any measure (Kazdin, 2003) cannot be ruled out. Moreover, one MBSR study that utilized a control group design did not find a difference in sleep quality between breast cancer patients in a MBSR intervention group relative to an attention placebo group (Shapiro, Bootzin, Figueredo, Lopez, & Schwartz, 2003), challenging the assumption that the trait of mindfulness is a primary factor strongly associated with sleep parameters.

The purpose of this study is to expand upon previous findings by exploring the interrelationship between stress associated with cancer and symptoms of insomnia among an outpatient breast cancer population. Additionally, this study aimed to extend upon previous research by conducting a novel and direct exploration into the relationship between cancer specific stress, symptoms of insomnia, and the trait of mindfulness, independent of the practice of mindfulness exercises. Our first goal was to explore the severity of insomnia symptoms among an outpatient breast cancer population given that few studies have quantitatively done so (Aim I). Next we aimed to investigate the unique
factors that predispose individuals with breast cancer to increased symptoms of insomnia (Aim II), the degree to which cancer specific stress precipitates insomnia symptoms (Aim III), and factors that perpetuate (dysfunctional beliefs and attitudes about sleep) symptoms of insomnia (Aim IV). Lastly we aimed to evaluate the role of mindfulness in potentially moderating the relationships between cancer specific stress and insomnia symptoms (Aim V), and beliefs and attitudes about sleep and insomnia symptoms (Aim VI).

A review of literature pertinent to the present study will be provided. A brief background on cancer and QoL is presented to highlight the importance in understanding insomnia symptoms among individuals with breast cancer. Next, research on cancer and sleep is delineated, with a focus on breast cancer research. Thereafter, a brief overview of insomnia is provided, given the foundation for the present study is derived, in part, from insomnia research conducted within nonmedical populations. Subsequently, an overview of insomnia in the context of breast cancer is discussed. Then, background on mindfulness and ACT theories is presented, in addition to the application of ACT constructs (i.e. mindfulness) to symptoms of insomnia in the context of cancer. Following the study’s rationale, methods for the present study are provided. Lastly, results of the study and a discussion of the findings are presented.
CHAPTER 2: LITERATURE REVIEW

Cancer

Cancer is a term used to describe a group of diseases characterized by the uncontrollable growth of abnormal cells. This group of diseases is a widespread health issue, affecting a large portion of the population. The National Cancer Institute estimated that 10.1 million individuals in the United States were living with cancer or had a history of cancer (were in remission) in the year 2002. Moreover, almost 1,400,000 new cases of cancer were estimated to be diagnosed in the year 2006, with the lifetime risk for developing cancer being one in every two men, and one in every three women (American Cancer Society, 2006). Breast cancer is the most common non-skin cancer among women in the United States. According to the Surveillance Epidemiology and End Results (SEER) report it is estimated that 182,460 women were diagnosed with breast cancer in the year 2008. Moreover, the lifetime risk among women for developing breast cancer is estimated to be one in every eight (Ries et al., 2008).

As cancer treatments become more advanced and effective, survival rates improve. From 1974-1976 the five year survival rate for all cancers was 50%, however, this rate improved to 65% between the years of 1995-2001 (American Cancer Society, 2006). The overall five year survival rate for 1996-2004 is estimated at 88.7% for individuals with breast cancer (Ries et al., 2008). Despite improvements in treatment leading to better medical prognoses, cancer continues to be a significant stressor that impacts countless aspects of a person’s life. Moreover, breast cancer appears to bring forth the greatest level of stress relative to other cancer diagnoses (for review, see Shapiro et al., 2001). In a review of the literature, Shapiro and colleagues (2001) found
that numerous factors related to breast cancer lead to stress including the possibility of recurrence and threat to life. In addition, factors unique to breast cancer include the numerous challenges to body images, sexuality, fertility, and one’s overall sense of femininity (e.g. breast surgery, hair loss, early menopause). Given that breast cancer is a significant stressor (e.g. diagnosis, treatment, recurrence, employment) and psychosocial variables such as stress are associated with QoL (Kreitle et al., 2007; Shapiro et al., 2001), it is not surprising that individuals with cancer are at risk for developing poorer QoL (Dunn et al., 2006).

Cancer and Quality of Life

The physiological and psychological effects of breast cancer and associated treatments implemented are noteworthy, and linked with decreased QoL, which more specifically refers to a number of factors including an individual’s subjective general health, physical functioning, physical symptoms, emotional functioning, cognitive functioning, role functioning, social well-being and functioning, sexual functioning, and existential issues (Fayers & Machin, 2000). Research has demonstrated a decrease in overall QoL among individuals with cancer (Dunn et al., 2006). Moreover, individuals with cancer are more likely to report poorer QoL, relative to individuals without cancer (Thome, Dykes, & Hallberg, 2004). Among individuals with cancer including breast cancer, elevated levels of perceived stress and distress (Kreitler et al., 2007; Shapiro et al., 2001) and symptoms of anxiety and depression (Frick et al., 2006; Shapiro et al, 2001) are often associated with poorer QoL.

Demographic variables are also strongly and differentially associated with QoL among individuals with cancer (Mystakidou et al., 2007). In reference to gender, women
consistently report poorer QoL, relative to men (Parker et al., 2003; Thome et al., 2004). Studies have also suggested that being happily married (Shapiro et al., 2001), is associated with enhanced QoL (Parker et al., 2003). Such findings support previous research suggesting that social support positively influences QoL among individuals with cancer (Houck, Avis, Gallant, Fuller, & Goodman, 1999). In addition, having a higher education is associated with enhanced QoL among cancer patients (Parker et al., 2003). The relationship between education and QoL among breast cancer patients was supported by Janz and colleagues (2005), who found higher education to buffer an association between receiving chemotherapy and poorer QoL. One may argue that individuals with lower education have difficulty understanding and communicating about complex medical information, thereby causing stress. The relationship between age and QoL is not well understood. While some researchers have found a relationship between older age and poorer QoL (Parker et al., 2003; Thome et al., 2004), a study conducted among women with breast cancer, found that younger women reported poorer QoL on several subscales (emotional and social functioning, body image, and future prospective) relative to women who were over 70 years of age (Janz et al., 2005). Therefore, the relationship between age and QoL may be unique among breast cancer patients relative to other cancer populations. Perhaps lower QoL among younger individuals with breast cancer is because of concerns surrounding infertility, recurrence, sexuality, and physical changes.

Surprisingly, some researchers have found that certain medically-related variables associated with one’s cancer, such as stage of cancer, are associated with QoL to a lesser degree relative to other variables such as demographic variables (Parker et al., 2003). Factors such as time lapse since diagnosis, recurrence status, treatments, and stage of
disease are not strongly associated with QoL (Janz et al., 2005; Parker et al., 2003). However, specific to breast cancer patients, one study found that women who received breast conserving surgery, opposed to mastectomy with reconstruction, reported higher QoL on the body image domain (Janz et al., 2005). Perhaps, women who receive mastectomies with reconstruction as opposed to breast conserving surgery experience more drastic changes to their physical appearance prior to the reconstruction.

**Psychological Factors**

Emotional functioning, such as depression and anxiety, is a component of QoL that is found to have a strong interrelationship among individuals with breast cancer (Shapiro et al., 2003). Parker and colleagues (2003) found that among a heterogeneous sample of individuals with cancer, being older and having better social support correlated with lower levels of anxiety. In reference to depression, cancer patients who were married, older, and had better social support were less likely to indicate depressive symptoms (Parker et al., 2003).

Understanding factors associated with QoL among breast cancer patients can aid in developing ways to enhance well-being. Given that more individuals are living longer with breast cancer, and/or surviving cancer, researchers are developing ways to aid individuals in living longer while maintaining a suitable QoL. Such research has lead to findings that sleep quality and QoL are related constructs (Fortner et al., 2002; for review, see Kvale & Shuster, 2006; Mystakidou et al., 2007; Schubert et al., 2002). Therefore, an understanding of sleep patterns and sleep dysfunction among individuals with breast cancer may aid in developing new ways to improve QoL among individuals with breast cancer in the future.
Cancer and Sleep Quality

The relationship between sleep quality and QoL is important, given the high prevalence of poor sleep quality and insomnia among individuals with cancer, including breast cancer (Engstrom, Strohl, Rose, Lewandowski, & Stefanek, 1999; Frontner et al., 2002; for review, see Kvale & Shuster, 2006; Mystakidou et al., 2007; Savard et al., 2001). Indeed, sleep quality and QoL are interrelated among individuals with cancer, including breast cancer patients (Fortner et al., 2002; for review, see Kvale & Shuster, 2006; Mystakidou et al., 2007; Schubert et al., 2002). Among a sample of breast cancer patients, poor sleep quality correlated with several constructs including lower ability to function generally, more physical pain, less energy for daily tasks, and more psychological difficulties (Fortner et al., 2002).

Insomnia

Due to inconsistent methods utilized by researchers, epidemiological studies yield variable information in reference to the prevalence of insomnia (difficulty initiating sleep, maintaining sleep or nonrestorative sleep; DSM-IV-TR; American Psychiatric Association, 2000; Edinger et al., 2004) among individuals with cancer. While some studies utilize specific research criteria to quantify insomnia, others do not use quantitative criteria (e.g. recommended cutoffs for sleep latency, standardized measures), and rely on unstandardized measures. The variability in measurement and criteria has lead to a vague estimate of insomnia symptoms prevalence among individuals with cancer. Despite the specific criteria being utilized, research suggests that an estimated 19% to 63% of individuals with cancer report insomnia (for review, see Kvale & Shuster, 2006). The prevalence of insomnia symptoms among breast cancer patients ranges from
37% to 63% (Davidson et al., 2002; Fortner et al., 2002; Koopman et al., 2002). Insomnia appears to be particularly high among breast cancer patients. Davidson and colleagues (2002) found that prevalence of insomnia symptoms was highest among individuals with breast and lung cancer relative to individuals with other forms of cancer. Moreover, when individuals with breast cancer were compared to healthy controls, breast cancer patients were found to have significantly more sleep disturbances (Carlson, Campbell, Garland, & Grossman, 2007). Estimates of 58% to 75% of cancer patients report symptoms of insomnia that are chronic (lasting greater than 6 months), with the duration of insomnia symptoms ranging on average from 19 months to 48 months (Davidson et al., 2002; Savard et al., 2001). Such findings highlight the importance in addressing and understanding symptoms of insomnia among individuals with breast cancer.

Defining Insomnia

The term insomnia refers to a perception or complaint of insufficient sleep due to difficulty falling asleep, frequent awakenings throughout the night with difficulty returning to sleep, waking up too early in the morning, or unrefreshing sleep (National Heart, Lung, and Blood Institute, 1995). The nighttime symptoms of insomnia coexist with daytime consequences such as sleepiness, fatigue, irritability, or diminished concentration (National Heart, Lung, and Blood Institute, 1995).

Primary versus Secondary versus Comorbid Insomnias

Insomnia can present as a symptom secondary to a medical condition (e.g. degenerative neurological conditions, endocrine conditions), present as a primary disorder (Harvey, 2001), or present as a comorbid disorder (Lichstein, 2006).
Categorization in large part depends on the conceptualization of the etiology of the insomnia, and the conceptualization of insomnia as a disorder versus a symptom.

Primary insomnia is conceptualized as being the central problem for the individual, as opposed to the byproduct of a medical or psychological disorder (DSM-IV-TR; American Psychiatric Association, 2000). Additionally, it is conceptualized as occurring on an independent course from other disorders. In order to meet DSM-IV-TR criteria for primary insomnia disorder, an individual must have a predominant complaint of insufficient sleep due to difficulty falling asleep, frequent awakenings throughout the night with difficulty returning to sleep, waking up too early in the morning, or unrefreshing sleep, lasting for at least one month (DSM-IV-TR; American Psychiatric Association, 2000; for a review, see Harvey, 2001). The American Academy of Sleep Medicine (AASM) utilizes more explicit criteria for a diagnosis of primary insomnia by requiring the presence of at least one daytime symptom in association with the nighttime criteria also endorsed by DSM-IV-TR (Edinger et al., 2004). Furthermore, Lichstein and colleagues (2003) composed quantitative criteria for insomnia that enables frequency and duration to be incorporated as criteria. Quantitative criteria for insomnia includes a sleep onset latency or wake time after sleep onset of greater than or equal to 31 minutes, occurring at least three nights a week, for at least 6 months (Lichstein, Durrence, Taylor, Bush, & Riedel, 2003). According to the International Classification of Sleep Disorder, Revised (ICSD-R) produced by the American Academy of Sleep Medicine, insomnia lasting less than one month is acute, insomnia lasting from one month to six months is subacute, and insomnia lasting longer than six months is chronic (ICSD-R; American Academy of Sleep Medicine, 2002).
Insomnia that is *secondary* to a medical disorder is conceptualized as a symptom of another condition, as opposed to a primary disorder (DSM-IV-TR; American Psychiatric Association, 2000; Harvey, 2001). Therefore, insomnia is secondary when the etiology of insomnia is attributable to a physiological change from a medical condition (e.g. degenerative neurological disorders, endocrine conditions). Although the onset or treatment of some conditions such as cancer may cause a secondary insomnia, when the insomnia is maintained and becomes chronic, additional factors are likely associated with the course of insomnia. For example, medications for certain types of cancer treatment may precipitate an acute insomnia by increasing physiological arousal, but additional factors such as behaviors or cognitions in reaction to the insomnia (trying to catch up on sleep, take naps, accepting the changes in sleep) may be what maintains the cycle of insomnia following completion of the medication. In such situations, Lichstein (2006) proposes that the insomnia is better conceptualized as comorbid insomnia, given that the cancer becomes one of many factors associated with the insomnia. Comorbid insomnia refers to an insomnia that coexists with another condition (Lichstein, 2006). In the context of comorbid insomnia, the insomnia and other condition fail to have an explicit physiological relationship or a continuing causal nature, but do coexist. The relationship between the two conditions may change throughout the course, but they remain associated with one another (Lichstein, 2006). Given that cancer is conceptualized as a stressor often associated with the onset of insomnia, and may or may not be the means of a physiological shift causing insomnia, insomnia in the context of cancer will be conceptualized as comorbid insomnia. Therefore, in the presence of predisposing factors (e.g. gender, age) the physiological and psychological stress of
cancer can precipitate insomnia, while factors such as beliefs about sleep can perpetuate insomnia into a chronic course. In light of the often chronic nature of insomnia among cancer populations (Davidson, 2002), this categorization is deemed appropriate. In an article evaluating insomnia in the context of cancer, Savard and Morin (2001) recommended diagnostic criteria for insomnia disorder that includes ICSD and DSM-IV-TR criteria. This criteria is the same as that for primary insomnia, but has been deemed appropriate for applying to individuals with comorbid cancer and insomnia. Please refer to Table 1 for a visual depiction of criteria for conceptualizing comorbid insomnia in the context of cancer.

**Three-factor Model**

Insomnia is associated with numerous psychological and physiological precipitants (Espie, 2002; Harvey, 2002). The three-factor model developed by Spielman and colleagues (1987; 1991) demonstrates the theoretical inner workings of psychological and physiological factors in conceptualizing the development and maintenance of insomnia (for a review, see Perlis et al., 2005; Spielman et al., 1987; Spielman & Glovinsky, 1991). Within this model, predisposing, precipitating, and perpetuating factors contribute to the development and continuance of insomnia. Predisposing factors are physiological or psychological factors that put an individual at an increased risk of experiencing insomnia, such as, gender, hyperarousal as a trait, or a disposition towards ruminative thought processes. Precipitating factors are acute psychological or physiological stressors such as an illness (e.g. cancer; Savard & Morin, 2001), divorce, or travel. Together, the precipitating and predisposing factors contribute to the onset of acute insomnia. The perpetuating factors maintain insomnia, thereby contributing to the
development of insomnia from an acute form to a more chronic form. Maladaptive thoughts and behaviors are thought to be at the core of perpetuating factors, such as staying in bed for too long without falling asleep or believing eight hours of sleep is always necessary to feel rested (Morin, Blais, & Savard, 2002; Perlis et al., 2005; Spielman et al., 1987; Spielman & Glovinsky, 1991).

Three-factors in the Context of Breast Cancer

The three-factor model can be utilized to understand comorbid insomnia as it occurs in the presence of breast cancer. In review of research, Savard and Morin (2001) delineated possible risk factors within the three-factor model in relation to cancer patients’ experience of insomnia. These factors, in addition to other factors derived from additional literature focusing on breast cancer patients, are reviewed below. A visual depiction of the present studies proposed three-factor model of insomnia in relation to breast cancer is provided in Figure 1.

Predisposing Factors. Fundamental factors that increase the likelihood of an individual developing insomnia among cancer populations and the general population include heightened cognitive and physiological arousal, gender, age, history of sleep difficulties, and the presence of a psychological disorder (Morin, 1993; for review, see Savard & Morin, 2001).

An additional predisposing factor that is unique to cancer is the type of cancer diagnosis an individual has (Davidson et al., 2002). Individuals with certain types of cancer are more likely to develop symptoms associated with insomnia. Higher levels of insomnia have been demonstrated among individuals with breast and lung cancer, relative to other cancer diagnoses (Davidson et al., 2002).
Engstrom and colleagues (1999) 45% of outpatients with breast or lung cancer reported sleep difficulties occurring most nights of the week. Davidson and colleagues (2002) also found breast and lung cancer patients to endorse insomnia at a higher rate relative to individuals with other forms of cancer. However, among the individuals with breast or lung cancer, the type of diagnosis (breast or lung) did not predispose an individual to a greater degree (Engstrom et al., 1999). One reason why breast cancer patients in particular may have a higher prevalence of insomnia is that individuals with breast cancer report the highest level of stress relative to other cancer diagnoses (for review, see Shapiro et al., 2001). Perhaps the higher level of stress among individuals with breast cancer is attributable to unique issues associated with breast cancer treatment such as changes related to body image, sexuality, fertility, and one’s overall sense of femininity (e.g. breast surgery, hair loss, early menopause).

