

**PSYCHOLOGICAL PROCESSES AND SYMPTOM OUTCOMES IN
CANCER SURVIVORS FOLLOWING A MINDFULNESS-BASED
STRESS REDUCTION INTERVENTION**

by

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ABSTRACT

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Title: Psychological Processes and Symptom Outcomes in Cancer Survivors Following a Mindfulness-Based Stress Reduction Intervention

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Mindfulness-based interventions targeting psychological and physical symptoms in cancer survivors have been shown to be efficacious. However, little is known about theory-based psychological processes through which mindfulness-based interventions may decrease symptoms. The present study is a secondary analysis of data from a mindfulness-based stress reduction (MBSR) pilot trial targeting cancer-related fatigue (CRF) in cancer survivors. Thirty-five persistently fatigued cancer survivors were recruited from a university hospital and various community clinics in Indianapolis, Indiana. Participants were randomized to either a 7-week MBSR intervention for CRF or a waitlist control (WC) condition. Measures were administered at pre-intervention, post-intervention, and 1-month follow-up and included levels of mindfulness, acceptance, and self-compassion as well as the symptom outcomes of fatigue interference, sleep disturbance, and distress. I hypothesized that MBSR would lead to increased levels of five facets of mindfulness (i.e., observing, describing, acting with awareness, nonjudging of inner experience, nonreactivity to inner experience), self-compassion, and acceptance as compared to the WC condition. Using a linear mixed modeling approach, significant group by time interactions were only found for observing, acting with awareness, nonjudging, and self-compassion, such that the MBSR group showed steady increases in these processes over time, whereas the WC group's scores remained relatively stable. In

addition, I examined whether positive changes in the five facets of mindfulness were associated with reductions in the three symptoms using multiple linear regression. This hypothesis was partially supported; acting with awareness was the only facet of mindfulness to show a modest association with a decrease in fatigue, but this result fell short of statistical significance. In addition, decreased sleep disturbance was predicted by increases in acting with awareness and nonjudging, while decreased distress was predicted by increases in observing, acting with awareness, nonjudging, and nonreactivity. Results point to specific psychological processes that may be targeted to maximize the efficacy of future MBSR interventions for cancer survivors.

CHAPTER 1. INTRODUCTION

Cancer survivors often experience physical and psychological symptoms for months or even years following treatment (Hofman, Ryan, Figueroa-Moseley, Jean-Pierre, & Morrow, 2007; Prue, Rankin, Allen, Gracey, & Cramp, 2006). Some of the most common symptoms are fatigue, sleep disturbance, depression, and anxiety, and, for some, these symptoms interfere with daily activities and cannot be relieved with medical therapies (Berger, Gerber, & Mayer, 2012; Minton et al., 2013). As evidence for psychosocial interventions for cancer survivors' symptoms has been growing, the focus on mindfulness-based therapies has increased (Bower, 2014; Faller et al., 2013). However, theory-based psychological processes through which mindfulness-based therapies, particularly mindfulness-based stress reduction (MBSR), may decrease symptoms have received limited attention. The present study examined several key psychological processes through which MBSR is hypothesized to influence symptoms, including mindfulness, acceptance, and self-compassion.

First, I will discuss common symptoms in cancer populations, including cancer-related fatigue, sleep disturbance, and anxiety and depressive symptoms, and available treatments for these symptoms. I will then review the literature on mindfulness-based interventions for these symptoms and provide a rationale for examining potential psychological processes underlying MBSR's effects on symptoms. Finally, I will present my hypotheses and study methods and discuss the results and their implications.

Cancer-related Fatigue, Sleep Disturbance, and their Treatment in Cancer Populations

Cancer-related Fatigue

Cancer-related fatigue (CRF) is one of the most common symptoms experienced by cancer patients and survivors (Hofman et al., 2007; Prue et al., 2006). It may be present before, during, and after treatment, with some survivors experiencing CRF for months or even years post-treatment (Hofman et al., 2007). CRF is frequently reported as the most distressing symptom and interferes with daily functioning even more so than pain (Curt, 2000). It is also strongly linked to several negative outcomes, including increased depressive symptoms and anxiety, increased disability, and decreased work productivity and engagement in social activities (Bower et al., 2000; Curt, 2000; Hann et al., 1998).

While there is no consensus regarding the definition of CRF, the National Comprehensive Cancer Network (NCCN) defines CRF as “a distressing, persistent, subjective sense of physical, emotional and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning” (National Comprehensive Cancer Network, 2015, p. 5). CRF is different from fatigue experienced by healthy individuals in that it is not typically relieved with increased rest and sleep (Ryan et al., 2007).

Prevalence rates for CRF have varied due to different screening measures and definitions of the symptom. In a review by Donovan and colleagues (2013), prevalence rates for CRF in patients and survivors ranged from 9.2% to 56% when using diagnostic criteria from the Fatigue Coalition. In a study of 814 cancer patients receiving chemotherapy and/or radiotherapy, 80% experienced CRF (Henry et al., 2008).

Prevalence rates for CRF in cancer patients who have completed treatment are typically lower and range from 21% to 53% (Cella, Davis, Breitbart, & Curt, 2001; Knobel et al., 2001). Fatigue often persists for years after cancer treatment (Bower et al., 2006). For example, in a longitudinal study of 763 disease-free breast cancer survivors at 5-10 years post-diagnosis, 34% reported significant fatigue, which is equivalent to prevalence rates at 1-5 years post-diagnosis (Bower et al., 2006). Because of the high prevalence and distressing nature of CRF, the American Society of Clinical Oncology (ASCO) has recommended that all cancer patients be evaluated for the presence of fatigue after completion of primary treatment and be offered specific information and strategies for fatigue management (Bower, Bak, et al., 2014).

Sleep Disturbance

Sleep disturbance, defined as perceived or actual disruptions in nighttime sleep or daytime wakefulness, is another prevalent symptom experienced by cancer patients and survivors and is associated with greater fatigue and depression, which negatively affect quality of life (Otte, Carpenter, Russell, Bigatti, & Champion, 2010; Palesh et al., 2010). Sleep disturbance can include a variety of sleep disorders, such as insomnia, restless legs syndrome, and sleep apnea (Otte et al., 2010). In one of the largest survey studies on sleep disturbances in cancer patients ($n = 982$), the most prevalent problems were excessive fatigue (44%), leg restlessness (41%), insomnia (31%), and excessive sleepiness (28%) (J. R. Davidson, MacLean, Brundage, & Schulze, 2002).