Similar to findings among the general population (National Heart, Lung, and Blood Institute, 1995; Sateia, Doghramji, Hauri, & Morin, 2000), higher rates of insomnia are found among women relative to men (Hugel, Elleshaw, Cook, Skinner, & Irvine, 2004) among cancer populations. Among women, post-menopausal and perimenopausal women are more likely to experience insomnia than pre-menopausal women (National Heart, Lung, and Blood Institute, 1995; National Sleep Foundation, 1998). This may in part be attributable to vasomotor symptoms, given night sweats have been associated with insomnia among breast cancer patients (Bardwell et al., 2008), and early menopause can be a consequence of treatment. However, some studies have found that among breast cancer patients, physiological markers such as endocrine and
sympathetic nervous system function, fail to correlate with psychological indices including sleep (Carlson et al., 2007).

Although increased age has been demonstrated as a predisposing factor among the general population (National Heart, Lung, and Blood Institute, 1995; Sateia et al., 2000), findings in reference to this association among individual with cancer, and more specifically breast cancer, is inconsistent. Interestingly, age does not consistently predict QoL among cancer patients (Janz et al., 2005; Parker et al., 2003; Thome et al., 2004). Likewise, age does not consistently predict sleep quality among individuals with cancer (Davidson et al., 2002; Engstrom et al., 1999). While some have found an inverse relationship between age and insomnia among individuals with cancer, with younger age increasing the likelihood of insomnia (Davidson et al., 2002), others have found older age as a predisposing factor in developing insomnia (Engstrom et al., 1999). The only noteworthy difference observed between these two studies was that Davidson and colleagues (2002) utilized a significantly larger sample size relative to Engstrom and colleagues (1999). However, most recently, Bardwell and colleagues (2008) did not find any relationship between insomnia and age among a sample of 2,645 women treated for breast cancer.

Psychological disorders and their associated symptoms commonly correlate with insomnia among the general population, heterogeneous cancer populations, and breast cancer populations (Bardwell et al., 2008; Espie, 2002; Ford & Kamero, 1989; Hoehn-Saric, 1981; Roth & Roehrs, 2003; Thase, 2005). Moreover, the most common comorbidity found among non-medically ill populations with insomnia is a psychological disorder, with one half of patients with insomnia having a primary psychological disorder
(Roth & Roehrs, 2003; Thase, 2005). Anxiety (Hoehn-Saric, 1981) and depression (Espie, 2002; Ford & Kamero, 1989; Perlis, Giles, Buysse, Tu, & Kupfer, 1997; Roth & Roehrs, 2003) are among the most notable psychological correlates of insomnia among the general population. Davidson and colleagues (2002) found mood to correlate with insomnia among both heterogeneous cancer populations and the general population, with low or variable mood predisposing an individual to develop insomnia. Moreover, depression has been demonstrated as a significant predictor of insomnia (Bardwell et al., 2008) and sleep disturbances (Koopman et al., 2002; Palesh et al., 2007) among women treated for breast cancer. Additionally, Carlson and colleagues (2007) found that breast cancer patients reported higher levels of depression, anxiety, and sleep difficulties, relative to healthy controls. Therefore, it is likely that the relationship between psychological disorders and insomnia is similar among the general population and breast cancer populations. In addition to mood disorders, a previous diagnosis of a sleep disorder is predictive of developing insomnia among individuals with cancer (Engstrom et al., 1999). Savard and Morin (2001) concur, proposing that a history of insomnia is a potential predisposing factor associated with the inception of insomnia following a diagnosis of cancer.

Savard and Morin (2001) proposed that the trait of hyperarousal is a probable predisposing factor of insomnia for individuals with cancer; however this has not been directly investigated. Research among the general population consistently finds an association between cognitive hyperarousal (an overactive mind) and insomnia (Espie, 2001). An individual with heightened cognitive arousal may lie in bed ruminating about many engaging thoughts (will my cancer metastasize, will I be sleepy tomorrow, will I
ever get to bed, if I continue to have poor sleep will my cancer return). Increased cognitive activity often coexists with physiological arousal, further fueling a reaction to a stressor (precipitating factor), thereby contributing to poorer sleep quality. Given such findings, individuals who are more hyperaroused are more likely to develop insomnia. However, one study investigating sleep quality failed to find a difference in sympathetic nervous system function between individuals with breast cancer and healthy controls (Carlson et al., 2007). Such findings challenge the significance of physiological factors in predisposing an individual to insomnia. Additionally, independent of precipitating factors, hyperarousal alone is unlikely to bring about insomnia (for review, see Espie, 2001).

Precipitating Factors. Stressful life events (e.g. medical illness, loss of a loved one, traumatic event) are often the precipitant of sleep difficulties, including insomnia, when in the presence of predisposing characteristics (Healey et al., 1981; Lavie, 2001). Moreover, individuals who experience heightened stress, such as the experience of breast cancer are more likely to develop insomnia, relative to the general population (National Heart, Lung, and Blood Institute, 1995; Sateia et al., 2000). Therefore, cancer is potentially a unique and robust precipitating factor that contributes to the onset of insomnia (for review, see Savard & Morin, 2001). It is unique in that it is associated with a multitude of stressors that serve as potential precipitating factors. These factors can consist of numerous stressors associated with cancer, including, but not limited to, diagnosis, treatment factors (e.g. surgery, hospitalization, radiation treatment, bone marrow transplantation, chemotherapy, hormonal therapy), and physical symptoms such as pain and nausea (for review, see Savard & Morin, 2001; Savard et al., 2001).
However, stress specific to cancer as a global construct has not been directly evaluated as a potential precipitating factor associated with insomnia. Therefore, more research is required to understand the degree to which these factors are related.

The initial diagnosis of breast cancer is a significant stressor that may precipitate insomnia. Both Davidson and colleagues (2002) and Savard and colleagues (2001) found that among individuals with cancer, including breast cancer, who reported insomnia, almost one half reported that the sleep difficulties materialized around the time of the cancer diagnosis. Given that among heterogeneous samples of individuals with cancer, individuals who reported insomnia, often reported the onset of difficulties around the time of the cancer diagnosis, the impact of stress associated with cancer is likely a strong precipitating factor associated with the onset of insomnia (Davidson et al., 2002; Hugel et al., 2004).

However, the degree to which physiological and psychological stress associated with cancer treatments precipitates insomnia is not well understood. Both physiological effects and emotional implications of treatments can potentially influence an individual’s sleep (for review, see Savard & Morin, 2001). Findings in reference to the relationship between sleep and treatment type are variable. Although hospitalizations have been associated with sleep difficulties (Sheely, 1996), some studies suggest that the specific types of cancer treatments an individual receives (e.g. radiation, chemotherapy, surgery, combination) do not differentially precipitate sleep difficulties (Davidson et al., 2002; Engstrom et al., 1999; Fortner et al., 2002). Other studies have found an association between side effects of treatments such as pain, stress, and menopausal symptoms, and the onset of symptoms of insomnia (Savard et al., 2001). Osoba and colleagues (1997)
found that among a heterogeneous sample of cancer patients receiving chemotherapy, individuals who reported nausea and vomiting were more likely to report insomnia. Radiotherapy has been associated with sleep disturbances, with one study finding an association between receiving radiotherapy and poorer sleep among a sample of women with breast cancer (Omne-Ponten, Holmberg, Burns, Adami, & Bergstrom, 1992). However, Omne-Ponten and colleagues (1992) found no differences in sleep difficulties between women who received mastectomy versus breast-conservation surgery. Therefore, it may be the severity of side effects experienced, and or the manner in which an individual perceives and interprets a treatment, more than the treatment modality itself. Medications commonly utilized for treatment have also been associated with sleep difficulties, including tomoxifen (Davidson et al., 2002), steroids, stimulant antidepressants, bronchodilators/theophylline and diuretics (Hugel et al., 2004).

Like treatment modalities, physical discomfort, such as pain and nausea, inconsistently correlates with insomnia when investigated among individuals with cancer. While some studies found physical discomfort or pain to significantly contribute to the onset of insomnia (Davidson et al., 2002; Fortner et al., 2002; Hugel et al., 2004; Palesh et al., 2007), other studies have failed to identify an association between physical discomforts and sleep difficulties (Engstrom et al., 1999). A robust correlation has been identified between nocturia (awakenings due to a need to urinate) and sleep difficulties among of women with breast cancer (Frontner et al., 2002).

As a whole, it appears that the level of stress an individual experiences during breast cancer can precipitate difficulty sleeping (Palesh et al., 2007). A longitudinal study conducted among breast cancer patients identified stress at baseline as a predictor
of insomnia symptoms, thereby supporting its role as a precipitant (Palesh et al., 2007). However, stress specifically associated with the experience of cancer opposed to general stress, and its role in precipitating symptoms of insomnia, has yet to be investigated. A cancer specific measure evaluating psychosocial stress associated with cancer was developed by Herschbach and colleagues (2004), but has not been applied to research investigating symptoms of insomnia. The measure does include one question about sleep (I often have trouble sleeping).

**Perpetuating Factors.** Perpetuating factors maintain insomnia, thereby contributing to a chronic course. Maladaptive sleep habits (e.g. getting in bed when not sleepy; napping) and dysfunctional beliefs about sleep (e.g. I need 8 hours of sleep to feel rested) are perpetuating factors associated with maintaining insomnia. Taken together, these factors increase one’s level of anxiety and arousal, fueling a cycle of insomnia that can become chronic. However, behaviors that are seemingly maladaptive among the general population are often utilized among individuals with cancer to combat the discomfort of treatment. For example, patients receiving chemotherapy reported changing their sleep-wake patterns (e.g. going to bed earlier, sleeping during the day) and changing rest routines (e.g. napping, modifying activities) to address fatigue (Richardson & Ream, 1997). Such behaviors, although functional within their context, may contribute to the maintenance of insomnia. Savard and Morin (2001) suggest that similar to the general population with chronic insomnia, individuals with cancer who experience chronic insomnia may be engaging in activities that are not compatible with sleep, such as watching television in bed, which contributes to the maintenance of dysfunction by weakening the connection between the bed and sleep (Morin, 1993).
Cognitions incompatible with sleep (e.g. unrealistic sleep expectations, misperceptions of sleep difficulties, faulty attributions about daytime dysfunction, misperceptions about causal factors) are also likely to maintain insomnia within cancer populations (Morin, 1993; Savard & Morin, 2001). Moreover, dysfunctional cognitions in reference to sleep and cancer (e.g. poor sleep will cause my cancer to return) have been hypothesized as perpetuating factors unique to individuals with cancer (Savard & Morin, 2001). However, this hypothesis has not yet been tested empirically.

Maladaptive behaviors and cognitions that are incompatible with sleep are theorized to heighten anxiety and arousal, thereby strengthening the cycle of insomnia and maintaining the dysfunction (Edinger et al., 1998; Espie, 2002; Harvey, 2002; Lundh, 2000; Lundh, 2005; Morin, 1993). Heightened arousal and anxiety, which are predisposing factors, have been identified among individuals with cancer reporting insomnia. Thirty-six percent of individuals who endorsed sleep difficulties while under care of hospice (73 out of the 74 had advanced malignancies) attributed difficulties to worried thoughts (Hugel et al., 2004). In addition, ruminative thinking may maintain insomnia by heightening ones level of predisposition via increased arousal, with individuals reporting thoughts of death, diagnosis, and family matters circling through their mind (Hugel et al., 2004). These perpetuating factors fuel predisposing factors, strengthening the cycle of insomnia.

Beyond the Three-factor Model

Recently, researchers have proposed that mindfulness may aid in understanding the cycle of insomnia (Lundh, 2000; 2005). Lundh (2000; 2005) expanded upon the previously described model of insomnia, incorporating mindfulness. Given that
mindfulness has been associated with stress (the precipitating factor associated with insomnia), theories of mindfulness and insomnia are theoretically linked. In addition, interventions targeting mindfulness have aided in improving sleep quality among individuals with cancer (for review, see Smith, 2005), suggesting mindfulness is a factor outside of the three factor model associated with sleep quality and the cycle of insomnia symptoms among individuals with cancer. The theories and principles that create a foundation for Acceptance and Commitment Therapy (ACT) aid in developing an understanding of how constructs such as mindfulness may be associated with symptoms of insomnia via stress, among individuals with cancer.

ACT Applied to Insomnia among Individuals with Cancer

Background on ACT

Acceptance and Commitment Therapy (ACT) is a third-generation behavior therapy that evolved in part from traditional Cognitive Behavior Therapy. A central goal of ACT is “psychological flexibility,” which refers to one’s ability to engage in behaviors that are more consistent with personally held values and goals rather than having one’s behavior constrained by the avoidance of unpleasant internal experiences (i.e., thoughts, feelings, sensations, memories, and urges). ACT addresses the importance of enabling the acceptance of subjective experiences (e.g., thoughts and feelings) in order to achieve enhanced psychological functioning. In addition, ACT highlights the unhelpful nature of experiential avoidance (Eifert & Forsyth, 2005; Hayes 2004; Hayes & Smith, 2005; Hayes, Luoma, Bond, Masuda, & Lillis, 2006).
Experiential Avoidance

Experiential avoidance is when an individual is unwilling to engage in life experiences such as thoughts, sensations, and behavioral patterns, and attempts to decrease or diminish the occurrence of these events (Hayes, Strosahl, & Wilson, 1999). In the context of sleep, experiential avoidance may be observed in a patient who unsuccessfully attempts to avoid and/or control the unwanted experience of a sleepless night or thoughts associated with breast cancer. Such attempts may lead to a paradoxical effect, with avoidant attempts (e.g. getting in bed earlier to get more sleep, trying hard to fall asleep, trying to stop thoughts) actually inhibiting the ability to achieve a restful night’s sleep. The opposite of avoidance is mindfulness. Moreover, one cannot be in a state of mindfulness while also engaging in experiential avoidance. From an ACT perspective, an individual may be better served by “accepting” and being “mindful” of each moment even if the possibility exists that a sleepless night may occur, unpleasant thoughts about breast cancer may be present, and the stress associated with cancer will fluctuate. Therefore, an individual who is mindful may be presented with the stressor of breast cancer, but not experience symptoms of insomnia. For example, a person may get diagnosed with breast cancer and avoid going to the doctor to start treatment. The avoidance would cause an increase in anxiety and likely increase the distress associated with the diagnosis. On the other hand, and individual may get a diagnosis of breast cancer, not engage in experiential avoidance and accept the diagnosis, and move forward with treatment. This individual may experience less overall distress, given they are being present and engaging in the present moment, not making attempts to avoid.
Mindfulness

Mindfulness is when internal thoughts and external experiences are brought into the present moment and acknowledged as opposed to judged (Baer, 2003; Hayes, Follette, & Linehan, 2004). Acceptance as defined by Hayes and colleagues (1999), is “abandonment of dysfunctional change agendas and an active process of feeling feelings as feelings, thinking thoughts as thoughts, remembering memories as memories, and so on (p. 77).” Therefore, mindfulness implies acceptance (Hayes et al., 1999). For the purposes of this study the term mindfulness will be used to refer to all aspects of mindfulness, including acceptance. In ACT, the patient is taught that experiential avoidance and attempts to control unwanted experiences (such as sleepless nights and unpleasant cognitions) are likely to be ineffective or even counterproductive, and that the experience should be accepted without defense. By gaining mindfulness, an individual experiences a decrease in distress (Brown & Ryan, 2003).

ACT Model Applied to Insomnia

The theoretical foundation of ACT, most notably mindfulness, has a potential role in explaining insomnia and factors associated with insomnia. Lundh (2000; 2005) proposed a model of insomnia which expands upon previously proposed cognitive models of insomnia, incorporating mindfulness. At a basic level, Lundh (2000) suggests that the core of insomnia exists at an interface; processes that are not compatible with sleep (e.g. cognitive and physiological arousal) and the manner in which one identifies with sleep (e.g. attribution and beliefs). Understood from the three-factor model (Spielman et al., 1987; Spielman & Glovinsky, 1991), Lundh (2000; 2005) is referring to predisposing, precipitating, and perpetuating factors. For example, an individual may
attribute life dissatisfaction with poor sleep, believe they can “fix” their sleep by getting in bed earlier, and then ruminate about how they are in bed early, still not able to sleep, and will thereafter attribute the following day’s maladies to the prior night’s poor sleep. While engaging in attempts to actively problem solve in bed, arousal is heightened and sleep is disturbed. The act of trying to control the internal experiences that may inhibit sleep are often counterproductive. Sleep itself is beyond our control; therefore attempts to control thoughts and the sleep state make thoughts more powerful and may increase arousal and activation.

Heightened mindfulness likely reduces cognitive and physiological arousal given that these constructs are unable to be experienced simultaneously. Moreover, in an insomnia treatment clinical trial that included mindfulness meditation as a component, increased mindfulness meditation practice was associated with decreased arousal (Ong et al., 2008). One cannot engage in a mindful, accepting and cognitively deactivated state of being while engaging in heightened cognitive and physiological arousal (Lundh, 2000). Given that mindfulness is incompatible with the experience of insomnia one can infer that a relationship exists between lower levels of mindfulness and symptoms of insomnia. Moreover, mindfulness may be the process through which the impact of cancer related stress and beliefs about sleep, relate to symptoms of insomnia. However, this has not been empirically evaluated. This leads to the present study’s investigation into mindfulness as a factor associated with symptoms of insomnia.

**Evidence of Relationship between Insomnia and Mindfulness**

Although Lundh’s (2000; 2005) proposed model of insomnia has not undergone the scrutiny of empirical research, several studies have demonstrated a potential link
between mindfulness and sleep quality among individuals with cancer. Moreover, several studies have found mindfulness-based interventions to decrease stress and improve sleep quality among cancer populations (for review, see Smith, 2005).

To illustrate, Carlson and Garland (2005) found improvements in sleep quality (PSQI-G), stress (Symptoms of Stress Inventory), mood (POMS), and fatigue (POMS subscale) among a heterogeneous sample of individuals with cancer who participated in an 8-week Mindfulness-Based Stress Reduction (MBSR) intervention. In another study evaluating a MBSR intervention, a sample of individuals with cancer (primarily breast cancer) demonstrated significant improvements in overall QoL and sleep quality (Carlson et al., 2003). At the start of treatment 40% of their sample reported poor sleep quality, whereas only 20% reported poor sleep quality at the end of treatment (Carlson et al., 2003). However, as described earlier, the MBSR intervention evaluated by Shapiro and colleagues (2003) failed to mirror the above results, with no significant difference in improvements in sleep quality between the MBSR group and attention placebo group. Nonetheless, a relationship between MBSR practice and improved overall outcome was observed. Several experimental factors, such as a small sample size, a 6-week intervention opposed to the traditional 8-week intervention, and significant between group differences at baseline, may have compromised results (Shapiro et al., 2003).

Although findings do suggest MBSR is efficacious in improving many aspects of an individual’s life, including sleep quality (Carlson et al., 2003; Carlson and Garland 2005) little is known about the mechanism of change and the characteristics of patients (Smith, 2005), or the associations with outcomes. Moreover, given somewhat inconsistent findings, and the lack of research directly evaluating mindfulness in reference to sleep
quality, mindfulness may or may not be associated with symptoms of insomnia among individuals with breast cancer. Other elements of MBSR, such as psycho-education, may be the mechanism by which sleep quality improves and insomnia symptoms dissipate. Although a qualitative investigation into an MBSR study among cancer patients found that mindfulness was reported as a coping tool, there was no quantitative analysis confirming the strength of the relationship (Mackenzie, M., Carlson, L., Munoz, M., & Speca, 2007). Only additional research can aid in better understanding previous findings.

Taken together, Lundh’s (2000; 2005) model of insomnia and the above mentioned MBSR studies, suggest that mindfulness may be associated with cancer specific stress and symptoms of insomnia. While Lundh (2000; 2005) provides a theoretical rationale, the MBSR studies suggest that these relationships may exist in the context of cancer related stress. However, the relationship between mindfulness and symptoms of insomnia has not been directly evaluated by these studies, and no study to date has evaluated the degree to which mindfulness is directly related to symptoms of insomnia among individuals with cancer. The MBSR research does suggest that if the relationship between mindfulness and insomnia symptoms exists, it is likely due to its interrelationship between factors associated with increased arousal such as cancer specific stress (precipitating factor) and dysfunctional beliefs and attitudes about sleep (perpetuating factor), and insomnia symptoms.

Rationale

Past research highlights the need for future investigations into insomnia among individuals with cancer (Hugel et al., 2004; Kvale & Shuster, 2006; Savard & Morin, 2001). Given that the prevalence of insomnia symptoms appears to be exceptionally high
among breast cancer patients (Davidson et al., 2002; Fortner et al., 2002; Koopman et al., 2002; Savard et al., 2001), this specific population summons further inquiry. Exploration into understanding symptoms of insomnia and factors (predisposing, precipitating, perpetuating) associated with symptoms of insomnia among breast cancer patients is important given several factors. Past research has often been conducted by means of non-standardized surveys limiting the validity of findings (Davidson et al., 2002; Engstrom et al., 1999; Hugel et al., 2004). Therefore, research that utilizes sound methodology will aid in developing a stronger understanding of factors related to symptoms of insomnia and cancer specific stress. In addition, given the high prevalence of insomnia among individuals with breast cancer (Davidson et al., 2002; Fortner et al., 2002; Koopman et al., 2002; Savard et al., 2001), an understanding of unique factors associated with symptoms of insomnia among this population, such as the impact of cancer specific stress, is of utility to many individuals. Lastly, although studies evaluating MBSR suggest a correlation between mindfulness and sleep, among individuals with cancer (Smith, 2005), and a theoretical association between insomnia and mindfulness (Lundh, 2000; Lundh, 2005), the relationship between an individual’s level of mindfulness and symptoms of insomnia among breast cancer patients has not been empirically investigated. Therefore, it is important to identify whether mindfulness is associated with insomnia symptoms among individuals with breast cancer, given interventions targeting such constructs are being utilized. It is hypothesized that mindfulness is a factor outside of the three factor model, potentially associated with insomnia symptoms indirectly through precipitating and perpetuating factors.
Proposed Study

This study was designed to investigate several aims derived from the literature delineated above. The first aim of this study was to identify the severity of insomnia symptoms among an outpatient breast cancer sample and the severity relative to samples composed of individuals with other forms of cancer. The second aim of this study was to examine the degree to which predisposing factors account for the variance in insomnia symptoms. The following predisposing factors were investigated: age, depression, anxiety, and history of sleep difficulties. The third aim of this study was to investigate the degree to which cancer specific stress (proposed precipitating factor) accounts for insomnia symptoms above and beyond predisposing factors. The fourth aim was to determine the degree to which dysfunctional beliefs and attitudes about sleep (proposed perpetuating factor) account for variance in insomnia symptoms above and beyond predisposing and precipitating factors. The fifth aim of this study was exploratory, and aimed to determine the degree to which mindfulness moderated the relationship between insomnia and cancer specific stress. The sixth aim of this study was also exploratory, and investigated the degree to which mindfulness moderated the relationship between insomnia symptoms and dysfunctional beliefs and attitudes about sleep.
CHAPTER 3: METHODS

Participants

As part of a larger study involving a heterogeneous cancer patient sample of 120 individuals, recruitment continued until successful enrollment of 56 breast cancer patient participants was achieved. Individuals who were interested in participating in this study and met all inclusion criteria were invited to participate. Individuals who chose to participate received a twenty dollar gift card as compensation for their time. No individual was excluded from this study on the basis of their race or ethnic background.

Description of Sample

The sample was recruited from two sites. Participants were recruited from The Cancer Institute of New Jersey at Cooper University Hospital in Voorhees and in Stratford, New Jersey. The Cancer Institute of New Jersey at Cooper University Hospital is one of thirty nine National Cancer Institute designated Comprehensive Cancer Centers in the nation. The satellite facilities in Voorhees and Stratford, New Jersey provide comprehensive outpatient care to individuals with cancer. The patient populations at the Voorhees and Stratford facilities are composed of patients with many types of cancers, with a larger percentage of patients having breast cancer, relative to other cancers. This is representative of the prevalence of cancer in the United States, with breast cancer being the second most common cancer (American Cancer Society, 2006). Specifics in reference to sample characteristics are provided in the results section.

Participant Recruitment

Recruitment took place from December 2007 through June 2008. A research assistant approached cancer outpatients who were awaiting medical appointments in the
oncology outpatient clinic waiting room or examination rooms, or receiving chemotherapy in the infusion room. The majority of patients were recruited in the infusion room. Potential participants were provided with a brief verbal description of the study, including the purpose of the study, procedures involved in participation, inclusion and exclusion criteria, and the monetary compensation for their time.

**Inclusion and Exclusion Criteria**

Please refer to Table 2 for inclusion and exclusion criteria. In order to participate in this study individuals had to be 18 years of age or older and were being treated for cancer at The Cancer Institute of New Jersey at Cooper University Hospital, in Voorhees or Stratford, New Jersey. Individuals were excluded from the study if they did not have a current cancer diagnosis, or had been in remission for more than one year.

**Procedures**

Prior to commencing the study, IRB approval was obtained from The Cancer Institute of New Jersey at Cooper University Hospital and Drexel University. This study was completed anonymously. Participants’ names and information were collected for the purposes of avoiding duplicate participation and verifying medical information. Protected participant information was kept separate from questionnaires. Participants were instructed not to write their names or any other identifying information on the questionnaires.

Participants’ information were given an identification number as to keep their identities private, and all forms were stored in a locked filing cabinet in Suite A at The Cancer Institute of New Jersey at Cooper. Information was only accessed by the
designated co-investigators, research assistants and the principal investigators. The data analysis files did not contain any identifying information.

Informed consent was reviewed orally and in writing to individuals who indicated they were interested in participating in the study and met inclusion criteria. This occurred directly following the recruitment process. Upon completion of informed consent, prior to the completion of measures, prospective participants who still chose to participate in the study, were asked to fill out a series of self-report measures. In order to protect all participants, the telephone number of Behavioral Medicine Service at The Cancer Institute of New Jersey at Cooper University Hospital, in Voorhees, NJ, was provided to individuals who conveyed distress. Following completion of the questionnaires, participants were provided with the twenty dollar gift card.

**Measures**

Details regarding each scale included in the study can be found in Table 3. Psychometric properties, purpose, scoring/scaling, and number of items are included.

**Descriptive Information Form**

All participants completed the Descriptive Information Form (Appendix A), to report demographic information, medication use, use of hormonal therapies, and medical history. This form was utilized to obtain information in reference to predisposing factors and potential covariates.

**Acceptance and Action Questionnaire-2**

The Acceptance and Action Questionnaire-2 (AAQ-2; Appendix B) is a 10-item self-report measure developed to assess experiential avoidance (Bond et al., submitted). The scale has two subscales. The acceptance subscale investigates one’s ability to
experience, without attempting to change the experience (Hayes et al., 1999). The psychological flexibility subscale investigates the ability to live within one’s values without engaging in behaviors that are aimed at avoiding unpleasant experiences (Hayes et al., 1999). These two subscales can be combined to obtain an overall score for acceptance. A total score was used for primary analyses in the present study and the subscales were used for post-hoc analyses. The AAQ-2 is the second edition to the original AAQ, developed by Hayes, Strosahl, Wilson, Bisset et al. (2004). The original AAQ has adequate internal consistency (Cronbach’s alpha = .70; the AAQ-2 does not have published validity and reliability information to date).

Dysfunctional Beliefs and Attitudes about Sleep-Short Form

The Dysfunctional Beliefs and Attitudes about Sleep-Short Form (DBAS-SF; Appendix C) is a 10-item self-report instrument used to assess the degree to which one subscribes to maladaptive thoughts, attitudes, attributions, and beliefs about sleep (Edinger, Wohlgemuth, Radtke, Marsh, & Quillian, 2001; Morin, 1993). The DBAS has a Cronbach’s alpha score of .81 and reliability ranging from .58 to .79 (Morin, 1993).

Five Facet Mindfulness Questionnaire

The Five Facet Mindfulness Questionnaire (FFMQ; Appendix D) is a 39-item self-report measure that evaluates five components of mindfulness including nonreactivity to inner experience (e.g. allowing thoughts and feelings to exist without becoming submerged in them), observing (e.g. having an awareness of internal and external stimuli), describing (e.g. the labeling of individual experiences with language), acting with awareness (e.g. being in the present moment), and nonjudgmental of inner experience (e.g. not evaluating thoughts and feelings; Bear, Smith, Hopkins,
Krietemeyer, & Toney, 2006; Bear et al., 2008). All five scales demonstrate adequate to good internal consistency with Cronbach’s alpha ranging from .79 - .91. All five scales can be aggregated to create a single measure of mindfulness, which is what the present study utilized for primary analyses. The separate subscales were used for post-hoc analyses.

_Hospital Anxiety and Depression Scale_  

The Hospital Anxiety and Depression Scale (HADS; Appendix E) is a 14-item questionnaire used to assess the severity of anxiety and depression symptoms (Zigmond & Snaith, 1983). The HADS is made up of two subscales, that being depression (D) and anxiety (A). Scores between 8-10 suggest mild, 11-15 suggests moderate, and 16 or above suggests severe symptoms of anxiety or depression (Zigmond & Snaith, 1983). In a review of studies, Cronbach’s alpha for the HADS-A ranged from .68 to .93 and .67 to .90 for the HADS-D (Bjelland, Dahl, Haug, & Neckelmann, 2002). Therefore both subscales have adequate internal consistency.

_Insomnia Severity Index_  

The Insomnia Severity Index (ISI; Appendix F) is a 7-item questionnaire used to evaluate the severity of insomnia while focusing on daytime symptoms (Bastien, Vallieres, & Morin, 2001). The ISI is a reliable (Cronbach’s alpha = .74) and valid ($p < .05$, comparing to self-reports of sleep) measure that is commonly used among sleep researchers (Bastien et al., 2001; Savard, Savard, Simard, & Ivers, 2005). A clinical cut off score of 8 has been suggested to indicate a clinical level of insomnia symptoms (Savard et al., 2005).
The Questionnaire on Stress in Cancer Patients (QSCP-R; Appendix G) is a 23-item self-report measure used to assess cancer specific stress (Herschbach et al., 2004). Questions focus on stressors specific to cancer, such as changes in body image, fear of disease prognosis and concerns about pain. The QSCP-R is a valid and reliable measure, demonstrating a Cronbach’s alpha score of .89 (Herschbach et al., 2004; Herschbach et al., 2003).

Data Analyses

Descriptive characteristics, frequency distributions, and normative data were collected, scored, entered and calculated to assess the distribution of variables. Characteristics, such as type of cancer treatment, were evaluated as potential covariates and included in primary analyses when deemed appropriate. After preliminary analyses were completed, the following statistical analyses were conducted to investigate hypotheses.

Aim I

The first aim of this study was to identify the severity of symptoms of insomnia among an outpatient breast cancer sample. Symptoms of insomnia were measured via the Insomnia Severity Index (ISI; Bastien et al 2001; Morin, 1993). Scores on the ISI were also compared to scores for other cancer patients. To evaluate Hypothesis 1a, descriptive analyses were conducted and evaluated to identify if the mean score on the ISI was equal to or great than 8, thereby suggesting a clinically significant level of insomnia symptoms. Percentages of scores were also evaluated. To evaluate hypothesis
1b, an ANOVA was run to identify if there was a significant difference between ISI scores between different types of cancer patients compared to breast cancer patients.

**Aim II**

The second aim of this study was to examine the degree to which predisposing factors (age, depression, anxiety, and history of sleep difficulties) accounted for variance in insomnia symptoms among an outpatient breast cancer patient population. To evaluate the second aim of this study which consisted of hypothesis 2a, 2b, 2c, and 2d, a simultaneous entry linear regression was conducted with symptoms of insomnia (scores on the ISI) as the dependent variable, and predisposing factors (2a. age, 2b. anxiety, 2c. depression, 2d. history of sleep problems) as predictor variables. Simultaneous entry was utilized to identify the degree to which each predisposing factor contributed to the variance in symptoms of insomnia.

**Aim III**

The third aim, that being to determine the degree to which cancer related stress accounts for variance in insomnia symptoms above and beyond predisposing factors as defined in Aim II, was evaluated via a hierarchical regression. Covariates were entered into the first step; predisposing factors found to be significant in Aim II were entered into the second step. Cancer related stress (as measured by the QSCP-R) was entered into the third step. Symptoms of insomnia (scores on the ISI) was the dependent variable. A hierarchical regression design aided in identifying the degree to which cancer specific stress accounts for variance of insomnia symptoms above and beyond predisposing factors.
**Aim IV**

The fourth aim of this study was to determine the degree to which dysfunctional beliefs and attitudes about sleep accounted for variance in insomnia symptoms above and beyond precipitating and predisposing factors as determined by Aim II and Aim III. A hierarchical regression was conducted to investigate the hypothesis. Covariates were entered into the first step, predisposing factors into the second step, precipitating factors into the third step, and perpetuating factors into the fourth step. Insomnia symptom severity was the dependent variable.

**Aim V (exploratory)**

The fifth aim of this study, that being to determine the degree to which acceptance (5a) and mindfulness (5b) moderate the relationship between cancer specific stress and insomnia symptoms, was evaluated via two separate regressions. Covariates were entered into the regression first. Centered independent variables (cancer specific stress and mindfulness) and the interaction term were entered second.

**Aim VI (exploratory)**

The sixth aim of this study, which was exploratory, was to determine the degree to which acceptance (6a) and mindfulness (6b) moderated the relationship between dysfunctional beliefs and attitudes about sleep and symptoms of insomnia. Two separate regressions were conducted to independently evaluate measures of acceptance and mindfulness. Centered independent variables (dysfunctional beliefs and attitudes about sleep and mindfulness or acceptance) and the interaction term were simultaneously entered second.
CHAPTER 4: RESULTS

Individuals who met inclusion criteria and were interested in participating in the study were included in the proposed analyses. Eighty five percent of the individuals approached for the larger heterogeneous cancer study, which included 120 individuals, agreed to participate. The participation rate for individuals with breast cancer only is not available. Individuals who choose not to participate in the larger study indicated the following reasons for not engaging in the study: did not have enough time to complete the questionnaires, were not interested or felt too sick to complete the forms. Prior to conducting the primary analyses, sample characteristics were defined, and variables under investigation were evaluated for reliability. Additionally, sample data was compared to published means derived from cancer populations when such information was available. Analyses of internal reliability on primary measures were conducted using Cronbach’s alpha. Preliminary analyses were conducted to determine possible covariates for the primary hypotheses. Primary hypotheses were investigated via several modes of analysis. When significant findings emerged, post-hoc analyses were conducted.

Sample Characteristics

Demographic information is presented in Table 4. Fifty six breast cancer patients participated in the study, ranging from age 26 to 75 (age 26-40 \([n=10]\); age 41-60 \([n=34]\); age 61-75 \([n=12]\)) with a mean of 50.61 years \((SD = 11.28)\). All participants were female. Seventy three percent of participants reported they were Caucasian \((n = 41)\), 18\% were African American \((n = 10)\), 5\% were Native American \((n = 3)\), 2\% were Hispanic \((n = 1)\), and 2\% were other \((n = 2)\).
Sleep characteristics including, diagnosed sleep disorder, and time at which any reported sleep disorder began, were collected. In addition, history of sleep difficulty, the time at which the sleep difficulty began, and what the nature of the difficulty was, was collected and will be discussed at length in Aim II and the post-hoc analyses. Only three individuals in the sample reported a diagnosed sleep disorder. One individual reported a diagnosis of Restless Leg Syndrome diagnosed in March of 2004, one reported sleep apnea diagnosed in January of 2005, and one reported that they had surgery to correct an unspecified sleep disorder that began in January of 1995.

Means and Normative Analyses

The means and standard deviations of sample scores and normative scores derived from publications for primary measures are reported in Table 5. The sample means obtained from our study were compared with published mean values for each measure.