One of the most prevalent and distressing sleep disorders in cancer populations is insomnia/insomnia syndrome, which is defined as difficulty falling asleep or staying asleep (wake episodes for >30 minutes in the middle of the night), early awakening

(waking 30 minutes before intended), or non-restorative sleep (Palesh et al., 2010).

Prevalence rates for insomnia are 36% to 43% for cancer patients on active treatment, and 30% for patients with no recent treatment (J. R. Davidson et al., 2002; Palesh et al., 2010; J. Savard & Morin, 2001; J. Savard, Simard, Blanchet, Ivers, & Morin, 2001). Cancer patients' rates of insomnia and other sleep disturbances exceed those found in non-cancer populations, with problems reported in about 30% to 87% of cancer patients (J. Savard et al., 2001) compared to 16% to 20% in the general population (Ohayon, 2002). For example, in a prospective study of 823 patients of mixed cancer types undergoing chemotherapy, 43% met clinical criteria for insomnia after their first cycle, which is nearly three times higher than the rate in the general population, and an additional 37% of patients reported subclinical levels of insomnia symptoms (Palesh et al., 2010). Furthermore, in a study comparing long-term breast cancer survivors who were at least 2 years post-treatment to age-matched women without a breast cancer history, survivors had significantly more sleep disturbances and worse sleep quality (Otte et al., 2010).

Due to the strong association between fatigue and sleep disturbance, ASCO has included assessment and treatment of sleep disturbance, among other contributing factors, in guidelines for treating fatigue in cancer populations (Bower, Bak, et al., 2014). The NCCN also recommends screening for sleep disorders in cancer survivors at regular intervals and providing different treatment options or referrals to sleep specialists when necessary (National Comprehensive Cancer Network, 2016).

Treatments for Cancer-related Fatigue and Sleep Disturbance

Treatments for CRF and sleep disturbance have included pharmacologic as well as psychosocial interventions. Evidence supporting the use of psychostimulants for fatigue following cancer therapy has been mixed (Minton, Richardson, Sharpe, Hotopf, & Stone, 2008). A meta-analysis of four methylphenidate trials and one dexamphetamine trial with advanced stage cancer patients ($n = 426$), most of whom were not receiving active cancer treatment, found that psychostimulants were on average significantly more effective compared to a placebo ($d = -0.28$), but four of the trials did not show significant differences between the groups (Minton, Richardson, Sharpe, Hotopf, & Stone, 2011). Modafinil is another stimulant tested for the treatment of CRF. A trial with 631 patients undergoing chemotherapy demonstrated that modafinil had some benefit for patients with severe fatigue, but not for patients with mild or moderate fatigue (Jean-Pierre et al., 2010). Furthermore, psychostimulants such as modafinil may produce adverse effects with long-term use, especially among older cancer patients (Minton et al., 2008).

Pharmacologic interventions for sleep disturbance in cancer patients have even more limited empirical support and have been associated with various risks, including anaphylaxis, angioedema, and complex sleep-related behaviors, such as sleep-driving (Food and Drug Administration, 2007). The NCCN noted several prescribing considerations when treating cancer patients' sleep disturbance, including withdrawal symptoms, dependency, and increased potential for drug interactions (National Comprehensive Cancer Network, 2015).

A larger literature has focused on psychosocial and activity-based interventions for addressing CRF and associated symptoms. Kangas and colleagues (2008) conducted

a meta-analysis of 41 psychosocial and 16 exercise intervention studies enrolling 4,621 cancer patients and found a significant small to moderate effect size ($d = -.31$) on CRF across all studies. The effect size did not significantly differ between psychosocial and exercise interventions. Another meta-analysis of 18 psychosocial and 12 activity-based interventions for CRF found a small effect size ($d = .09$) across all studies, and a significantly larger effect size for psychosocial studies ($d = .10$) compared to exercise studies ($d = .05$) (Jacobsen, Donovan, Vadaparampil, & Small, 2007). The authors also reported that 50% of psychological trials and 44% of exercise trials had significantly greater effects on CRF in their respective intervention groups when compared to the control group. However, the evidence remains limited due to the failure to include CRF as an enrollment criterion in many studies. Overall, evidence for the psychosocial treatment of fatigue has been moderate to strong, leading the NCCN to make a category 1 recommendation for psychosocial intervention, including MBSR, for fatigue in cancer survivors (National Comprehensive Cancer Network, 2015). A category 1 recommendation is made when the NCCN reaches a uniform consensus based on high-level evidence.

Psychosocial interventions have also been examined for sleep disorders in cancer populations. Cognitive-behavioral therapy for insomnia (CBT-I), which involves sleep restriction, stimulus control, sleep hygiene, cognitive restructuring, and relaxation training, is one of the more commonly tested interventions. A recent meta-analysis of 8 studies with 752 cancer survivors found that the CBT-I condition produced medium-sized effects on sleep efficiency ($d = 0.53$), sleep latency ($d = 0.43$), and wake time after sleep onset ($d = 0.41$) compared to control conditions (Johnson et al., 2016). Large effect sizes

were also found for self-reported insomnia ($d = 0.77$). Overall, the strength of the evidence has led the NCCN to make a category 1 recommendation for CBT-I (National Comprehensive Cancer Network, 2015).

Distress and its Treatment in Cancer Populations

Distress

During and after cancer treatment, many patients and survivors also experience anxiety and depressive symptoms related to cancer treatment, concerns about recurrence, adjustment to daily living following treatment, and many other cancer-related experiences. Research has found that rates of depressive disorders in cancer patients in primarily inpatient settings range from 10% to 25%, which is about four times greater than the general population and comparable to the rate identified in other populations with chronic physical illnesses (Carr et al., 2002; Pirl, 2004). Another study of a representative sample of 1,323 cancer survivors at six months post-diagnosis found that 24% had elevated anxiety, 14% had elevated depressive symptoms, and 10% had elevated anxiety and depressive symptoms on the Hospital Anxiety and Depression Scale (Boyes, Girgis, D'Este, & Zucca, 2011). A recent meta-analysis of 211 studies assessing self-reported depressive symptoms in cancer patients during and after treatment found an 8% to 24% pooled prevalence of depression, defined as meeting DSM or ICD criteria or clinical cutoffs on self-report measures of depressive symptoms (Krebber et al., 2014). Depressive symptoms and anxiety in cancer patients have been linked to poorer quality of life, increased health care costs, and more physical symptoms such as pain, insomnia, and fatigue if the psychological symptoms are not adequately addressed (Andersen et al., 2014; Trudel-Fitzgerald, Savard, & Ivers, 2013). Given the high prevalence of mood

disturbance in cancer populations, ASCO has recommended that all cancer patients be evaluated for depression and anxiety at multiple time points of care so that providers may intervene (Andersen et al., 2014).

Treatment of Distress

Research supports the use of both psychosocial and pharmacologic interventions for distress in cancer populations (Hart et al., 2012; Li, Fitzgerald, & Rodin, 2012). Laoutidis and Mathiak (2013) conducted a meta-analysis of six antidepressant randomized controlled trials (RCTs) ($N = 563$ cancer patients) and found that, compared to placebo controls, antidepressants had a large effect size ($d = 1.56$). In addition, a meta-analysis of 198 psychological intervention trials ($N = 22,238$ cancer patients) addressing emotional distress and health-related quality of life (i.e., a global construct including depression, anxiety, and somatic complaints) found significant small-to-medium effects for psychotherapy and psychoeducation compared to controls (Faller et al., 2013). However, when analyzing the subset of studies with a distress criterion for enrollment, there were large effects for general emotional distress ($d = 1.01$) and quality of life ($d = 0.89$) and medium effects for anxiety ($d = 0.56$) and depression ($d = 0.53$). A systematic review of 14 meta-analyses of psychosocial interventions for cancer populations found that having a distress criterion for eligibility led to psychological treatment effects three times as large as those found in trials with no distress criterion (Linden & Gigris, 2012).

When examining specific psychological therapies, a meta-analysis of 15 studies enrolling 1,492 adult cancer survivors found that cognitive-behavioral therapy (CBT) had large effects on depression ($d=1.20$), anxiety ($d = 1.99$), and quality of life ($d = 0.91$) post-intervention as well as significant effects on quality of life at follow-up time points

<8 months and >8 months post-intervention ($d = 1.45$ and $d = 0.26$, respectively) compared to control groups, but these effects were not sustained at follow-up (Osborn, Demoncada, & Feuerstein, 2006). In subgroup analyses of six psychotherapeutic and four pharmacologic RCTs with elevated depressive symptoms as an enrollment criterion, CBT appeared to be more effective than problem-solving therapy ($p < .001$), but not more effective than pharmacologic intervention ($p = .07$) (Hart et al., 2012). Although the evidence for psychosocial interventions is strong, with specific forms of therapy having more empirical support than others, many patients do not benefit from CBT or other standard therapies and may be more responsive to mindfulness-based interventions.

Theory of MBSR

MBSR is a well-studied mindfulness-based intervention with origins in Buddhist philosophy and has been used to treat physical and psychological symptoms. The theory of MBSR has a core maxim to reduce human suffering by cultivating flexibility in participants' attention and attitude towards undesirable experiences (Kabat-Zinn, 1990). Suffering from either psychopathology or medical pathology is thought to be rooted in experiential avoidance, which refers to attempts to control the undesirable symptom or experience (Hayes, Strosahl, & Wilson, 1999). Efforts to control unwanted experiences by fighting or avoiding them can lead to the loss of activities of value and meaning. This maladaptive approach to life's uncomfortable circumstances is targeted in MBSR by fostering greater psychological flexibility, which has been defined as the ability to remain fully present to emotions, thoughts, and sensations while engaging in activities consistent with personal values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

The present trial was grounded in an MBSR framework, positing that survivors with CRF may have debilitating fears that result in experiential avoidance affecting valued activities. The examined MBSR intervention sought to decrease experiential avoidance by increasing psychological flexibility. Specifically, the intervention targeted three interrelated components of psychological flexibility: acceptance, mindfulness, and self-compassion.

The first of these components is acceptance--a primary target for intervention as it is the opposite of experiential avoidance. Acceptance refers to permitting an internal or external experience to be as it is with no attempts to control or change it (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Acceptance also refers to recognition of one's own tendencies to evaluate experiences and the belief that judging, controlling, or avoiding them are not helpful. This perspective leads to change in responses to unwanted experiences by directing one's focus to actions that promote personal goals and values.

Another component of psychological flexibility is mindfulness, which is commonly defined as intentionally attending to the present moment without judging that experience as either positive or negative (Baer, 2011; Kabat-Zinn, 1994). With mindfulness, any experiences that enter awareness are noticed and recognized as fleeting, not as unwanted experiences that should be avoided or eliminated (Kabat-Zinn, 1994).

Researchers have conducted confirmatory and exploratory analyses with existing mindfulness questionnaires and concluded that mindfulness has multiple dimensions. One common definition of mindfulness includes five facets: (1) *observing*, which refers to noticing and attending to experiences in and outside of oneself, (2) *describing*, which refers to labeling internal experiences with words, (3) *acting with awareness*, which

involves purposeful attention to one's present activities, (4) *nonjudging of inner experience*, which refers to taking a nonevaluative stance toward thoughts and feelings, and (5) *nonreactivity to inner experience*, which refers to the tendency to allow thoughts and feelings to come and go without being caught up in them (Baer et al., 2008).

Examination of each facet is common in research studies, although some research supports the use of a general overarching mindfulness construct (Carmody & Baer, 2008). To date, research has not determined whether there is a temporal element in the development of mindfulness facets.

A third component of psychological flexibility is self-compassion. Research has suggested that self-compassion includes three aspects: (1) self-kindness, defined as “being kind and understanding toward oneself in instances of pain or failure rather than being harshly self-critical,” (2) common humanity, or “perceiving one’s experience as part of the larger human experience rather than seeing them as isolating,” and (3) “holding painful thoughts and feelings in balanced awareness rather than over-identifying with them” (Neff, 2003, p.89). These three components are thought to enhance one another. Having self-compassion has also been described as similar to feeling forgiveness towards oneself, or perceiving one’s suffering as part of the human condition and acknowledging its worth (Neff, 2003b). By approaching unwanted experiences with this attitude, non-judgment and associated reductions in experiential avoidance are easier to achieve.