Both measures associated with sleep (DBAS-SF and ISI) were compared to published means. When investigating insomnia symptom severity via the ISI (Bastien et al., 2001), our sample did not significantly differ from a sample of female breast cancer patients utilized to validate the ISI among cancer patients (Savard et al., 2005). Our sample did have significantly fewer symptoms of insomnia relative to a clinical sample of individuals with sleep disorders (Bastien et al., 2001). Individuals with breast cancer who participated in the study did report a clinically significant level of insomnia symptoms on the ISI (demonstrated by a score above 8; Savard et al., 2005) as indicated by a mean of 9.04 (SD=6.56). On the DBAS-SF (Edinger et al., 2001; Morin, 1993), our sample reported significantly more dysfunctional beliefs and attitudes about sleep relative
to both a sample of individuals with insomnia and a nonclinical comparison group reported by Rumble et al., 2005. To our knowledge, the DBAS-SF has not been utilized among cancer populations. Therefore, no comparisons could be made between our sample and previously investigated cancer samples on DBAS scores.

In reference to cancer related stress as measured by the QSCP-R (Herschbach et al., 2004), our sample reported significantly more stress relative to the sample of female cancer patients investigated by Herschbach and colleagues (2004). Moreover, our sample reported a clinically significant level of stress ($M=1.85; SD=.65$), as indicated by the mean score being above the suggested cut-off score of 1.5 (Herschbach et al., 2004). In addition, the sample utilized by Herschbach and colleagues (2004) was in Germany and the measure has not been investigated in the United States. Therefore, differences may be attributable to cultural factors.

Scores derived from our sample using the HADS (Snaith & Zigmond, 1994) Anxiety and Depression Subscales were not significantly different from scores derived from a non-clinical sample investigated by Crawford, Henery, Crombie, and Taylor (2001). Moreover, our sample did not report clinically significant levels of depression not anxiety.

Both measures of mindfulness (FFMQ and AAQ-2) were compared to published norms. The means obtained from Baer and colleagues (2008) validation study of the five mindfulness facets were utilized to obtain a total mindfulness score. Analyses indicated that our sample endorsed significantly more mindfulness relative to the community sample investigated by Baer and colleagues (2008). However, there was no significant difference between the level of mindfulness of our sample and the sample termed as the
“educated” group in Baer and colleagues (2008) study. The educated group had an average of 18.2 (SD = 2.1) years of education (Baer et al., 2008). Almost half of our sample had college degrees or higher, therefore our sample’s average level of education fell between the “educated” group and community sample (Baer et al., 2008). In addition, our sample reported higher levels of acceptance on the AAQ-2 relative to a student and community sample collected by Bond and Colleagues (Submitted).

Reliability Check

Internal consistencies for primary measures are presented in Table 6. Primary measures utilized in the present study were evaluated for internal consistency reliability using Cronbach’s alpha (Cronbach, 1951). All measures demonstrated reliability ranging from adequate to good (.79-.91), allowing for the confident interpretation of all scales.

Preliminary Analyses

Preliminary analyses for the present study included the evaluation of dependent measures, independent measures, and demographic variables for normality, distribution, and descriptive statistics. A correlation matrix of all primary independent and dependent variables can be found in Table 7. Cancer specific factors such as receiving chemotherapy were also evaluated as potential covariates. Pearson correlations were used to evaluate continuous variables and ANOVAs to evaluate categorical variables. Demographic characteristics or cancer specific factors that did have a significant relationship with independent or dependent variables were controlled for by including them as covariates in the first step of regression analyses and independent variables entered into subsequent steps.
All primary measures were found to be normally distributed, aside from the Depression Subscale of the HADS. The Depression Subscale distribution of participants was positively skewed (e.g. less depressed). The log \((y = \log_{10}(x +1))\) was taken and analyzed in an attempt to normalize the distributions per recommendations of Fox (1991). This did normalize the distribution for the factor. Therefore, both transformed and original scores for the HADS Depression Subscale were utilized and reported.

The QSCP-R includes a question about sleep, “I often have trouble sleeping.” To confirm that results in reference to insomnia were not attributable to this single question, analyses were run without the sleep question included. No noteworthy differences were observed in results. Therefore, reported results are using the standardized QSCP-R measure including all questions.

**Analyses of Covariates**

No relationships were identified between participant age, ethnicity, employment, education, stage of cancer, HRT treatment, metastatic status, or income with primary measures \((ps > .05)\), and were therefore not included as covariates in analyses. Marital status was significantly related to dysfunctional beliefs about sleep (as measured by the DBAS) as demonstrated via ANOVA analysis, \(F(5,50) = 3.64, \ p = .007\), with divorced individuals reporting the highest level of dysfunctional thoughts about sleep, \(M=74.27, SD=10.27\), and widowed individuals reporting the lowest level of dysfunctional thoughts about sleep, \(M=39.54, SD=21.14\). Medical and cancer specific factors, stage of cancer, having additional medical problems, being on hormone replacement therapy, having metastatic disease, and receiving a recommendation for hospice were not correlated with primary measures. ANOVA analyses indicated that individuals who had surgery as an
intervention for their cancer reported significantly more symptoms of insomnia (as measured by the ISI; $F(1,54)=4.63, p=.036$) and greater cancer specific stress (as measured by the QSCP-R; $F(1,49)=6.23, p=.016$), relative to individuals who did not answer the question or individuals who did not have surgery. In sum, marital status and having surgical intervention(s) were included as covariates in appropriate analyses.

Statistical Power

In order to identify power obtained for statistical analyses G Power (Faul, Erdfelder, Lang, & Buchner, 2007) was used. The post-hoc power analysis was based on Aim III, which investigated the precipitating factor of cancer specific stress. For Aim III, using an alpha level of .05, a medium effect size, and 56 participants, a power of .81 was obtained for the regression analysis looking at an $R^2$ increase conducted with two predictor variables entered on separate steps.

Analyses of Hypotheses

Aim I

The first aim of this study was to identify the severity of symptoms of insomnia among an outpatient breast cancer sample. Symptoms of insomnia were measured via the Insomnia Severity Index (ISI; Bastien et al., 2001; Morin, 1993). A score equal to or above 8 (Savard et al., 2005) on the Insomnia Severity Index (ISI; Bastien et al., 2001; Morin, 1993) is indicative of clinically significant insomnia symptoms. 

Hypothesis 1a

Breast cancer patients, on average, reported a clinically significant level of insomnia symptoms as indicated by a mean of 9.04 ($SD=6.56$) on the ISI. Forty eight percent of participants in the sample indicated a clinically significant level of insomnia
symptoms, having an ISI score that was equal to or greater than 8. Please see Figure 2 for the complete distribution of scores on the ISI.

_Hypothesis 1b_

Breast cancer patients were compared with individuals with other forms of cancer who participated in the larger study the present study was housed under. Other forms of cancer included lung (n=12), gynecological (n=22), colon (n=12), lymphoma (n=5), and prostate (n=3). Only one participant had liver cancer, therefore this was not included as a comparison group. Due to the small sample size for other forms of cancer presented findings should be interpreted with caution.

Breast cancer patients did not report a significantly higher level of insomnia symptoms relative to individuals with lung cancer, gynecological cancer, colon cancer, or prostate cancer (ps > .05). Breast cancer patients did endorse less symptoms of insomnia relative to individuals with lymphoma, \( t(55) = -4.06, p < .001 \), however, this was based on a sample size of 5. There was no significant difference between individuals with breast cancer and lung cancer, \( t(55) = -0.05 \); gynecological cancer, \( t(55) = -0.02 \); colon cancer, \( t(55) = 1.64 \); and prostate cancer, \( t(55) = 0.08, p = .94 \), all ps > .10. Means and standard deviations for other forms of cancer used as comparison groups can be found in Table 8.

_Aim II_

The second aim of this study was to examine the degree to which predisposing factors (age, depression, anxiety, and history of sleep difficulties) accounted for variance in insomnia symptoms among an outpatient breast cancer patient population. Results obtained using the original HADS depression scores opposed to the transformed HADS
depression scores are reported.\footnote{Results did not differ between the transformed and non-transformed data} Having surgery, which was indicated on the demographics form, was entered into the analyses as a covariate given that symptoms of insomnia were found to correlate with having surgery. All variables, including the covariates, were entered simultaneously into the linear regression. Predisposing factors significantly accounted for variance in insomnia symptoms when controlling for the covariate of surgery ($R=.65, p<.001$). See Table 9 for results from regression.

**Hypothesis 2a**

Age did not account for a significant amount of variance in symptoms of insomnia ($p>.05$) when controlling for the covariate surgery and additional independent variables (symptoms of anxiety, symptoms of depression, and a history of sleep difficulties). Findings did not change ($p>.05$) when age was investigated as a categorical factor (age 26-40 [$n=10$]; age 41-60 [$n=34$]; age 61-75 [$n=12$]).

**Hypothesis 2b**

Symptoms of anxiety did not account for a significant amount of variance in symptoms of insomnia ($p>.05$) when controlling for the covariate surgery and additional independent variables (age, symptoms of depression, and a history of sleep difficulties).

**Hypothesis 2c**

Symptoms of depression did not account for a significant amount of variance in symptoms of insomnia ($p>.05$) when controlling for the covariate surgery and additional independent variables (symptoms of anxiety, age, and a history of sleep difficulties).
Hypothesis 2d

A history of sleep difficulties significantly accounted for variance in symptoms of insomnia, \(p<.001\) when controlling for the covariate surgery and additional independent variables (symptoms of anxiety, symptoms of depression, and age). While covarying for surgery, symptoms of insomnia significantly correlated with a history of sleep difficulties when simultaneously entered into the linear regression with symptoms of anxiety, symptoms of depression, and age, \(R^2=.42, F(5,47)=6.75, p<.001\).

Aim III

The third aim of this study was to determine the degree to which cancer related stress accounts for variance in insomnia symptoms above and beyond predisposing factors. A history of sleep difficulties was the only proposed predisposing factor entered into the hierarchical regression for Aim III. Other independent variables investigated in Aim II were not found to significantly contribute to the variance in symptoms of insomnia, and therefore, were not included. Surgery was entered into the hierarchical regression on the first step as a covariate, history of sleep difficulties was entered in the second step as an independent variable, and cancer specific stress was entered on the third step as an independent variable. See Table 10 for results from hierarchical regression.

Hypothesis 3

Cancer specific stress predicted insomnia symptoms above and beyond having surgical treatment(s) and a history of sleep difficulties, \(p<.001\). History of sleep difficulties remained significant in the model, \(p=.003\). Cancer specific stress and history
of sleep difficulties explained a significant proportion of variance in insomnia symptoms, 
\[ R = .74, F(1,48) = 18.07, p < .001. \]

**Aim IV**

The fourth aim of this study was to determine the degree to which dysfunctional beliefs and attitudes about sleep accounts for variance in insomnia symptoms above and beyond precipitating and predisposing factors. A hierarchical regression was conducted to investigate this hypothesis. Surgery and marital status were entered as covariates in the first step given findings that surgery correlated with cancer specific stress and insomnia symptoms, and marital status correlated with dysfunctional beliefs and attitudes about sleep. History of sleep difficulties was entered on the second step as a predisposing factor. Cancer specific stress was entered on the third step as a precipitating factor. Dysfunctional beliefs and attitudes about sleep was entered on the fourth step as a perpetuating factor. Dysfunctional beliefs and attitudes about sleep were measured by the DBAS-SF (Morin, 1993). Factors significantly contributing to the variance in insomnia symptoms \( R = .74, p < .001 \). See Table 11 for results from hierarchical regression.

**Hypothesis 4**

Dysfunctional behaviors and attitudes about sleep did not significantly contribute to the variability in insomnia symptoms above and beyond covariates, predisposing factors, and precipitating factors identified in Aim II and Aim III \( (R^2 \ Change = .001; p > .05) \).
Aim V (exploratory)

The fifth aim of this study, which was exploratory, was to determine the degree to which acceptance (5a) and mindfulness (5b) moderate the relationship between cancer specific stress and symptoms of insomnia. Surgery was included as a covariate in both regression analyses. Acceptance was measured by the AAQ-2 (Bond et al., submitted), and mindfulness was measured by the FFMQ (Baer et al., 2006). Two separate regressions were conducted to independently evaluate measures of acceptance and mindfulness. The regressions were run as a simultaneous entry, with the covariate surgery, centered independent variables (cancer specific stress and mindfulness or acceptance) and the interaction term entered together. See Tables 12 and 13 for results from the following regressions.

*Hypothesis 5a*

Acceptance did not moderate the relationship between cancer specific stress and symptoms of insomnia ($p > .05$).

*Hypothesis 5b*

Mindfulness did not moderate the relationship between cancer specific stress and symptoms of insomnia ($p > .05$).

Aim VI (exploratory)

The sixth aim of this study, which is exploratory, was to determine the degree to which acceptance (6a) and mindfulness (6b) moderate the relationship between dysfunctional beliefs and attitudes about sleep and symptoms of insomnia. Surgery and marital status were included as a covariate in both regression analyses. Two separate regressions were conducted to independently evaluate measures of acceptance and
mindfulness. Covariates, centered independent variables (dysfunctional beliefs and attitudes about sleep and mindfulness or acceptance) and the interaction term were simultaneously entered in a linear regression. Results from analyses are presented in Tables 14 and 15.

**Hypothesis 6a**

Acceptance did not moderate the relationship between dysfunctional behaviors and attitudes about sleep insomnia symptoms \((p > .05)\).

**Hypothesis 6b**

Mindfulness did not moderate the relationship between dysfunctional behaviors and attitudes about sleep and insomnia symptom severity \((p > .05)\).

**Post-hoc Exploratory Analyses**

Several analyses were conducted to further explore significant findings from the primary analyses. The present study investigated the nature of sleep difficulties indicated by participants. The potential differences in cancer specific stress between breast cancer patients and individuals with other forms of cancer were investigated. Questions on the QSCP-R were investigated to better understand the interrelationship between cancer specific stress and symptoms of insomnia. Aspects of mindfulness were explored. The subscales of the FFMQ were investigated to identify which of the five factors of mindfulness were associated with symptoms of insomnia. In addition, the two factors of the AAQ-2 were investigated. Dysfunctional beliefs and perceptions about sleep were also explored in more depth.
Nature of Sleep Difficulties

As reported in Aims I and II, sleep difficulties were pervasive among individuals with breast cancer. These difficulties were further explored in reference to duration and presentation to better understand the experience of breast cancer patients. Savard and colleagues (2001) found that 95% of individuals with breast cancer in their sample who reported insomnia had a chronic form of insomnia lasting greater than six months. Although the present study did not collect information on when insomnia symptoms being reported emerged, information on when the history of reported sleep difficulties emerged was collected. It was hypothesized that the majority of individuals who endorsed a history of sleep difficulties would indicate an onset of difficulties greater than six months prior. As anticipated, among the 35.7% of individuals who reported a history of sleep difficulties, 88% reported an onset of over one year ago, with onset ranging from January of 1980 to January of 2008. Information on the type of history of sleep difficulties being reported was also collected. Savard and colleagues (2001) found that among breast cancer patients endorsing insomnia symptoms, 61% reported difficulties initiating sleep (sleep onset latency > 30 minutes), and 72% reported difficulty maintaining sleep (awake for > 30 minutes at least once per week). Among individuals endorsing insomnia disorder, 75% reported difficulties initiating sleep (sleep onset latency > 30 minutes), 86% reported difficulty maintaining sleep (awake for > 30 minutes at least once per week), and 73% reported awakening too early (awake prior to desired time > 30 minutes; Savard et al., 2001). Given these findings we anticipated that, individuals would report a high level of all three difficulties, with maintenance being the most prevalent problem. As predicted, maintenance was the most cited sleep difficulty among
our sample. Among individuals who reported a history of sleep difficulties, 45.5% reported difficulties with maintenance and onset, 36.4% reported difficulties with maintenance, 13.6% reported difficulties with onset, and 4.5% reported difficulties with waking too early.

Cancer Specific Stress

Differences by Cancer Type. Given that significant differences in insomnia severity were not found between breast cancer and other cancer types, investigations into potential differences in cancer specific stress were conducted. Shapiro and colleagues (2001) highlighted findings that individuals with breast cancer on average report the highest level of stress relative to individuals with other cancer diagnoses. This is potentially attributable to factors unique to breast cancer including the numerous challenges to body image, sexuality, fertility, and one’s overall sense of femininity (e.g. breast surgery, hair loss, early menopause). Since the present study did not find significant differences in insomnia symptoms between individuals with breast cancer and individuals with other forms of cancer, we hypothesized that no significant difference would emerge between individuals with breast cancer compared to individuals with other forms of cancer on levels of cancer specific stress.

Individuals with breast cancer were compared to individuals with other forms of cancer who participated in the larger study the present study was housed under. Other forms of cancer individuals had included lung ($n=12$), gynecological ($n=22$), colon ($n=12$), lymphoma ($n=5$), and prostate ($n=3$). Only one participant had liver cancer, therefore this was not included as a comparison group. Due to the small sample sizes for other forms of cancer, presented findings should be interpreted with caution.
As predicted, breast cancer patients did not report significantly higher levels of cancer specific stress relative to individuals with lung cancer, gynecological cancer, colon cancer, or prostate cancer ($p$s > .05). However, some analyses did approach significance. A trend emerged, with individuals with breast cancer endorsing less cancer specific stress relative to individuals with colon cancer, $t(50) = -1.89$, $p = .06$. A trend emerged, with individuals with breast cancer endorsing less cancer specific stress relative to individuals with lymphoma, $t(50) = -2.00$, $p = .05$. There was no significant difference between individuals with breast cancer and lung cancer, $t(50) = 1.19$, $p = .24$. There was no significant difference between individuals with breast cancer and gynecological cancer, $t(50) = .42$, $p = .68$. There was no significant difference between individuals with breast cancer and prostate cancer, $t(50) = .42$, $p = .68$. Means and standard deviations of each form of cancer for cancer specific stress can be found in Table 16.

*Types of Stressors.* Given the demonstrated relationship between cancer specific stress and symptoms of insomnia, individual questions from the QSCP-R were examined in relation to the ISI. Several questions on the QSCP-R were entered into separate linear regressions to identify the contribution of each question in the variance of insomnia symptoms while controlling for appropriate covariates. Surgery was included as a covariant for all regressions aside from the regression including the QSCP-R question on surgery. The following four questions were included: *I am suffering pain due to surgery; I feel physically imperfect; I do not feel well informed about my illness/treatment; I have too few opportunities to talk about emotional problems with a specialist.* Although research on the relationship between cancer treatments and insomnia yields inconsistent results (Davidson et al., 2002; Engstrom et al., 1999; Fortner et al., 2002; Savard et al.,
2001), it was hypothesized that the stress of pain due to surgery would be associated with more insomnia symptoms. This was hypothesized given the present study identified surgical treatment as a covariate of insomnia symptoms and cancer specific stress. The question on body image was chosen given physical changes are a potential stressor unique to breast cancer treatment (For review, see Shapiro et al., 2001). It was hypothesized that poor body image would be associated with more symptoms of insomnia. The question on not feeling well informed about cancer and its associated treatments, was driven by previous findings that lower education level is associated with poorer QoL among breast cancer patients (Janz et al., 2005). Moreover, it was hypothesized that individuals who did not feel well informed or who were not able to understand information and therefore felt poorly informed, were more likely to report symptoms of insomnia. The question on the availability of mental health specialists was to identify whether a relationship exists between a perceived need among patients for more mental health support and insomnia symptoms. It was anticipated that individuals who felt there was not an opportunity to speak with mental health care professionals would indicate more symptoms of insomnia. It should be noted that the two sites where information was obtained houses a behavioral medicine department that is available to patients.

Suffering surgical pain did not predict insomnia symptoms, $t(54)=1.85, p=.07$. As hypothesized, more feelings of body imperfection predicted more insomnia symptoms, $t(55)=4.80, p<.001$, while controlling for surgery as a covariate. As hypothesized, feeling less informed about one’s illness and associated treatments predicted greater insomnia symptoms, $t(55)=2.62, p=.011$, while controlling for surgery as a covariate. As
predicted, having few opportunities to talk about emotional issues with a specialist predicted more symptoms of insomnia, $t(55)=3.39, p=.001$, while controlling for surgery as a covariate.

In order to identify the relative contribution of each stressor found to be significant (*I feel physically imperfect; I do not feel well informed about my illness/treatment; I have too few opportunities to talk about emotional problems with a specialist*), a simultaneous linear regression was run. While controlling for surgery as a covariate, the only stressor that remained significant was feelings of physical imperfection. Therefore, while controlling for surgery as a covariate, feeling uninformed about illness/treatment, and having too few opportunities to speak with health care professionals, more feelings of physical imperfection predicted more symptoms of insomnia, $t(55)=3.26, p<.002$.

**Mindfulness**

Mindfulness, as measured by the FFMQ, did not correlate with symptoms of insomnia. Moreover, mindfulness did not moderate the relationship between insomnia symptoms and precipitating (history of sleep difficulties) or perpetuating factors (cancer specific stress). To identify if specific factors of mindfulness were potentially associated with insomnia symptoms, the relative contributions of the five factors of mindfulness included in the FFMQ and the covariate surgery were entered into a linear regression simultaneously. The five factors of mindfulness as delineated by Baer and colleagues (2008) include nonreactivity to inner experience (e.g. allowing thoughts and feelings to exist without becoming submerged in them), observing (e.g. having an awareness of internal and external stimuli), describing (e.g. the labeling of individual experiences with
language), acting with awareness (e.g. being in the present moment), and nonjudgmental of inner experience (e.g. not evaluating thoughts and feelings). It was hypothesized that individuals who were more nonreactive, acted with awareness, and were nonjudgmental of inner experiences would endorse less symptoms of insomnia, while factors such as describing and observing would not be significant predictors of insomnia symptoms. This was proposed given nonreactivity, acting with awareness, and being nonjudgmental of inner experiences are likely to be deactivating processes, inversely associated with arousal thereby decreasing insomnia symptoms. Although all factors of mindfulness are interrelated, observing and describing appear to have less of a direct connection with arousal.

Nonreactivity to inner experiences was the only factor that predicted insomnia symptoms when controlling for surgery and all other mindfulness factors, \(t(53)=-2.58, p=.013\), with greater reactivity predicting higher endorsement of insomnia symptoms. Observing, describing, acting with awareness, and nonjudgmental of inner experience, did not predict symptoms of insomnia \(p>.05\). Given these results, the nonreactivity subscale was entered into the originally proposed moderation analyses investigating the relationship between symptoms of insomnia and precipitating and perpetuating factors. Nonreactivity was not found to moderate the relationship between dysfunctional beliefs and attitudes about sleep and insomnia severity. In addition, nonreactivity was not found to moderate the relationship between cancer specific stress and insomnia severity.

Although the AAQ-2 (aggregated score) and symptoms of insomnia did correlate, acceptance/psychological flexibility as measured via the AAQ-2 did not moderate the relationship between insomnia symptoms and precipitating or perpetuating factors. To
better understand the interrelationship between variables, aspects of acceptance were investigated by the two subscales of the AAQ-2. The acceptance subscale specifically investigates one’s ability to experience, without attempting to change the experience, therefore the opposite of experiential avoidance (Hayes et al., 1999). The psychological flexibility subscale investigates the ability to live within one’s values without engaging in behaviors that are aimed at avoiding unpleasant experiences (Hayes et al., 1999). It was hypothesized that higher scores on the acceptance subscale would predict insomnia severity while controlling for the psychological flexibility scale. This hypothesis was driven by the potential role of acceptance in inhibiting increased arousal therefore decreasing insomnia by its inverse relationship with experiential avoidance. Psychological flexibility would hypothetically have a less direct relationship with arousal, therefore be a less robust predictor of insomnia. Both subscales were entered simultaneously into a linear regression while covering for surgery. Neither subscale of the AAQ-2 predicted insomnia symptoms when controlling for the other (ps>.05). When entered individually into two linear regressions, both acceptance \([t(54)=-3.06, p=.004]\) and psychological flexibility \([t(54)=-2.64, p=.011]\) predicted insomnia severity while controlling for surgery.

*Dysfunctional Beliefs and Attitudes about Sleep*

Although dysfunctional beliefs and attitudes about sleep as measured by the DBAS-SF, did correlate with insomnia symptoms \((p=.002)\), it was not found to contribute to the variance in symptoms of insomnia above and beyond predisposing and precipitating factors. Given these findings, dysfunctional beliefs and attitudes about sleep were not found to be a significant perpetuating factor associated with insomnia
among individuals with breast cancer. However, dysfunctional beliefs and attitudes in reference to insomnia symptoms and cancer (e.g. poor sleep will cause my cancer to return) have also been hypothesized as perpetuating factors unique to individuals with cancer (Savard & Morin, 2001). This has not been empirically evaluated. In order to explore this potential cancer specific factor, question number three on the DBAS-SF was evaluated (*I am concerned that chronic insomnia may have serious consequences on my physical health*) in relation to insomnia symptoms. It was hypothesized that greater beliefs in insomnia having physical consequences would be associated with an increase in insomnia symptoms. While controlling for covariates (marital status and surgical treatment), concern about the consequences of insomnia on physical health was predictive of insomnia severity, \( t(55)=2.34, p=.023 \). Given this finding, concern about the consequences of insomnia on physical health was evaluated as a potential perpetuating factor within the three factor model. A hierarchical regression was conducted to investigate this hypothesis. Surgery and marital status were entered as covariates in the first step. History of sleep difficulties was entered on the second step as a predisposing factor. Cancer specific stress was entered on the third step as a precipitating factor. Concern about the consequences of insomnia on physical health was entered on the fourth step as a potential perpetuating factor. Concern about the consequences of insomnia on physical health did not significantly contribute to the variability in severity of insomnia symptoms above and beyond covariates, and predisposing and precipitating factors \((p>.05)\).
CHAPTER 5: DISCUSSION

Findings from the present study suggest that symptoms of insomnia are prevalent among individuals with cancer, including breast cancer. Specific predisposing and precipitating factors were found to account for insomnia symptoms among our sample of individuals with breast cancer. Having a history of sleep difficulties was the only predisposing factor found to account for symptoms of insomnia. In reference to precipitating factors, cancer specific stress contributed to the variance in insomnia symptoms above and beyond a history of sleep difficulties. This is a novel finding, and to our knowledge, the relationship between cancer specific stress and insomnia has never been investigated or reported before in the literature. Although dysfunctional beliefs and attitudes about sleep correlated with insomnia severity, they did not contribute to the variance in insomnia severity above and beyond predisposing or precipitating factors, and were therefore, not identified as a perpetuating factor of insomnia. Although aspects of mindfulness did correlate with insomnia symptoms and cancer specific stress, mindfulness did not moderate the relationship between cancer specific stress and insomnia symptoms, or dysfunctional beliefs and attitudes about sleep and insomnia symptoms. These findings aid in better understanding factors associated with insomnia symptoms among individuals with breast cancer and aid in directing future research.

Insomnia Symptoms among Breast Cancer Patients

The present study replicated findings that insomnia symptoms are prevalent among individuals with breast cancer (Carlson et al., 2007; Davidson et al., 2001; Fortner et al., 2002; Koopman et al., 2002). As projected, 48% of individuals in this sample indicated clinically significant levels of insomnia symptoms, consistent with Savard and
colleagues (2001) who found 51%. Moreover, present findings may even underestimate the prevalence of insomnia symptoms given that some individuals who declined participation may have felt too sick to participate and may have endorsed even greater insomnia symptoms. The history of sleep difficulties reported by individuals with breast cancer was often chronic, with 88% of individuals endorsing its onset dating back past one year. In addition, the sleep difficulties were characterized mainly by a combination of maintenance and onset problems.

**Predisposing Factors**

As anticipated, the present study identified a history of sleep difficulties as being associated with elevated symptoms of insomnia among breast cancer patients. Savard and Morin (2001) proposed that a history of insomnia is a predisposing factor associated with comorbid insomnia in the context of cancer. This too is consistent with Engstrom and colleagues (1999) who found that a history of a sleep disorder was a predisposing factor associated with insomnia among individuals with cancer. Moreover, 67% of a breast cancer sample reported having sleep difficulties prior to the diagnosis of breast cancer, suggesting that past sleep problems, at least in part, are likely to predispose an individual to insomnia within the context of breast cancer (Savard et al., 2001). Despite the present study having a lower prevalence of history of sleep difficulties (37.5%) relative to Savard and colleagues (2001), it remained prevalent and a significant predisposing factor associated with insomnia. Findings suggest that a high percentage of individuals who develop breast cancer are predisposed to developing insomnia before even being diagnosed with cancer. Therefore, the overall high prevalence of insomnia among individuals with breast cancer is not surprising. Perhaps if medical providers
were aware of a newly diagnosed cancer patient’s history of sleep difficulties, this could be addressed prior to the cascade of precipitating factors such as cancer related stressors. By addressing the predisposing factor at the start, insomnia may be avoided.

Results from the present study in reference to additional proposed predisposing factors (age, symptoms of anxiety, and symptoms of depression) were not consistent with much of the research reviewed. Most noteworthy is the failure to find a significant relationship between psychological factors and symptoms of insomnia. Although higher levels of anxiety and depression correlated with greater endorsement of insomnia symptoms, neither symptoms of depression nor symptoms of anxiety were identified as predisposing factors associated with insomnia severity. Psychological disorders have been consistently identified as having an association with insomnia symptoms among the general population, heterogeneous cancer populations, and breast cancer populations (Bardwell et al., 2008; Espie, 2002; Ford & Kamero, 1989; Hoehn-Saric, 1981; Palesh et al., 2007; Roth & Roehrs, 2003; Thase, 2005). Given past research findings, Savard and Morin (2001) included psychiatric disorders as likely predisposing factors associated with comorbid insomnia among cancer patients. The present study’s findings are puzzling, given our participants did not even endorse a significant amount of symptoms of depression or anxiety, with reported psychological symptoms similar to what is found in the general population. One could argue that our sample had earlier stages of cancer with better prognoses which would potentially lead to less psychological symptoms; however, no relationship between primary variables and stage of cancer were significant. The present sample may not have had a high enough level of anxiety or depression to influence sleep, or the variability in anxiety and depression may have been too limited to
detect an effect. Although anxiety was normally distributed, it had a relatively restricted range. In addition, there may not have been sufficient power to detect relationships of predisposing factors. However, our sample did endorse a significant level of insomnia; therefore, findings suggest that anxiety and depression may not be a robust precipitating factor associated with insomnia severity among individuals with breast cancer.

Age was not significantly associated with symptoms of insomnia. Participants ranged in age from 26-75, allowing for ample variability and range. Additionally, the age range was normally distributed (age 26-40 [n=10]; age 41-60 [n=34]; age 61-75 [n=12]). Significance was not found when age was investigated categorically either, but may have been undetectable because once age was divided into categories, the group size became small. Past studies have yielded inconsistent findings in reference to the relationship between sleep and age among individuals with cancer. Although some studies of cancer patients have found younger age to be associated with insomnia (Davidson et al., 2002) other researchers have found older age to be associated with insomnia (Engstrom et al., 1999). However, Bardwell and colleagues (2008) did not find any relationship between insomnia and age among a sample of 2,645 women treated for breast cancer. Although age may not be a direct predisposing factor, Davidson and colleagues (2002) suggest that individuals who are younger may experience more stress when diagnosed with cancer. Factors such as fertility are likely to have greater implications for younger patients. For example, a woman who is diagnosed with breast cancer at the age of 25 may be concerned about her ability to have children in the future, ability to care for young children, long term health concerns, and implications the cancer will have on a new career; where as an older women may not experience these stressors. Therefore, another
explanation for the present study’s findings is that there were not enough younger patients with stressors such as young children or fertility concerns to identify statistical significance. Perhaps a larger sample size would be better able to identify the effects of age on insomnia among individuals with breast cancer. Nonetheless, present findings, coupled with the variability in previous findings suggest that age may not be a robust direct predisposing factor associated with insomnia among individuals with breast cancer.

Precipitating Factors

Individuals exposed to stressors, such as stress related to breast cancer, are more likely to develop insomnia relative to the general population (National Heart, Lung, and Blood Institute, 1995; Sateia et al., 2000). Morin and Savard (2001) proposed that stress associated with cancer is likely a precipitating factor associated with insomnia. Moreover, a longitudinal study demonstrated stress as a precipitator of insomnia symptoms among individuals with breast cancer (Palesh et al., 2007). However, the direct relationship between cancer specific stress and symptoms of insomnia had not been explored. The novel investigations into cancer specific stress as a unique precipitating factor of insomnia symptoms in our sample did indeed reveal that cancer specific stress contributed to variability in insomnia severity above and beyond a history of sleep difficulties (predisposing factor).

Post-hoc analyses identified certain aspects of cancer specific stress to be more robustly associated with symptoms of insomnia relative to others. Feeling uninformed about one’s illness and associated treatments, feelings of bodily imperfection, and feeling that there were limited opportunities to speak with specialists about emotional well-being were all associated with symptoms of insomnia among individuals with breast cancer.
However, feelings of body imperfection were the most robust factor associated with insomnia severity. Such findings are consistent with QoL research, which discusses the potential impact of breast cancer and associated treatments to an individual’s identity as a female (Shapiro et al., 2001). The effects of treatments such as mastectomies and chemotherapy can change one’s physical appearance and challenge societal views of beauty. Moreover, the manner in which an individual once saw themselves has changed, their previous sense of self challenged. One might develop insomnia due to ruminative thoughts and cognitive arousal, thinking about the physical alterations and change in one’s view of themselves. Moreover, the relationship may be more indirect, with concerns about physical alterations creating marital stress, thereby creating a decrease in social support and an increase in stressors. Likewise, the physical alterations could act as reminders of mortality. As stressors increase, cognitive arousal may increase, and an individual who is already predisposed to sleep difficulties may develop insomnia.

Given the potential uniqueness in this stressor, one may anticipate that breast cancer patients experience insomnia differently relative to individuals with other forms of cancer. However, there was no difference in cancer specific stress experienced between cancer types. As previously discussed, this may help clarify why there were not differences between cancer type and insomnia severity within our sample. Moreover, it was anticipated that cancer specific stressors unique to breast cancer would contribute to differences between cancer types, such as the numerous challenges to body images, sexuality, fertility, and one’s overall sense of femininity (e.g. breast surgery, hair loss, early menopause) that are associated with breast cancer. For that reason, the question investigating feelings associated with physical imperfections was evaluated
independently in the post-hoc analyses. Feelings associated with physical imperfections did emerge as a predictor of insomnia among individuals with breast cancer. However, there was no difference between types of cancer and feelings associated with physical imperfections. Two possibilities emerge. One being that changes in physical appearance are associated with other forms of cancer in the same manner as it is associated with breast cancer (e.g. chemotherapy and hair loss). Another possibility leads back to the small sample size in the groups of other cancer types. Therefore, future studies are needed to truly identify whether or not individuals with different forms of cancer experience different types of stressors associated with cancer that are related to insomnia severity.

Perpetuating Factors

Dysfunctional beliefs and attitudes about sleep did correlate with insomnia symptoms, yet did not account for variability in insomnia symptoms above and beyond the predisposing factor of a history of sleep difficulties or the precipitating factor of cancer specific stress. Savard and Morin (2001) suggested that individuals with cancer who experience chronic insomnia may be engaging in activities that are not compatible with sleep, such as watching television in bed. These activities were proposed as potentially contributing to the maintenance of sleep dysfunction by weakening the connection between one’s place of sleep and the actual act of sleeping (Morin, 1993). Dysfunctional cognitions in reference to sleep and cancer (e.g. poor sleep will cause my cancer to return) have also been hypothesized as perpetuating factors unique to individuals with cancer (Savard & Morin, 2001). However, the anticipated relationship between general dysfunctional beliefs and attitudes about sleep and insomnia was not
supported by present findings. Interestingly, although our sample was normally distributed, individuals had significantly higher endorsement of dysfunctional beliefs and attitudes about sleep relative to published norms for both a nonclinical group and individuals with insomnia (Rumble et al., 2005). Therefore, one would expect that if dysfunctional beliefs and attitudes about sleep were a strong perpetuating factor of insomnia among individuals with breast cancer, a relationship would have emerged in our sample.