Mindfulness-based Interventions

Mindfulness-based interventions have been employed in a large number of trials targeting physical and psychological symptom outcomes. The standard MBSR course

has been adapted for various medical and psychiatric conditions, and other related interventions have been tested, including mindfulness-based cognitive therapy (MBCT), dialectical behavior therapy, yoga, and acceptance and commitment therapy (ACT) (Cramer, Lange, Klose, Paul, & Dobos, 2012; Hulbert-Williams, Storey, & Wilson, 2014; Zainal, Booth, & Huppert, 2013).

Standard MBSR Course

MBSR is a teacher-facilitated course developed by Jon Kabat-Zinn at the University of Massachusetts Medical Center in 1979. MBSR is based on the idea that cultivating mindfulness, or paying attention on purpose to the present moment with compassion and open-hearted curiosity, can lead to fuller participation in life (Kabat-Zinn, 1994). It was first tested with participants dealing with general stress, pain, and illness and was then adapted to patients with specific medical and psychiatric conditions and symptoms (Carlson, 2012; Kabat-Zinn, 1990). The standard MBSR course comprises eight weekly 2.5-hour classes and a day-long retreat. The curriculum includes experiential meditation practices, group discussion, and education on stress reactivity, stress physiology, and basic neurobiology. Participants are also given daily home practice assignments to complete with the help of guided meditation recordings.

Meditation is a core component of the MBSR course, with various meditation practices introduced during the classes. Participants are first taught fundamental elements of meditation, including mindful breathing exercises and the sitting meditation, which emphasizes postures and incorporates aspects of the breathing exercises. Awareness of the body and noticing but not judging internal experiences, such as thoughts, are taught through these practices. After simply noticing thoughts, participants'

focus is then redirected to the breath and current meditation. These ideas are extended in the gentle mindful yoga and mindful walking practices. Attentional practice is a target of these exercises, and participants learn to acknowledge both internal and external cues, such as bodily sensations and environmental distractions, without judging them. Gradually, participants learn to further apply these practices to situations in their daily lives. Participants are also provided with opportunities to clarify and review the meditation practices, discuss didactics on the mind-body relationship, and share their progress with one another.

Efficacy of MBSR and Mindfulness-based Interventions

Numerous studies have been conducted since the inception of MBSR demonstrating the effectiveness of mindfulness training for a wide range of conditions and symptoms, including stress, pain, depression, anxiety, and sleep (Chiesa & Serretti, 2009; Grossman, Niemann, Schmidt, & Walach, 2004; Hofmann, Sawyer, Witt, & Oh, 2010; Veehof, Oskam, Schreurs, & Bohlmeijer, 2011; Winbush, Gross, & Kreitzer, 2007). In a narrative review of mindfulness-based interventions, Carlson and colleagues (2012) evaluated their efficacy for populations with cancer, chronic pain, low back pain, fibromyalgia, rheumatoid arthritis, cardiovascular disease, diabetes, HIV/AIDS, irritable bowel syndrome, and organ transplant. For nearly all of these conditions, level 1 or 2 evidence for efficacy in reducing a variety of symptoms was found, with some conditions such as cancer having much stronger level 1 evidence for psychological, functional, and quality-of-life outcomes compared to evidence for other chronic conditions. Level 1 indicates the highest level of evidence, with at least one systematic review or meta-

analysis conducted on RCTs, while level 2 refers to evidence from RCTs with a usual care, waitlist, or active comparison group (Merlin, Weston, & Tooher, 2009).

An earlier meta-analysis examined the effects of MBSR on various health outcomes of both clinical and non-clinical populations in 20 studies, of which 13 were RCTs (Grossman et al., 2004). In five controlled trials ($N= 203$ participants) with physical symptom outcomes, there was a medium effect size for physical health ($d = 0.53$). In 11 controlled trials ($N = 771$ participants) examining psychological outcomes, there was also a medium effect size for mental health ($d = 0.54$). Similarly, a recent meta-analysis of 209 studies on mindfulness-based therapies for people with physical and psychological conditions as well as non-clinical populations found moderate effect sizes for the targeted physical or psychological outcome in pre-post comparisons (Hedges' $g = .55$) and comparisons to waitlist controls (Hedges' $g = .53$) or active controls (Hedges' $g = .33$) (Khoury et al., 2013). Overall, these results suggest that MBSR can improve a range of physical and mental health outcomes in clinical and non-clinical samples.

Research on mindfulness-based interventions adapted to the cancer context has been rapidly growing in the last decade. Several recent meta-analyses and clinical trials involving mindfulness-based interventions have demonstrated positive results with respect to physical and psychological health outcomes in cancer patients (Ledesma & Kumano, 2009; Musial, Bussing, Heusser, Choi, & Ostermann, 2011; Piet, Würzen, & Zachariae, 2012; Shennan, Payne, & Fenlon, 2011; Zainal et al., 2013). For example, a meta-analysis of nine studies examining the effects of MBSR on the mental health of breast cancer patients found promising results (Zainal et al., 2013). Examined studies included two RCTs, a quasi-experimental case-control study, and one group pre-post

intervention studies. There were medium effect sizes for MBSR on stress ($d = 0.71$), depression ($d = 0.58$), and anxiety ($d = 0.73$). These findings suggest moderate effects of MBSR on the mental health of breast cancer patients, although the study designs limit the conclusions that may be drawn.

Similar positive evidence has been found in mindfulness-based RCTs for patients with other types of cancer. For example, a meta-analysis of nine high-quality RCTs of MBSR and MBCT targeting anxiety and depression in cancer patients and survivors of various disease types and stages ($n = 955$) found effects for anxiety (Hedges' $g = 0.37$) and depression (Hedges' $g = 0.44$) (Piet et al., 2012). In a recent meta-analysis of seven mindfulness-based RCTs addressing cancer patients' mental health outcomes ($N = 469$), reductions in anxiety and depression were found compared to control groups (pooled SMD = -0.75 and pooled SMD = -0.90; respectively) (Zhang et al., 2015). Subgroup analyses showed that these effects varied by type of mindfulness-based therapy, with mindfulness-based art therapy and MBCT being more efficacious than other forms of mindfulness-based therapy. Another meta-analysis examined the effects of four MBSR RCTs and six single-group, pre- and post-test MBSR studies and found that MBSR had a medium effect ($d = .48$) on the mental health of cancer patients and a small effect ($d = 0.18$) on physical health, which included self-reported physical functioning as well as biological markers of general health (Ledesma & Kumano, 2009).