An alternative explanation for results is that beliefs about sleep may have less of a role in the cycle of insomnia among breast cancer patients relative to individuals with insomnia in the general clinical insomnia population. The chronicity of insomnia among individuals with breast cancer may not be long enough to have perpetuating factors emerge. However, Savard and colleagues (2001) found that among individuals with breast cancer endorsing insomnia, 95% endorsed chronic insomnia. Although our study cannot report on the chronicity of the insomnia specifically, among individuals who reported a history of sleep difficulties, the difficulties began over one year ago for 88% of breast cancer patients. Moreover, individuals in the present sample did endorse a high level of dysfunctional beliefs and attitudes about sleep suggesting that if the relationship was present, it would have emerged.

Another hypothesized explanation is that individuals with cancer are more engaged in dysfunctional beliefs and attitudes about sleep associated with their cancer, such as concerns about poor sleep impacting recovery from cancer. This was initially proposed by Savard and Morin (2001) and lead to the investigation into a specific DBAS-SF question (*I am concerned that chronic insomnia may have serious consequences on*...
my physical health). Although concerns about the medical implications of insomnia did correlate with insomnia symptoms, it did not predict insomnia above and beyond predisposing and precipitating factors. Therefore, a dysfunctional belief about insomnia and physical well being was not found to perpetuate the insomnia in the present study’s sample. However, interpretations should be made with caution given only one question was included in the analyses and it did not directly address cancer. Future studies should aim to better identify the relationship between breast cancer and dysfunctional beliefs and attitudes about sleep specific to cancer.

An alternative thought is that cancer specific stress is both a precipitating and perpetuating factor which trumps the influences of dysfunctional beliefs and attitudes about sleep. The stress of cancer is often a constant and multifaceted group of issues, with treatment, physical changes, and issues of employment emerging throughout the process. For example, an individual may get diagnosed with breast cancer, starts treatment one month later, have issues with employment emerge one year later due to taking leave, and continue on a path of new stress associated with the breast cancer. Perhaps this series of stressors is both a robust precipitating factor and perpetuating factor among breast cancer patients. Dysfunctional beliefs and attitudes about sleep may remain a perpetuating factor among the general population because the stress of cancer is not a factor.

Mindfulness and Symptoms of Insomnia

The investigation of mindfulness and symptoms of insomnia among individuals with breast cancer was a novel conceptual approach to a complex problem. Contrary to what was expected, mindfulness conceptualized as a singular global construct, was not
associated with insomnia as a moderator among individuals with breast cancer. Moreover, the global construct of mindfulness did not correlate with insomnia symptoms. However, aspects of mindfulness such as acceptance and nonreactivity, did correlate with insomnia among breast cancer patients. These findings lead one to question how mindfulness should be conceptualized and what role mindfulness has in the context of insomnia.

The investigation into the relationship between the global construct of mindfulness and symptoms of insomnia was motivated by Lundh’s (2000; 2005) conceptualization of insomnia incorporating aspects of mindfulness. Lundh’s (2000; 2005) theory of insomnia suggests that heightened mindfulness likely reduces cognitive and physiological arousal since these constructs are mutually exclusive. In addition, Ong and colleagues (2008) found that increased mindfulness meditation leads to both decreased arousal and decreased symptoms of insomnia. Lundh’s (2000; 2005) theory and Ong and colleagues (2008) findings contributed to the present study’s hypotheses that mindfulness may change the relationship between symptoms of insomnia and precipitating and perpetuating factors.

**Cancer Specific Stress and Mindfulness**

The individual aspects of mindfulness that were associated with symptoms of insomnia in the present study were acceptance – that is acceptance of thoughts as thoughts and emotions as emotions, and being nonreactive – that is, one’s ability to remain nonreactive to inner experiences. It was hypothesized that higher endorsement of the global trait of mindfulness would change the relationship between cancer related stress and insomnia severity. Moreover, if one has the stress of cancer, but remains
nonreactive and accepting, their sleep is more likely to be preserved given they will not become aroused. Although greater nonreactivity and acceptance did correlate with fewer insomnia symptoms and less cancer specific stress, the moderation did not emerge. Mindfulness-based interventions have been shown to decrease stress and improve sleep quality among cancer populations (for review, see Smith, 2005), including breast cancer populations (Carlson et al., 2003). But present findings suggest that it may not be as simple as being high on the global trait of mindfulness, and that changing the impact of stress, and thereby, decreases insomnia severity. One possibility is that the relationship is more specific and more direct. Perhaps only certain aspects of mindfulness such as nonreactivity and acceptance directly influence insomnia. Therefore, when mindfulness is investigated as a global construct or as a moderator, significance would not be found. Perhaps it is simply that nonreactivity and acceptance decrease cognitive arousal and therefore decrease insomnia symptoms.

Another possibility is that the decrease in insomnia symptoms observed in MBSR interventions or interventions that include mindfulness meditation (Ong et al., 2008), are not attributable to an increase in the global trait of mindfulness. Perhaps these changes are attributable to other aspects of the intervention that are independent of mindfulness. This may explain why when researchers included an attention placebo group, individuals in the MBSR group were not found to have a significantly different improvement in sleep quality relative to the attention placebo group (Shapiro et al., 2003). Therefore, other elements of MBSR, such as psycho-education or relaxation, may be the mechanism by which insomnia symptoms dissipate. Another possibility is that the practice of mindfulness meditation may be contributing to the decrease in stress and decrease in
insomnia symptoms within mindfulness based interventions (Carlson et al., 2003; Carlson & Garland 2005; Ong et al., 2008). This may explain why only two factors of mindfulness, and not mindfulness as a whole, emerged as significantly being associated with insomnia and cancer specific stress. Perhaps nonreactivity and acceptance are constructs that are more highly associated with the act of mindfulness meditation. When an individual engages in mindfulness meditation perhaps the most influenced trait of mindfulness is nonreactivity and acceptance. Being that nonreactivity is likely to have an association with arousal, this could explain the decrease in insomnia symptoms. However, nonreactivity or acceptance were not found to moderate the relationships between cancer specific stress and insomnia symptoms. Such findings suggest that perhaps aspects of mindfulness do not change the relationship between stress and insomnia, but are interrelated to insomnia in a different manner. Perhaps higher nonreactivity decreases arousal, which increases acceptance, therefore changing the impact of stress on insomnia symptoms. Future studies may be able to identify this better by separating the act of mindfulness meditation and the trait of mindfulness apart. Additionally, future research on insomnia interventions that include a mindfulness component should evaluate the trait of mindfulness before and after treatment to identify changes. This may aid in identifying shifts in mindfulness associated with treatment and insomnia severity.

Dysfunctional Beliefs and Attitudes about Sleep and Mindfulness

Mindfulness as measured by the AAQ-2 or FFMQ was not found to moderate the relationship between dysfunctional beliefs and attitudes about sleep and symptoms of insomnia. Moreover, mindfulness and acceptance did not correlate with dysfunctional
beliefs and attitudes about sleep. Lundh (2000) suggests that insomnia exists at an interface, that being, the interrelationship between processes that are not compatible with sleep (e.g. cognitive and physiological arousal) and the manner in which one identifies with sleep (e.g. attribution and beliefs). Heightened mindfulness was proposed to reduce cognitive and physiological arousal given that these constructs are unable to be experienced simultaneously. One cannot engage in a mindful, accepting and cognitively deactivated state of being, while aroused (Lundh, 2000). Moreover, one would be less impacted by dysfunctional beliefs and attitudes about sleep if they were more mindful because they would not become as aroused. The present study failed to confirm this connection. It is possible that the relationship between dysfunctional attitudes and beliefs about sleep is less robust among individuals with cancer. Ong and colleagues (2008) were not investigating cancer patients. Moreover, as previously discussed, the stress associated with cancer may be such a strong precipitant that it washes out the effects of dysfunctional beliefs and attitudes, minimizing the importance of associated relationships. However, Ong and colleagues (2008) found that the number of times an individual engaged in mindfulness meditation did not correlate with dysfunctional beliefs and attitudes about sleep. Therefore, mindfulness may not change the relationship between dysfunctional beliefs and attitudes about sleep and insomnia severity among individuals with breast cancer.

Limitations

The strengths of this study are that it utilizes a clinical population comprised of breast cancer patients and implements standardized measures. In doing so, the present study allows for conclusions to be drawn in reference to symptoms of insomnia and its
associated factors among individuals with breast cancer. However, a number of limitations are acknowledged to help guide future research in this area.

The absence of objective sleep measurements is one such limitation. The present study focused on the subjective experience of sleep in order to make conclusions about the experience of symptoms of insomnia rather than the physiology of insomnia among individuals with breast cancer. Given that the study aims to understand subjective sleep quality and the distress associated, objective measures of sleep were not deemed crucial in this preliminary study. However, future studies may gain more insight into the physiology of insomnia among individuals with breast cancer by including objective measures of sleep.

The use of an outpatient breast cancer sample may limit the ability to generalize findings to individuals with cancer who are hospitalized or receiving at home care. However, our results do suggest that findings may be generalizable to individuals with other forms of cancer, given that breast cancer patients indicated comparable levels of insomnia symptoms and cancer specific stress relative to individuals with other forms of cancer (lung, lymphoma, gynecological, colon, and prostate). Generalizability may also be compromised given the depression scale was not evenly distributed and our sample failed to endorse a clinically significant amount of psychological distress which is inconsistent with past studies. Future studies should aim to explore the differences in the experience of insomnia between individuals with different forms of cancer and while being hospitalized or receiving at home care. The present study may not have had adequate sample sizes to identify differences between cancer types and did not include participates that were hospitalized or receiving at home care.
All factors potentially associated with insomnia among individuals with breast cancer were not assessed. Menopausal status may be a factor worthy of exploration. Although the present study did not find an association between hormone replacement therapy and insomnia, menopausal status was not evaluated. In addition, dysfunctional beliefs and attitudes about sleep specific to the experience of breast cancer would be worthy of future study. Although dysfunctional beliefs and attitudes about sleep were not found to perpetuate insomnia, dysfunctional beliefs and attitudes about sleep specific to breast cancer was not adequately investigated. One question on the DBAS-SF did address this by asking about one’s belief that insomnia causes poorer physical health, but because it is only one question it yields poor construct validity. Future research should aim to explore explicit dysfunctional beliefs and attitudes about sleep specific to breast cancer, such as asking if they believe poor sleep will cause them to have more unpleasant side effects from chemotherapy, or not being able to sleep will cause immunosuppression when their immune system is already suppressed due to treatments such as chemotherapy. Lastly, cognitive arousal was not evaluated in the present study. Future studies should aim to include a measure of cognitive arousal in order to understand the pathway to which predisposing and precipitating factors influence insomnia. In addition, ascertaining the relationship between cognitive arousal and mindfulness may aid in understanding the role mindfulness has in the cycle of insomnia. More research is needed to understand the multitude of factors potentially associated with insomnia among individual with breast cancer.

It is also important to distinguish that the trait, not the practice, of mindfulness meditation was explored. Future studies, such as research in MBSR, should examine the
practice of mindfulness meditation as a potential factor associated with insomnia. By developing a better understanding of moderating factors, more efficacious treatments can be implemented.

Additionally, the present study is correlational, and one cannot make conclusions in reference to causation. Although cancer specific stress emerged as being a significant factor in understanding symptoms of insomnia among individuals with breast cancer, current findings cannot be used to indicate that cancer specific stress causes symptoms of insomnia. It is plausible that difficulty sleeping may increase one’s cancer related distress. However, present findings in conjunction with previously proposed theoretical models (for a review, see Perlis et al., 2005; Savard & Morin, 2001; Spielman et al., 1987; Spielman & Glovinsky, 1991) do suggest predisposing (history of sleep disorder) and precipitating (cancer specific stress) factors. Longitudinal or intervention studies may aid in better understanding the potential causal relationship between factors.

Implications

The present study supports past findings that symptoms of insomnia are prevalent among breast cancer patients (Carlson et al., 2007). Moreover, insomnia has been cited by individuals with cancer as impacting many dimensions of QoL, including an individual’s overall physical and emotional functioning (Davidson et al., 2002). Such findings highlight the importance of investigating factors associated with symptoms of insomnia within breast cancer patients.

The present study highlights the importance of history of sleep difficulties as a predisposing factor and cancer specific stress as a precipitating factor associated with insomnia severity among individuals with breast cancer. Interventions developed to
address insomnia among the general population may need to be tailored for breast cancer patient populations to focus on predisposing and precipitating factors that emerge within this population. For example, dysfunctional beliefs and attitudes about sleep is an important perpetuating factor associated with insomnia among the general population, but our sample failed to demonstrate dysfunctional beliefs and attitudes about sleep as a perpetuating factor. In addition, cancer specific stress is a precipitating factor that houses many stressors over a period of time (e.g. diagnosis, treatments, physical changes due to treatment, employment issues) potentially maintaining an insomnia. In the general population the precipitating factor may be a single event, such as the death of a family member.

These findings aid in developing better ways to address symptoms of insomnia among breast cancer populations. Past research coupled with present findings suggest that a history of sleep difficulties predisposes an individual to develop symptoms of insomnia when in the context of breast cancer. Given such findings it may be of utility to evaluate breast cancer patients for a history of sleep difficulties when initially diagnosed with breast cancer. Spending more time addressing potential issues of insomnia among patients with a history of sleep disorders may aid in decreasing the likelihood of future symptoms of insomnia. In addition, many of the stressors that were noted by breast cancer patients could potentially be socially or environmentally mediated, such as psychological interventions to address body image issues associated with cancer treatment. Identifying ways to address the stress specifically associated with cancer (e.g. body image concerns) may be beneficial in decreasing insomnia severity. Such interventions may aid in alleviating associated stress. Additional services may be
beneficial, such as consultation liaison services to address concerns about conflicting information from the medical team and clarify information, availability of occupational therapy to aid in managing self care, and accessibility of social work and rehabilitation psychology to aid in addressing vocational concerns. Focusing on these specific factors, opposed to general dysfunctional beliefs and attitudes about sleep, appear to be more appropriate for breast cancer patients according to the present study’s findings.

Additional research is needed to better understand the relationship between mindfulness and insomnia among breast cancer patient populations. Findings in reference to mindfulness did not conclusively suggest whether MBSR or other mindfulness based treatments are appropriate for addressing issues of insomnia among individuals with breast cancer nor clarify how mindfulness is related to insomnia severity. Although aspects of mindfulness were associated with symptoms of insomnia (nonreactivity and acceptance), nonreactivity and acceptance failed to moderate the relationship between cancer specific stress and symptoms of insomnia or dysfunctional beliefs and attitudes and sleep and insomnia severity. Such findings highlight the importance in controlled randomized trials to identify why MBSR treatments have aided some individuals in decreasing symptoms of insomnia and what role mindfulness has in these changes. Investigating both the trait of mindfulness separately from the act of mindfulness meditation may also aid in understanding the role. Although aspects of mindfulness are likely associated with insomnia among individuals with cancer, the means to which these two constructs are linked requires additional research.

Perhaps research would be better served by starting with a qualitative approach to investigating the three factor model of insomnia within breast cancer patient populations.
Such research should include the relationship between symptoms of insomnia and cancer specific stress. Qualitative means would aid in exploring potential concerns over mortality and the experience of pain. Although the present study did include these factors, they were explored via one or two questions on the measure of cancer specific stress. Qualitative means would aid in understanding the role of existential concerns among breast cancer patients, such as worry about who will take care of their small children should they not survive. Pain is also a multifaceted construct that could be explored in more depth, such as the type of pain, and chronicity of pain. In addition, pain can often be a reminder of one’s illness. Such qualitative analyses would allow for an exploration into the actual impact breast cancer has on one’s sense of self given all these factors. Identifying how cancer specific stressors play a role in an individual’s life may help identify future directions for quantitative research. Given findings from the present study, further investigations into cancer specific stress may aid in understanding comorbid insomnia in the context of breast cancer.
List of References


Ohayon, M. M. (2002). Epidemiology of insomnia: What we know and what we still need to learn. Sleep Medicine Reviews, 6(2), 97-111


APPENDIX A: Demographic Questionnaire

ID#________________

Date of Participation________________________

Please help us to gain a better understanding of who you are by completing this short demographics scale. Place a check next to, or circle, the answer that you feel best describes yourself and your needs. If you do not feel that you fit into any of the categories listed, write in your answer. Thank you.

1. What is your age? _____

2. What is your ethnicity or racial background?

   ___White   ___Asian   ___Black   ___Hispanic   ___Other (_______)

3. Are you a U.S. born citizen?

   _____ YES   _____NO (If not, in what country were you born?___________)

4. Were you raised in the U.S.?

   _____YES   _____NO (If not, where were you raised?______________)

5. If you were not raised in the U.S., at what age did you move to the U.S?____

6. What type of cancer do you have?

   ___Breast   ___Colon   ___Prostate
   ___Gynecological   ___Lymphoma   ___Other:________________

7. Do you have metastatic disease?

   _____ YES_____ NO

8. What type of treatment are you receiving? (Please check all that apply).

   ___Radiation   ___Chemotherapy   ___Hormonal Treatment   ___Surgery
APPENDIX A: Demographic Questionnaire (continued)

If applicable: What types of surgical procedures have you had as part of cancer treatment?