Recent primary studies have also demonstrated the impact of mindfulness-based interventions on a variety of psychological and physical health outcomes in cancer patients and survivors. Hoffman and colleagues (2012) found that breast cancer patients who completed an 8-week MBSR course had decreased mood disturbance, endocrine

symptoms, and breast-related quality-of-life symptoms as compared to waitlist controls at post-intervention and 3-month follow-up assessments. In another recent study, Bower and colleagues (2015) demonstrated that a 6-week mindfulness meditation intervention for younger breast cancer survivors resulted in significant reductions in perceived stress, proinflammatory gene expression, and levels of inflammatory biomarkers post-intervention as compared to a waitlist control group. Several recent studies of mindfulness-based interventions for cancer patients used a symptom criterion for study entry (Johannsen et al., 2016; Johns et al., 2015). For example, an RCT enrolled breast cancer patients with significant post-treatment pain and found significant effects of MBCT on pain intensity and neuropathic pain compared to the waitlist control group (Johannsen et al., 2016).

Although the results of new trials of mindfulness-based interventions for cancer populations continue to be promising, a limitation across studies is the lack of active control groups. This limitation has recently received greater attention, and researchers are calling for more studies with active control conditions or comparators (Bower, 2016). New studies have started adopting this study design. In one study comparing mindfulness-based cancer recovery (MBCR), an adaptation of MBSR for cancer populations, to supportive expressive group therapy (SET) for distressed breast cancer survivors, those in the MBCR group showed greater reductions in mood disturbance and stress symptoms, as well as increased emotional and functional quality of life, social support, spirituality, and post-traumatic growth compared to those in the SET group, and most effects were sustained at 1-year follow-up (Carlson et al., 2016). A pilot study compared MBSR to psychoeducational support for CRF in breast and colorectal cancer

survivors who were not on active treatment and found lower levels of CRF interference post-intervention in the MBSR group, but this result was not statistically significant (Johns et al., 2016). Those in the MBSR group also had greater improvement in vitality and greater reductions in pain post-intervention.

Interventions with similar components to MBSR have also been conducted with cancer patients and survivors. Yoga, which is part of the standard MBSR course, is one of these interventions. In a meta-analysis of 12 yoga RCTs ($N = 742$ breast cancer patients and survivors), yoga had short-term effects on global health-related quality of life (Hedges' $g = 0.62$), functional well-being (Hedges' $g = 0.30$), social well-being (Hedges' $g = 0.29$), and spiritual well-being (Hedges' $g = 0.41$) relative to control conditions (Cramer et al., 2012). Short-term effects were also found for anxiety (Hedges' $g = -1.51$), depression (Hedges' $g = -1.59$), perceived stress (Hedges' $g = -1.14$), and psychological distress (Hedges' $g = -0.86$). However, these results were not obtained for the subgroup of participants who had completed active cancer treatment, and methodological shortcomings of the trials were noted (e.g., possible attrition bias). Similar results were obtained in another meta-analysis of 10 yoga RCTs with cancer patients; compared to controls, the yoga groups showed greater improvement in anxiety (8 studies; SMD = -0.76), depression (8 studies; SMD = -0.95), distress (2 studies; SMD = -0.40), and stress (2 studies; SMD = -0.95) (Lin, Hu, Chang, Lin, & Tsauo, 2011).

Another intervention with similar components and theory relative to MBSR is ACT. ACT is an approach to therapy that employs a range of behavioral techniques to increase psychological flexibility with a focus on mindfulness and value-based action (Hayes et al., 2006). A systematic review discussed promising findings from six

preliminary studies of ACT for cancer patients and noted the need for control groups and larger samples (Hulbert-Williams et al., 2014). In one of the few controlled studies of ACT to date in cancer patients, late-stage ovarian cancer patients randomly assigned to 12 sessions of ACT showed greater decreases in psychological distress and better quality of life post-intervention than those in a CBT condition (Rost, Wilson, Buchanan, Hildebrandt, & Mutch, 2012). A 9-week ACT intervention trial with 45 cancer patients also found improvement in distress, mood, and quality of life at post-intervention and 3-month follow-ups (Feros, Lane, Ciarrochi, & Blackledge, 2013). However, there was no control arm in this study.

Despite a growing body of research on mindfulness-based therapies, the effect of such interventions on theory-based psychological processes (e.g., mindfulness, self-compassion) in cancer and non-cancer populations has received limited research attention. In a university-based, cohort-controlled study of therapists in training, MBSR led to increased levels of mindfulness and self-compassion compared to control courses (research methods and psychological theory) (Shapiro, Brown, & Biegel, 2007). A study of a community sample also found increases in self-compassion, spirituality, and empathic perspective-taking following a mindfulness-based intervention, but a control group was not employed (Birnie, Speca, & Carlson, 2010). Another study of MBCR versus waitlist control for cancer patients at varying stages of disease and treatment found that MBCR led to increased levels of mindfulness (Labelle, Campbell, Faris, & Carlson, 2015).

Although mindfulness has been assessed as an outcome of some mindfulness-based intervention trials (Labelle et al., 2015; Shapiro et al., 2007), limited research has

linked changes in mindfulness and related processes during the intervention period to physical or psychological symptom improvement. A study of MBSR versus waitlist control in a non-clinical population found that mindfulness mediated MBSR's impact on difficulties in emotional regulation and fear of emotion (Keng, Smoski, Robins, Ekblad, & Brantley, 2012). A meta-analysis of mediation studies on MBSR and MBCT in all populations ($ns = 6\text{-}12$ studies across outcomes) demonstrated that mindfulness, rumination, and worry mediated the interventions' effects on mental health outcomes (e.g., depression, anxiety, stress, distress, and negative affectivity) and did not find sufficient evidence for links between self-compassion and acceptance and these outcomes (Gu, Strauss, Bond, & Cavanagh, 2015). However, methodological shortcomings of the included studies were noted, such as lack of randomization in some studies and publication bias.

A few intervention studies have examined links between changes in psychological processes, including mindfulness, and symptom outcomes in cancer populations. In one study of cancer patients, increased levels of mindfulness following participation in an 8-week MBSR course were related to reduced stress and mood disturbance (Garland, Tamagawa, Todd, Speca, & Carlson, 2013). Several trials testing an MBSR course compared to a waitlist control condition for cancer patients found that increased mindfulness mediated the effect of MBSR on psychological outcomes, including decreased perceived stress, exhaustion, and posttraumatic avoidance symptoms and increased positive affect, quality of life, spirituality, and posttraumatic growth (Bränström, Kvillemo, Brandberg, & Moskowitz, 2010; Labelle, Lawlor-Savage, Campbell, Faris, & Carlson, 2014). Additionally, a recent study of a mindfulness

meditation intervention for breast cancer survivors as compared to a waitlist control condition found that the intervention led to decreased depressive symptoms, which was mediated by increased self-kindness (a component of self-compassion), increased mindfulness, and decreased rumination (Boyle et al., 2017). However, another study of MBSR versus a waitlist control condition for cancer patients demonstrated that increased mindfulness did not mediate the effects of MBSR on depressive symptoms, and the effect was instead attributed to decreased rumination (Labelle, Campbell, & Carlson, 2010). The limited and mixed findings suggest a need for additional research to elucidate relationships between psychological processes and clinical outcomes of MBSR for cancer populations.

Theory suggests that mindfulness may impact symptom experiences because non-judgmental attention to the present moment may result in *reperceiving*, or a significant shift in perspective (Shapiro, Carlson, Astin, & Freedman, 2006). This shift may interrupt automatic, maladaptive reactions to unwanted internal experiences. Shapiro and colleagues (2006) theorized that reperceiving anxiety, for example, allows one to step back from it and view it as an emotional state that will pass with time. Mindfulness is also hypothesized to impact symptom experiences by decreasing rumination (Coffey, Hartman, & Fredrickson, 2010), or repetitive and negative thoughts about symptoms that do not lead to problem-solving (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008) and may exacerbate depressive and anxiety symptoms (Nolen-Hoeksema, 2000).

Theory suggests that mindfulness also may be related to several physiological processes associated with symptom reduction (Creswell & Lindsay, 2014; Lazar et al., 2000). One theory proposes that mindfulness is linked to a physiological relaxation

response that leads to reduced somatic symptoms (Carlson & Garland, 2005; Lazar et al., 2000). Another related theory suggests that mindfulness is negatively associated with the stress reactivity response, which triggers exacerbation of disease pathogenic processes in depression, HIV, cardiovascular disease, and cancer, and encourages unhealthy behaviors that may affect health outcomes (Creswell & Lindsay, 2014). In support of this theory, neuroimaging studies conducted with non-clinical populations have shown that both trait mindfulness and mindfulness-based interventions are associated with increased activation in the stress-regulatory areas of the prefrontal cortex (Creswell, Way, Eisenberger, & Lieberman, 2007; Modinos, Ormel, & Aleman, 2010). Additionally, in non-clinical samples, completion of an MBSR course has been linked to better immune function, increased left-sided anterior activation (associated with positive affect), lower levels of the inflammatory c-reactive protein, and decreased pro-inflammatory gene expression (Creswell et al., 2012; R. J. Davidson et al., 2003; Malarkey, Jarjoura, & Klatt, 2013). In the cancer survivorship literature, yoga, an intervention with strong mindfulness components, has also been associated with decreased gene expression that contributes to chronic inflammation (Bower, Greendale, et al., 2014). Furthermore, a recent trial of mindfulness meditation for breast cancer survivors found that at post-intervention, those in the intervention group had lower perceived stress, depressive symptoms, proinflammatory gene expression, and inflammatory signaling compared to a waitlist control group (Bower et al., 2015). Sleep disturbance and fatigue have also been associated with higher levels of proinflammatory cytokines in cancer populations (Irwin, Olmstead, Ganz, & Haque, 2013; Raison & Miller, 2003). However, specific mindfulness processes potentially underlying intervention effects on symptoms have yet



to be examined in relation to physiological changes in cancer survivors. Research elucidating links between specific facets of mindfulness and common symptoms in cancer populations could inform future intervention designs.

The Present Study

The present study begins to address these gaps in the literature by analyzing data from a pilot MBSR trial targeting fatigue interference in cancer survivors. Primary outcomes of the trial have been published (Johns et al., 2015). At post-intervention, large effects were found for fatigue interference ($d = -1.43$), fatigue severity ($d = -1.55$), vigor ($d = 1.29$), and depression ($d = -1.30$) relative to a waitlist control group, and these effects were maintained at 1-month follow-up ($ds = -1.34, -1.54, 1.73$, and -1.71 , respectively). Medium effects were also found for disability status ($d = -0.45$), anxiety ($d = -0.47$), and sleep disturbance ($d = -0.74$) and were maintained or increased at 1-month follow-up ($ds = -1.22, -0.98$, and -1.00 , respectively). Changes in mindfulness, acceptance, and self-compassion were not reported in this paper.

To further our understanding of the relationship between MBSR, psychological processes (i.e., mindfulness, acceptance, and self-compassion), and symptom outcomes in cancer survivors, the present study has two specific aims:

Aim 1: To examine the impact of the MBSR intervention on facets of mindfulness (i.e., observing, describing, acting with awareness, nonjudging of inner experience, nonreactivity to inner experience), self-compassion, and acceptance in cancer survivors.

Hypothesis 1: MBSR will lead to increased levels of the five facets of mindfulness (i.e., observing, describing, acting with awareness, nonjudging of inner

experience, nonreactivity to inner experience), self-compassion, and acceptance as compared to the WC condition.

This hypothesis is based on theory linking MBSR to increases in mindfulness, self-compassion, and acceptance (Chawla & Ostafin, 2007; Kabat-Zinn, 1990; Neff, 2003a; Shapiro et al., 2006). In addition, these three psychological processes were specifically targeted in the current intervention through experiential exercises such as mindfulness meditation. Although some evidence suggests that MBSR may impact mindfulness (Garland et al., 2013; Labelle et al., 2015; Shapiro et al., 2007), little is known regarding its impact on acceptance and self-compassion, especially in cancer populations.