__________________________________________________________________________________

__________________________________________________________________________________

9. If you have completed your cancer treatment and are currently attending follow-up appointments, please check how long it has been since completing your treatment:

____ 0-6 months ______ 6 months- 1 year ______ Greater than 1 year

10. What is your marital status?

____Single ______Separated ______In a significant relationship

____Married ______Widowed ______Divorced

11. Do you currently live with anyone? Yes ______ No

If yes, with whom? ______Husband

________Significant other

________Parents

________Sibling(s)

________Other ___________________

12. Do you have children? Yes ______ No

If yes, how many? __________

What are their ages? __________

If you are a female, did you breast feed? __________
APPENDIX A: Demographic Questionnaire (continued)

13. What is your education level?
   ___Less than high school - number of years you attended school = ___
   ___High School
   ___Completed Trade School
   ___Some College
   ___Graduated College - 2 year
   ___Graduated College - 4 year
   ___Graduate School – Masters
   ___Graduate School – Doctorate

14. What is your job status?
   ___Full-time
   ___Part-time
   ___Homemaker
   ___Retired
   ___Student
   ___Unemployed
   ___Other______________

15. Do you have health insurance?
   ___No
   ___Yes, I have….  
      ___Private
      ___HMO (Health Maintenance Organization)
      ___PPO (Preferred Provider Organization)
      ___Partial Year: Specify ____________________
      ___Full Year: Specify ______________________

16. What is your religious affiliation?
   ___Catholic
   ___Baptist
   ___Protestant
   ___None
   ___Jewish
   ___Other______________
   ___Muslim

17. What is your family income?
   ___Less than 5,000
   ___5,000 – 7,999
   ___8,000 – 11,999
   ___12,000 – 15,999
   ___16,000 – 24,999
   ___25,000 – 35,999
   ___36,000 – 45,999
   ___46,000 – 50,000
   ___Over 50,000

18. Please list any additional medical problems you may be experiencing:
   ____________________________________________________________
APPENDIX B: Acceptance and Action Questionnaire-2 (AAQ-2)

Below you will find a list of statements. Please rate how true each statement is for you by circling a number next to it. Use the scale below to make your choice.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>True</td>
<td>very</td>
<td>seldom</td>
<td>true</td>
<td>seldom</td>
<td>true</td>
<td>sometimes</td>
</tr>
<tr>
<td>1.</td>
<td>Its OK if I remember something unpleasant.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>My painful experiences and memories make it difficult for me to live a life that I would value.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td>I’m afraid of my feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>I worry about not being able to control my worries and feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5.</td>
<td>My painful memories prevent me from having a fulfilling life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>I am in control of my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7.</td>
<td>Emotions cause problems in my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8.</td>
<td>It seems like most people are handling their lives better than I am.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>9.</td>
<td>Worries get in the way of my success.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>10.</td>
<td>My thoughts and feelings do not get in the way of how I want to live my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
APPENDIX C: Dysfunctional Beliefs and Attitudes about Sleep - Short Form

Several statements reflecting peoples’ beliefs and attitudes about sleep are listed below. Please indicate to what extent you personally agree or disagree with each statement. There is no right or wrong answer. For each statement, place a mark (/) along the line wherever your personal rating falls. Try to use the whole scale, rather than placing your marks at one end of the line.

1) I need 8 hours of sleep to feel refreshed and function well during the day.

Strongly disagree ____________________________ Strongly agree

2) When I don’t get the proper amount of sleep on a given night, I need to catch up on the next day by napping or one the next night by sleeping longer.

Strongly disagree ____________________________ Strongly agree

3) I am concerned that chronic insomnia may have serious consequences on my physical health.

Strongly disagree ____________________________ Strongly agree

4) When I have trouble getting to sleep, I should stay in bed and try harder.

Strongly disagree ____________________________ Strongly agree

5) I am worried that I may lose control over my abilities to sleep.

Strongly disagree ____________________________ Strongly agree
APPENDIX C: Dysfunctional Beliefs and Attitudes about Sleep- Short Form (continued)

6) After a poor night’s sleep, I know that it will interfere with my daily activities on the next day.

   Strongly disagree ................................................................. Strongly agree

7) When I feel irritable, depressed, or anxious during the day, it is mostly because I did not sleep well the night before.

   Strongly disagree ................................................................. Strongly agree

8) When I sleep poorly on one night, I know it will disturb my sleep schedule for the whole week.

   Strongly disagree ................................................................. Strongly agree

9) When I feel tired, have no energy, or just seem not to function well during the day, it is generally because I did not sleep well the night before.

   Strongly disagree ................................................................. Strongly agree

10) I get overwhelmed by my thoughts at night and often feel I have no control over this racing mind.

   Strongly disagree ................................................................. Strongly agree

APPENDIX D: Five Facet Mindfulness Questionnaire

Please rate each of the statements below using the scale provided. Circle the number that best describes your own opinion of what is generally true of you.

<table>
<thead>
<tr>
<th></th>
<th>1 Never or rarely true</th>
<th>2 Rarely true</th>
<th>3 Sometimes true</th>
<th>4 Often true</th>
<th>5 Very often or always true</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I perceive my feelings and emotions without having to react to them</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I watch my feelings without getting lost in them</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>In difficult situations, I can pause without immediately reacting</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Usually when I have distressing thoughts or images, I am able to just notice them without reacting</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Usually when I have distressing thoughts or images, I feel calm soon after</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Usually when I have distressing thoughts or images, I “step back” and am aware of the thought or image without getting taken over by it</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Usually when I have distressing thoughts or images, I just notice them and let them go</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>When I’m walking, I deliberately notice the sensations of my body moving</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>When I take a shower or a bath, I stay alert to the sensations of water on my body</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>I notice how foods and drinks affect my thoughts, bodily sensations, and emotions</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>I pay attention to sensations, such as the wind in my hair and sun on my face</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>I notice the smells and aromas or things</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>I pay attention to how my emotions affect my thoughts and behavior</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I find it difficult to stay focused on what’s happening in the present</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>It seems I am “running on automatic” without much awareness of what I’m doing</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>I rush through activities without being really attentive to them</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Never or rarely true</td>
<td>Rarely true</td>
<td>Sometimes true</td>
<td>Often true</td>
<td>Very often or always true</td>
<td></td>
</tr>
<tr>
<td>19. I do jobs or tasks automatically, without being aware of what I’m doing</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. I find myself doing things without paying attention</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. When I do things, my mind wanders off and I’m easily distracted</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. I don’t pay attention to what I’m doing because I’m daydreaming, worrying, or otherwise distracted</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. I am easily distracted</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. I’m good at finding the words to describe my feelings</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. I can easily put my beliefs, opinions, and expectations into words</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. It’s hard for me to find the words to describe what I’m thinking</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. I have trouble thinking of the right words to express how I feel about things</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. When I have a sensation in my body, it’s hard for me to describe it because I can’t find the right words</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Even when I’m feeling terribly upset, I can find a way to put it into words</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. My natural tendency is to put my experiences into words</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. I can usually describe how I feel at the moment in considerable detail</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. I criticize myself for having irrational or inappropriate emotions</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. I tell myself that I shouldn’t be feeling the way I’m feeling</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. I believe some of my thoughts are abnormal or bad and I shouldn’t think that way</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. I make judgments about whether my thoughts are good or bad</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. I tell myself I shouldn’t be thinking the way I’m thinking</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. I think some of my emotions are bad or inappropriate and I shouldn’t feel them</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. I disapprove of myself when I have irrational ideas</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Usually when I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX E: Hospital Anxiety and Depression Inventory

Instructions: Please read each statement carefully and circle the answer which best describes how you feel.

1. I feel tense or “wound up”.
   a. Most of the time
   b. A lot of the time
   c. From time to time, occasionally
   d. Not at all

2. I still enjoy the things I used to enjoy.
   a. Definitely as much
   b. Not quite as much
   c. Only a little
   d. Hardly at all

3. I get a sort of frightened feeling as if something awful is about to happen.
   a. Very definitely and quite badly
   b. Yes, but not too badly
   c. A little, but it doesn’t worry me
   d. Not at all

4. I can laugh and see the funny side of things.
   a. As much as I always could
   b. Not quite so much now
   c. Definitely not so much now
   d. Not at all

5. Worrying thoughts go through my mind.
   a. A great deal of the time
   b. A lot of the time
   c. From time to time but not too often
   d. Only occasionally

6. I feel cheerful.
   a. Not at all
   b. Not often
   c. Sometimes
   d. Most of the time

7. I can sit at ease and feel relaxed.
   a. Definitely
   b. Usually
   c. Not often
   d. Not at all
APPENDIX E: Hospital Anxiety and Depression Inventory (continued)

8. I feel as if I am slowed down.
   a. Nearly all the time
   b. Very often
   c. Sometimes
   d. Not at all

9. I get a sort of frightened feeling like “butterflies” in the stomach.
   a. Not at all
   b. Occasionally
   c. Quite often
   d. Very often

10. I have lost interest in my appearance.
    a. Definitely
    b. I don’t take so much care as I should
    c. I may not take quite as much care
    d. I take just as much care as ever

11. I feel restless as if I have to be on the move.
    a. Very much indeed
    b. Quite a lot
    c. Not very much
    d. Not at all

12. I look forward with enjoyment to things.
    a. As much as I ever did
    b. Rather less than I used to
    c. Definitely less than I used to
    d. Hardly at all

13. I get sudden feelings of panic.
    a. Very often indeed
    b. Quite often
    c. Not very often
    d. Not at all

14. I can enjoy a good book or radio or TV program.
    a. Often
    b. Sometimes
    c. Not often
    d. Very seldom
1. Please rate the current SEVERITY of your insomnia problem(s) in the past MONTH.

<table>
<thead>
<tr>
<th>Difficulty falling asleep:</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Very Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty staying asleep:</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Problem waking up too early:</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. How SATISFIED/dissatisfied are you with your current sleep pattern?

<table>
<thead>
<tr>
<th>Very Satisfied</th>
<th>Satisfied</th>
<th>Neutral</th>
<th>Dissatisfied</th>
<th>Very Dissatisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

3. To what extent do you consider your sleep problem to INTERFERE with your daily functioning (e.g. daytime fatigue, ability to function at work/daily chores, concentration, memory, mood, etc.).

<table>
<thead>
<tr>
<th>Not at all Interfering</th>
<th>A Little</th>
<th>Somewhat</th>
<th>Much</th>
<th>Very Much Interfering</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

4. How NOTICEABLE to others do you think your sleeping problem is in terms of impairing the quality of your life?

<table>
<thead>
<tr>
<th>Not at all Noticeable</th>
<th>A Little</th>
<th>Somewhat</th>
<th>Much</th>
<th>Very Much Noticeable</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

5. How WORRIED/distressed are you about your current sleep problem?

<table>
<thead>
<tr>
<th>Not at all Worried</th>
<th>A Little</th>
<th>Somewhat</th>
<th>Much</th>
<th>Very Much Worried</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

APPENDIX G: The Questionnaire on Stress in Cancer Patients-Revised

Here is a list of situations that you might encounter and that might cause you stress. For each situation, please first decide whether the situation currently applies to you. If so, then please indicate how much of a problem the situation is for you by making an 'X' on the five point scale "only a slight problem" to "a very big problem". If not, then make an 'X' under "Does not apply to me".

1. I often feel tired and weak. ____________________________ □ □ □ □ □
2. I am suffering pain due to surgery. ____________________________ □ □ □ □ □
3. I feel unconfident in relationships with other people. ____________________ □ □ □ □ □
4. I am suffering pain due to unknown causes (headaches, lower back pain, stomach aches). ____________________________ □ □ □ □ □
5. I am afraid of the progression of my disease. ____________________________ □ □ □ □ □
6. Other people’s reactions are often inconsiderate/unsympathetic. ________________ □ □ □ □ □
7. Body care has become difficult since I developed cancer. ____________________ □ □ □ □ □
8. I am afraid of developing pain. ____________________________ □ □ □ □ □
9. I feel I am of less value to other people. ____________________________ □ □ □ □ □
10. I am afraid of having to go to the hospital again. ____________________________ □ □ □ □ □
11. I feel physically imperfect. ____________________________ □ □ □ □ □
12. I cannot partake in my hobbies (e.g. sports) as much as before I developed cancer. ___ □ □ □ □ □
13. I often have trouble sleeping. ____________________________ □ □ □ □ □
14. I am afraid of not being able to work anymore. ____________________________ □ □ □ □ □
15. I do not feel well informed about my illness/treatment. ____________________________ □ □ □ □ □
16. I am often tense and nervous. ____________________________ □ □ □ □ □
17. I have had sex less frequently since developing cancer. ____________________________ □ □ □ □ □
18. I do not feel adequately informed about possibilities for social/financial support. ___ □ □ □ □ □
19. It is difficult to talk with my family about my situation. ____________________________ □ □ □ □ □
APPENDIX G: The Questionnaire on Stress in Cancer Patients (continued)

20. Since I developed cancer I have been going out less (to the movies, out to eat, visiting friends, etc.). ____________________________ □ □ □ □ □

21. Different doctors gave different information about my illness. ________________ □ □ □ □ □

22. I have too few opportunities to talk about emotional problems with a specialist. _____ □ □ □ □ □

23. It is difficult for my spouse/partner to empathize with my situation. ________________ □ □ □ □ □
Table 1. Diagnostic Criteria for Comorbid Insomnia

<table>
<thead>
<tr>
<th>General Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Difficulty sleeping, characterized by either (or both) of the following:</td>
</tr>
<tr>
<td>1. Difficulty initiating sleep (&gt;30 minutes to fall asleep)</td>
</tr>
<tr>
<td>2. Difficulty maintaining sleep (&gt;30 minutes of nocturnal awakenings)</td>
</tr>
<tr>
<td>with corresponding sleep efficacy (ratio of total sleep time to time spent</td>
</tr>
<tr>
<td>in bed) less than 85%.</td>
</tr>
<tr>
<td>B. Sleep disturbance occurs at least 3 nights per week.</td>
</tr>
<tr>
<td>C. Sleep disturbance causes significant impairment of daytime functioning (e.g.</td>
</tr>
<tr>
<td>fatigue, sleepiness) or marked distress.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration Specifies</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Transient or situational: duration of 1 month or less</td>
</tr>
<tr>
<td>B. Short-term or subacute: duration of more than 1 month and less than 6 months</td>
</tr>
<tr>
<td>C. Chronic: duration of 6 months or more</td>
</tr>
</tbody>
</table>

Table 2: Inclusion and Exclusion Criteria

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Be 18 years of age and older</td>
<td>• Do not have a current cancer diagnosis.</td>
</tr>
<tr>
<td>• Diagnosed and treated for cancer at The Cancer Institute of New Jersey at Cooper University Hospital</td>
<td>• Been in remission for more than one year.</td>
</tr>
<tr>
<td>Appendix</td>
<td>Name of Tool</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>A</td>
<td>Acceptance and Action Questionnaire -2</td>
</tr>
<tr>
<td>B</td>
<td>Descriptive Information Form</td>
</tr>
<tr>
<td>C</td>
<td>Dysfunctional Beliefs and Attitudes about Sleep- Short Form</td>
</tr>
<tr>
<td>D</td>
<td>Five Facet Mindfulness Questionnaire</td>
</tr>
<tr>
<td>E</td>
<td>Hospital Anxiety and Depression Scale</td>
</tr>
<tr>
<td>F</td>
<td>Insomnia Severity Index</td>
</tr>
</tbody>
</table>
### Table 3: Outline of Measures (continued)

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Name of Tool</th>
<th>Source/ Year</th>
<th>Purpose/Focus</th>
<th>Number of Items</th>
<th>Scaling/ Scoring</th>
<th>Psychometric Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Questionnaire on Stress in Cancer Patients - Revised</td>
<td>Herschbach, Keller, Knight, Brandi, Huber, Henrich, &amp; Marten-Mittag, 2004</td>
<td>Evaluate stress specific to cancer as a precipitating factor.</td>
<td>23</td>
<td>5 point scale</td>
<td>Cronbach’s $\alpha$ = .89</td>
</tr>
</tbody>
</table>
Table 4. Demographic Variables for Sample

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Number of Subjects</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnic Identity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>41</td>
<td>73.2</td>
</tr>
<tr>
<td>African American</td>
<td>10</td>
<td>17.9</td>
</tr>
<tr>
<td>Native American</td>
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<td>Other</td>
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<tr>
<td>Marital Status</td>
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<td>Married</td>
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<td>Divorced</td>
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<td>Widowed</td>
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<tr>
<td>In a Significant Relationship</td>
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<td>8.9</td>
</tr>
<tr>
<td>Children</td>
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<tr>
<td>Yes</td>
<td>45</td>
<td>80.4</td>
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<tr>
<td>No</td>
<td>11</td>
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<tr>
<td>Education Level</td>
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<td>High School</td>
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<td>Trade School</td>
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<tr>
<td>Some College</td>
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<td>23.2</td>
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<td>Graduated College (2 year)</td>
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<tr>
<td>Graduated College (4 year)</td>
<td>17</td>
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<td>Graduate School (Masters)</td>
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<td>Graduate School (Doctorate)</td>
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<td>Employment</td>
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<td>Full Time</td>
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<td>Part Time</td>
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<td>Homemaker</td>
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<tr>
<td>Retired</td>
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<td>17.9</td>
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<td>Unemployed</td>
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<td>Other</td>
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Table 4. Demographic Variables for Sample (continued)

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Number of Subjects</th>
<th>%</th>
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<tbody>
<tr>
<td><strong>Stage of Cancer</strong></td>
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<td></td>
</tr>
<tr>
<td>Stage I or IA</td>
<td>11</td>
<td>20.4</td>
</tr>
<tr>
<td>Stage II or IIA</td>
<td>16</td>
<td>29.6</td>
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<tr>
<td>Stage IIB</td>
<td>3</td>
<td>5.6</td>
</tr>
<tr>
<td>Stage III or IIIA</td>
<td>11</td>
<td>20.4</td>
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<td>Stage IIB</td>
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<td>3.7</td>
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<tr>
<td>Stage IIIIC</td>
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<td>1.9</td>
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<tr>
<td>Stage IV</td>
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<td><strong>Metastatic Disease</strong></td>
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<td>Yes</td>
<td>10</td>
<td>18.5</td>
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<td>No</td>
<td>35</td>
<td>64.8</td>
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<tr>
<td>I don’t know</td>
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<td>16.7</td>
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<td><strong>Radiation Treatment</strong></td>
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<td>Yes</td>
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<td><strong>Chemotherapy Treatment</strong></td>
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<td>1.8</td>
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<td><strong>Hormone Treatment</strong></td>
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<td><strong>Surgical Treatment</strong></td>
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<td>Yes</td>
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<td><strong>Receiving Psychological Treatment</strong></td>
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<td></td>
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<td>Yes</td>
<td>12</td>
<td>22.2</td>
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<tr>
<td>No</td>
<td>42</td>
<td>77.8</td>
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</tbody>
</table>

Mean Age = 50.61 (SD = 11.28)
Age 26-40 [n=10]; Age 41-60 [n=34]; Age 61-75 [n=12]
Table 5: Sample Means Compared to Published Means

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample Mean and Standard Deviation</th>
<th>Normative Mean and Standard Deviation</th>
<th>T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance and Action Questionnaire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$M = 53.28$ (8.93)</td>
<td>$M = 50.72$ (9.19)</td>
<td>$t(53) = 2.10^*$</td>
</tr>
<tr>
<td>Dysfunctional Beliefs and Attitudes about Sleep-Short Form</td>
<td>$M = 49.75$ (19.09)</td>
<td>$M = 44.12$ (14.74) †</td>
<td>$t(55) = 2.21^†$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$M = 27.74$ (17.31) ††</td>
<td>$t(55) = 8.63^{**}$</td>
</tr>
<tr>
<td>Five Facet Mindfulness Questionnaire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score (Community)</td>
<td>$M = 133.54$ (16.72)</td>
<td>$M = 116.9†$</td>
<td>$t(53) = 7.31^{**}$</td>
</tr>
<tr>
<td>Total Score (Educated)</td>
<td>$M = 133.54$ (16.72)</td>
<td>$M = 137.32††$</td>
<td>$t(53) = -1.66$</td>
</tr>
<tr>
<td>Hospital Anxiety and Depression Scale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>$M = 6.83$ (3.92)</td>
<td>$M = 6.14$ (3.76)</td>
<td>$t(53) = 1.30$</td>
</tr>
<tr>
<td>Depression</td>
<td>$M = 4.04$ (3.55)</td>
<td>$M = 3.68$ (3.07)</td>
<td>$t(55) = .75$</td>
</tr>
<tr>
<td>Insomnia Severity Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer Sample</td>
<td>$M = 9.04$ (6.56)</td>
<td>$M = 8.7$ (6.8)</td>
<td>$t(55) = .38$</td>
</tr>
<tr>
<td>Sleep Disorder Sample</td>
<td>$M = 9.04$ (6.56)</td>
<td>$M = 19.70$ (4.1)</td>
<td>$t(55) = -12.16^{**}$</td>
</tr>
<tr>
<td>Questionnaire on Stress in Cancer Patients- Revised</td>
<td>$M = 1.85$ (.65)</td>
<td>$M = 1.32$ (.85)</td>
<td>$t(50) = 5.82^{**}$</td>
</tr>
</tbody>
</table>

---

2 Bond et al., Submitted. Means based on student and community sample.
3 Rumble et al. 2005. Means are based on: insomnia group† comparison group††
4 Bear et al., 2008. Means are based on nonclinical: community sample † educated group††
5 Crawford et al., 2001. Means are based on non-clinical sample.
6 Savard et al., 2005. Means are based on female cancer patients.
7 Bastien et al., 2001. Means are based on sleep disorder patients.
8 Herschbach et al., 2004. Means are based on female cancer patients.