Aim 2: To examine the extent to which change in facets of mindfulness (i.e., observing, describing, acting with awareness, nonjudging of inner experience, nonreactivity to inner experience) predict change in fatigue interference, sleep disturbance, and distress in cancer survivors.

Hypothesis 2: Positive change in the five facets of mindfulness will be linked to reduced fatigue interference, sleep disturbance, and distress in cancer survivors.

Theorized cognitive and physiological pathways of mindfulness-based interventions suggest that increased mindfulness may be linked to improvement in physical and psychological symptoms (Creswell & Lindsay, 2014; R. J. Davidson et al., 2003; Nolen-Hoeksema et al., 2008; Shapiro et al., 2006). Indeed, some intervention studies with general population samples have linked increases in mindfulness to reduced psychological symptoms (Carmody & Baer, 2008; Keng et al., 2012; Shapiro et al., 2007). Although limited, several intervention studies have reported links between

increased mindfulness and psychological symptom improvement in cancer patients (Bränström et al., 2010; Labelle et al., 2014; Nyklíček & Kuijpers, 2008). However, associations between specific facets of mindfulness and physical and psychological symptom outcomes warrant further study.

CHAPTER 2. METHOD

The present study is a secondary analysis of data from a Walther-funded randomized pilot study of MBSR for fatigued cancer survivors (Johns et al., 2015). The Indiana University Institutional Review Board and Indiana University Simon Cancer Center Scientific Review Committee approved study procedures. This study complies with the Health Insurance Portability and Accountability Act (HIPAA).

Participants

Participants were recruited from clinics affiliated with the Indiana University Simon Cancer Center, Indiana University cancer research recruitment registries, or via self-referral upon receiving a study brochure at one of 13 support or treatment facilities in the Indianapolis area. Eligible individuals were adult cancer survivors (18+ years of age) who reported clinically significant CRF for the past 8 weeks or longer. CRF was considered clinically significant if the survivor had a score of 4 or higher on the 3-item Fatigue Symptom Inventory (FSI; Hann et al., 1998). Individuals were excluded if they: (1) had received cancer treatment, including chemotherapy, biologic response modifiers, radiation therapy, surgery, or a bone marrow or stem cell transplant in the previous 3 months; (2) were enrolled in hospice care; (3) had severe hearing impairment; (4) were experiencing severe depression (as defined by a score of ≥ 20 on the Patient Health Questionnaire-8 [PHQ-8]); (5) had previously taken a mindfulness meditation course; or (6) lacked English fluency.

Of the 159 people who were assessed for eligibility, 67 (42%) did not meet the CRF clinical cutoff, 7 (4%) had severe depression, 2 (1%) had previous mindfulness

training, and 48 (30%) declined to participate. Primary reasons for refusal were time constraints (71%), living too far away (10%), and lack of interest (6%). The remaining 35 individuals provided informed consent, completed the baseline assessment, and were randomized to either the MBSR class ($n = 18$) or the waitlist control (WC) condition ($n = 17$).

Participants were primarily diagnosed with breast cancer (86%), and most had early-stage disease (stages 0 to III) (94%). The sample was, on average, White (80%), female (94%), 57.3 years of age ($SD = 9.3$), and college educated (71%). Nearly half (49%) of participants were employed, 60% were married, and 60% reported having a comfortable income (versus just enough or not enough to make ends meet). Additionally, all participants had completed active cancer treatment (chemotherapy and/or radiation therapy) at least 9 months prior to enrollment, with an average time between completion and study enrollment of 51.3 months ($SD = 39.3$ months). About 23% of participants reported receiving mental health treatment in the past 6 months.

Procedure

Eligible participants attended one of two group enrollment sessions, which included the informed consent process, baseline assessment, and randomization to either MBSR or the WC group. Randomization was completed in blocks of four by the principal investigator; thus, the research staff was blinded to the process. Individuals randomized to the MBSR arm received a brief orientation to the intervention at the enrollment session. Individuals in the WC condition were informed that they would be contacted in approximately 7 weeks to schedule the next study assessment.

The MBSR intervention was a series of 7 weekly classes, each 2 hours in length, and included psychoeducation related to CRF as well as home practice assignments. The class was taught by a licensed physician with six years of experience teaching MBSR who remained blind to the home practice outcomes reported by participants at each weekly session. The MBSR course was adapted for cancer survivors, but maintained fidelity to the standard MBSR program. Adaptations for cancer survivors included 2-hour classes rather than 2.5-hour classes, seven instead of eight classes, no extended day-long retreat, the addition of psychoeducation related to CRF, and shorter (20-minute) home practice sessions.

The first class session included an overview of the MBSR intervention and covered course logistics, including confidentiality among the group members. The participants then practiced the skills of mindful eating, mindful breathing, and a body scan. They were also introduced to the guided meditations and other exercises on the CD for assigned home practice each week. In sessions 2 and 3, the participants practiced the body scan, were introduced to the practices of gentle hatha yoga and awareness of breath meditation, and learned about perceived stress and behavioral techniques for sleep hygiene. In sessions 4 and 5, participants received further training in these skills, and an emphasis was placed on translating the skills to address stressors in everyday life. In session 6, the participants deepened their training in mindfulness practices and discussed the full incorporation of the skills into their life, making them adaptable for various situations. Finally, in session 7, the participants further practiced mindfulness exercises, reviewed and clarified course topics, and were provided with strategies to maintain their practice beyond the course. Throughout the course, participants were encouraged to

practice daily mindfulness exercises and log the number of minutes and type of mindfulness practice on a diary card, which was submitted to a staff member at the following class session.

Data were collected at 3 or 4 time points, depending on the randomization arm. The first 3 time points, baseline prior to randomization (T1), post-intervention (T2), and 1-month follow-up (T3), were the same for both groups. The WC group completed an additional assessment following completion of their respective MBSR course (T4). All self-report measures were administered on paper-based forms. Participants completed the baseline and post-intervention assessments in person, and the follow-up assessments were completed either on-site or mailed to the study team, depending on the participant's preference. Each participant received a \$10 gift card to a local supermarket after completing the baseline assessment (T1), a \$25 supermarket gift card after completing the post-intervention assessment (T2), and a \$30 supermarket gift card after completing the 1-month follow-up assessment (T3). Participants in the WC group received an additional \$30 gift card for completing an assessment following their MBSR course (T4).