*p<.05, **p<.01
Table 6: Cronbach’s Alpha for Primary Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance and Action Questionnaire-2(^9)</td>
<td>.79</td>
</tr>
<tr>
<td>Dysfunctional Beliefs and Attitudes about Sleep-Short Form(^10)</td>
<td>.81</td>
</tr>
<tr>
<td>Five Facet Mindfulness Questionnaire(^11)</td>
<td>.86</td>
</tr>
<tr>
<td>Nonreactivity</td>
<td></td>
</tr>
<tr>
<td>Observing</td>
<td></td>
</tr>
<tr>
<td>Acting with awareness</td>
<td></td>
</tr>
<tr>
<td>Describing</td>
<td></td>
</tr>
<tr>
<td>Nonjudgment</td>
<td></td>
</tr>
<tr>
<td>Hospital Anxiety and Depression Scale(^12)</td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>.87</td>
</tr>
<tr>
<td>Depression</td>
<td>.82</td>
</tr>
<tr>
<td>Insomnia Severity Index(^13)</td>
<td>.91</td>
</tr>
<tr>
<td>Questionnaire on Stress in Cancer Patients – Revised(^14)</td>
<td>.91</td>
</tr>
</tbody>
</table>

\(^9\) AAQ-2 (Bond et al., submitted)
\(^10\) DBAS (Morin, 1993)
\(^11\) FFMQ (Bear et al., 2006; Bear et al., 2008)
\(^12\) HADS (Zigmond & Snaith, 1983)
\(^13\) ISI (Bastien, Vallieres, & Morin, 2001)
\(^14\) QSCP-R (Herschbach et al., 2004)
Table 7: Interrelationship between Primary Measures

<table>
<thead>
<tr>
<th></th>
<th>Outcome</th>
<th>Precipitating Factors</th>
<th>Perpetuating Factors</th>
<th>Predisposing Factors</th>
<th>Moderating Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale</td>
<td></td>
<td>Insomnia Symptoms (r_p)</td>
<td>Cancer Specific Stress (r_p)</td>
<td>Beliefs and Attitudes about Sleep (r_p)</td>
<td>Depression (r_p)</td>
</tr>
<tr>
<td>Outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insomnia Symptoms(^{15})</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer Specific Stress(^{16})</td>
<td>(.66, &lt;.001 )**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beliefs and Attitudes about Sleep(^{17})</td>
<td>(.40, .002 )**</td>
<td>(.45, .001 )**</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression(^{18})</td>
<td>(.28, .017 *)</td>
<td>(.54, &lt;.001 )**</td>
<td>(.29, .029 *)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Anxiety(^{19})</td>
<td>(.43, .001 )**</td>
<td>(.58, &lt;.001 )**</td>
<td>(.31, .022 *)</td>
<td>(.34, .011 *)</td>
<td>-</td>
</tr>
<tr>
<td>Mindfulness(^{20})</td>
<td>(-.10, .462 )</td>
<td>(-.20, .157 )</td>
<td>(.02, .866 )</td>
<td>(-.34, .012 *)</td>
<td>(-.50, &lt;.001 *)</td>
</tr>
<tr>
<td>Acceptance(^{21})</td>
<td>(-.34, .01 *)</td>
<td>(-.05, &lt;.001 )**</td>
<td>(-.26, .06 )</td>
<td>(-.42, .002 )**</td>
<td>(-.67, &lt;.001 **)</td>
</tr>
</tbody>
</table>

\(^{15}\) Insomnia Severity Index (Bastien, Vallieres, & Morin, 2001)
\(^{16}\) Questionnaire on Stress in Cancer Patients - Revised (Herschbach et al., 2004)
\(^{17}\) Dysfunctional Beliefs and Attitudes about Sleep-Short Form (Edinger et al., 2001; Morin, 1993)
\(^{18}\) Hospital Anxiety and Depression Scale - Depression Subscale (Zigmond & Snaith, 1983)
\(^{19}\) Hospital Anxiety and Depression Scale - Anxiety Subscale (Zigmond & Snaith, 1983)
\(^{20}\) Five Facets of Mindfulness Questionnaire (Bear et al., 2006; Bear et al., 2008)
\(^{21}\) Acceptance and Action Questionnaire-2 (Bond et al., submitted)
Table 8. Means on Insomnia Severity Index by Type of Cancer

<table>
<thead>
<tr>
<th>Symptoms of Insomnia</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast Cancer</td>
<td>9.04</td>
<td>6.56</td>
</tr>
<tr>
<td>Colon Cancer</td>
<td>7.60</td>
<td>4.86</td>
</tr>
<tr>
<td>Gynecologic Cancer</td>
<td>9.05</td>
<td>6.89</td>
</tr>
<tr>
<td>Liver Cancer</td>
<td>4.00</td>
<td>(N/A)†</td>
</tr>
<tr>
<td>Lung Cancer</td>
<td>9.08</td>
<td>6.69</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>12.60</td>
<td>2.88</td>
</tr>
<tr>
<td>Prostate Cancer</td>
<td>8.00</td>
<td>7.81</td>
</tr>
</tbody>
</table>

†not included in analysis because n=1

---

22 ISI (Bastien, Vallieres, & Morin, 2001)
Table 9. Results from Simultaneous Entry Linear Regressions (Aim II)

### Symptoms of Insomnia\(^{23}\)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>(R^2)</th>
<th>(F)</th>
<th>(B)</th>
<th>(SE)</th>
<th>(Beta)</th>
<th>(t)</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery</td>
<td>1.99</td>
<td>1.48</td>
<td>.16</td>
<td>1.35</td>
<td>.185</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety(^{24})</td>
<td>.23</td>
<td>.21</td>
<td>.14</td>
<td>.14</td>
<td>.293</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression(^{25})</td>
<td>.27</td>
<td>.24</td>
<td>.14</td>
<td>1.14</td>
<td>.260</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-.02</td>
<td>.07</td>
<td>-.03</td>
<td>-.28</td>
<td>.779</td>
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</tr>
<tr>
<td>History of Sleep Difficulties</td>
<td>6.17</td>
<td>1.65</td>
<td>.47</td>
<td>3.75</td>
<td>&lt;.001**</td>
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</tbody>
</table>

\[.42\] 6.75

---

\(^{23}\) ISI (Bastien, Vallieres, & Morin, 2001)

\(^{24}\) HADS Anxiety Subscale (Zigmond & Snaith, 1983)

\(^{25}\) HADS Depression Subscale (Zigmond & Snaith, 1983)
Table 10. Results from Hierarchical Regressions (Aim III)

Symptoms of Insomnia\(^{26}\)

<table>
<thead>
<tr>
<th></th>
<th>(R^2)</th>
<th>(F)</th>
<th>(B)</th>
<th>(SE)</th>
<th>Beta</th>
<th>(t)</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: Covariate</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Surgery</td>
<td>.51</td>
<td>.25</td>
<td>.28</td>
<td>2.03</td>
<td>.048*</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>.08</td>
<td>4.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2: Predisposing Factors</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>.34</td>
<td>.22</td>
<td>.19</td>
<td>1.57</td>
<td>.123</td>
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<tr>
<td>History of Sleep Difficulties</td>
<td>1.00</td>
<td>.23</td>
<td>.52</td>
<td>4.31</td>
<td>(&lt;.001^*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.34</td>
<td>12.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3: Precipitating Factors</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>.10</td>
<td>.19</td>
<td>.05</td>
<td>.50</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of Sleep Difficulties</td>
<td>.65</td>
<td>.21</td>
<td>.34</td>
<td>3.09</td>
<td>.003**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer Specific Stress(^{27})</td>
<td>.71</td>
<td>.16</td>
<td>.51</td>
<td>4.49</td>
<td>(&lt;.001^{**})</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>.54</td>
<td>18.07</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Note. \(\Delta R^2=.26\) for Step 2; \(\Delta R^2=.20\) for Step 3.*

\(^{26}\) ISI (Bastien, Vallieres, & Morin, 2001)

\(^{27}\) QSCP-R (Herschbach et al., 2004)
Table 11. Results from Hierarchical Regressions (Aim IV)

### Symptoms of Insomnia

<table>
<thead>
<tr>
<th>Step 1: Covariate</th>
<th>$R^2$</th>
<th>$F$</th>
<th>$B$</th>
<th>SE</th>
<th>Beta</th>
<th>t</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery</td>
<td>.52</td>
<td>.24</td>
<td>.29</td>
<td></td>
<td>2.15</td>
<td>.036**</td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td>.18</td>
<td>.08</td>
<td>.29</td>
<td></td>
<td>2.19</td>
<td>.034**</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.16</td>
<td></td>
<td></td>
<td>4.60</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2: Predisposing Factors</th>
<th>$R^2$</th>
<th>$F$</th>
<th>$B$</th>
<th>SE</th>
<th>Beta</th>
<th>t</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery</td>
<td>.37</td>
<td>.22</td>
<td>.20</td>
<td></td>
<td>1.68</td>
<td>.099</td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
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<td>.08</td>
<td>.17</td>
<td></td>
<td>1.40</td>
<td>.169</td>
<td></td>
</tr>
<tr>
<td>History of Sleep Difficulties</td>
<td>.92</td>
<td>.24</td>
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Note. $\Delta R^2=.20$ for Step 2; $\Delta R^2=.18$ for Step 3; $\Delta R^2=.001$ for Step 3.

---

28 ISI (Bastien, Vallieres, & Morin, 2001)
29 QSCP-R (Herschbach et al., 2004)
30 QSCP-R (Herschbach et al., 2004)
31 DBAS (Morin, 1993)
### Table 12. Results from Simultaneous Entry Linear Regressions (Hypothesis 5a)

<table>
<thead>
<tr>
<th></th>
<th>$R^2$</th>
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<th>SE</th>
<th>Beta</th>
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<td>.08</td>
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<td>-.01</td>
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<td>(Cancer specific stress$^\dagger$) X (Acceptance$^\dagger$)</td>
<td>-.06</td>
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<td>-.07</td>
<td>-.53</td>
<td>.60</td>
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</table>

$^\dagger$Centered Variables

---

32 ISI (Bastien, Vallieres, & Morin, 2001)
33 AAQ-2 (Bond et al., submitted)
34 QSCP-R (Herschbach et al., 2004)
Table 13. Results from Simultaneous Entry Linear Regressions (Hypothesis 5b)

<table>
<thead>
<tr>
<th>Symptoms of Insomnia(^{38})</th>
<th>(R^2)</th>
<th>(F)</th>
<th>(B)</th>
<th>(SE)</th>
<th>(Beta)</th>
<th>(t)</th>
<th>(p)</th>
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<tr>
<td>Surgery</td>
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<td>.09</td>
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<tr>
<td>Mindfulness(^{36})</td>
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<td>.10</td>
<td>.10</td>
<td>.83</td>
<td>.41</td>
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<td>6.59</td>
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<td>.65</td>
<td>5.39</td>
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<td>(Cancer specific stress(^{3}) (\times) (Mindfulness(^{3}))</td>
<td>.09</td>
<td>.09</td>
<td>.12</td>
<td>.12</td>
<td>1.03</td>
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\(^{35}\) ISI (Bastien, Vallieres, & Morin, 2001)  
\(^{36}\) FFMQ (Bear et al., 2006; Bear et al., 2008)  
\(^{37}\) QSCP-R (Herschbach et al., 2004)  

\(^{\dagger}\) Centered Variables
Table 14. Results from Simultaneous Entry Linear Regressions (Hypothesis 6a)

<table>
<thead>
<tr>
<th>Symptoms of Insomnia&lt;sup&gt;38&lt;/sup&gt;</th>
<th>R²</th>
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<th>B</th>
<th>SE</th>
<th>Beta</th>
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<td>.11</td>
<td>.83</td>
<td>.41</td>
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<td>Acceptance&lt;sup&gt;39&lt;/sup&gt;</td>
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<td>-.02</td>
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<td>.00</td>
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<td>-.24</td>
<td>-.69</td>
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<sup>39</sup>Centered Variables

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<sup>38</sup> ISI (Bastien, Vallieres, & Morin, 2001)
<sup>39</sup> AAQ-2 (Bond et al., submitted)
<sup>40</sup> DBAS-SF (Edinger et al., 2001; Morin, 1993)
### Table 15. Results from Simultaneous Entry Linear Regressions (Hypothesis 6b)

<table>
<thead>
<tr>
<th>Symptoms of Insomnia(^4)</th>
<th>(R^2)</th>
<th>(F)</th>
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<th>(Beta)</th>
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<th>(p)</th>
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<td>.19</td>
<td>1.48</td>
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<td>Mindfulness(^2)</td>
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<td>1.49</td>
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\(^{2}\) Centered Variables

---

\(^{4}\) ISI (Bastien, Vallieres, & Morin, 2001)

\(^{2}\) FFMQ (Bear et al., 2006; Bear et al., 2008)

\(^{3}\) DBAS-SF(Edinger et al., 2001; Morin, 1993)
Table 16. Descriptive Statistics by Type of Cancer: Questionnaire on Stress in Cancer Patients – Revised Version

<table>
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<th>Cancer Specific Stress</th>
<th>$M$</th>
<th>$SD$</th>
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<td>Colon Cancer</td>
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<td>Gynecologic Cancer</td>
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<td>.59</td>
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<td>Liver Cancer</td>
<td>1.26</td>
<td>(N/A)†</td>
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<td>Lung Cancer</td>
<td>1.74</td>
<td>.61</td>
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<tr>
<td>Lymphoma</td>
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<td>Prostate Cancer</td>
<td>1.81</td>
<td>.81</td>
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†not included in analysis because n=1

QSCP-R (Herschbach et al., 2004)
Figure 1: Proposed Three-factor Model of Insomnia in relation to Breast Cancer
Figure 2: Distribution of Insomnia Severity Index Scores

---

45 ISI (Bastien, Vallieres, & Morin, 2001)
**Figure Captions**

Figure 1. Proposed Three-factor Model of Insomnia in relation to Breast Cancer
Adapted from: Savard, & Morin. (2001); Spielman et al., (1987); Spielman & Glovinsky. (1991)

Figure 2: Distribution of Insomnia Severity Index Scores
Vita

Jessica Heather Wolfman, M.S., M.A.

EDUCATION

<table>
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<th>Location</th>
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<td>Philadelphia, Pennsylvania</td>
<td>Clinical Psychology</td>
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<td>Philadelphia, Pennsylvania</td>
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<tr>
<td>M.A.</td>
<td>Columbia University, Teachers College</td>
<td>New York, New York</td>
<td>Psychology and Education</td>
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<tr>
<td>B.A.</td>
<td>University of Colorado</td>
<td>Boulder, Colorado</td>
<td>Psychology</td>
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CLINICAL TRAINING

Clinical Psychology Intern, Denver VA Medical Center, Denver, CO

Graduate Practicum Student, Cooper Hospital, Voorhees and Camden, NJ

Graduate Practicum Student, Children’s Hospital of Philadelphia, Philadelphia, PA

Graduate Practicum Student, University of Pennsylvania Hospital, Department of Rehabilitation Medicine, Philadelphia, PA

PUBLICATIONS


AWARDS AND HONORS

2009 Rehabilitation Psychology Conference, Division 22 student poster presentation award

2007 Drexel University, Office of Research Award for Research, Innovation, Scholarship and Creativity

2007 Drexel University, College of Arts and Sciences Honorable Mention for poster presentation

2007 Cooper Cancer Institute Cooper Cancer Institute, $15,000 grant to conduct study on Why Weight?