Retention was excellent; all 35 participants completed assessments at T1, T2, and T3. Only one participant did not complete the assessment at T4 (see Figure 1 for study flow chart).

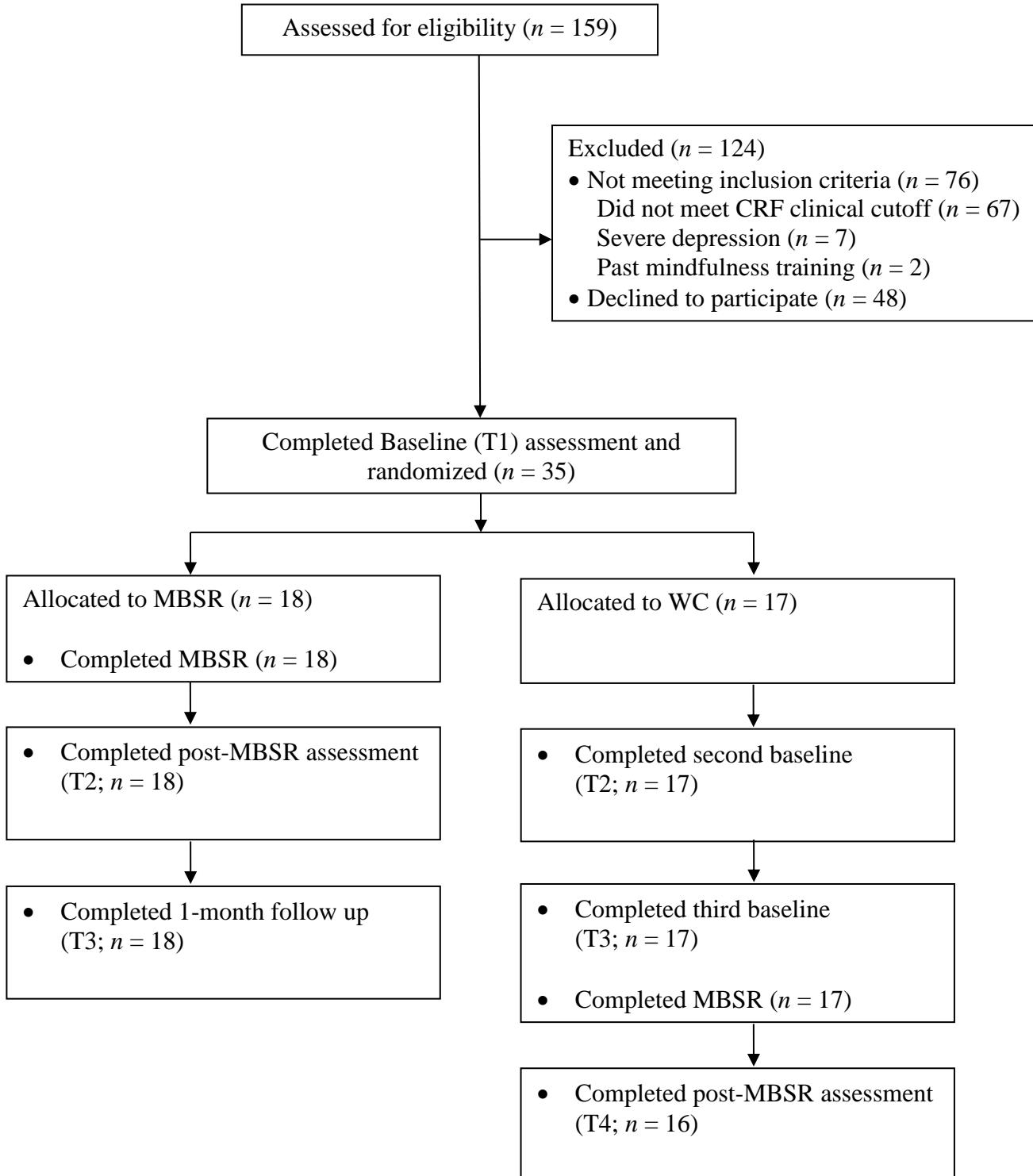


Figure 1: Intervention flow diagram. Adapted from Johns, S. A., Brown, L. F., Beck-Coon, K., Monahan, P. O., Tong, Y., & Kroenke, K. (2015).

CRF = cancer-related fatigue; MBSR = Mindfulness-based stress reduction; WC = waitlist control.

Measures

Measures were administered at all time points to assess levels of mindfulness, acceptance, self-compassion, fatigue interference, sleep disturbance, and distress (see Appendix A).

Psychological Processes

Mindfulness

Mindfulness was measured with the 39-item *Five Factor Mindfulness Questionnaire* (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Confirmatory factor analysis of five existing mindfulness questionnaires informed the development of the FFMQ. It contains five subscales, each representing one facet of mindfulness: observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience. Participants rated how true each item was for them (e.g., “I perceive my feelings and emotions without having to react to them”) on a Likert-type scale from 1 (*never or very rarely true*) to 5 (*very often or always true*). Cronbach’s alpha coefficients have ranged from .75 to .91 for the total instrument (Baer et al., 2006). Good internal consistency was also found for each of the five facets: nonreactivity ($\alpha = 0.75$), observing ($\alpha = 0.83$), acting with awareness ($\alpha = 0.87$), describing ($\alpha = 0.91$), and nonjudging of inner experience ($\alpha = 0.87$). Construct validity has been established, as four of the facets (all except for acting with awareness) have been associated with meditation experience (Baer et al., 2008). The FFMQ has been used with cancer populations, with generally good internal consistency (e.g., $\alpha = 0.92$ for the total instrument) (Nakamura, Lipschitz, Kuhn, Kinney, & Donaldson, 2013). The current

sample also had good internal consistency for the total instrument ($\alpha = 0.94$) and a similar pattern in the subscales: nonreactivity ($\alpha = 0.68$), observing ($\alpha = 0.75$), acting with awareness ($\alpha = 0.95$), describing ($\alpha = 0.93$), and nonjudging ($\alpha = 0.91$).

Acceptance

Acceptance of experience was measured with the 10-item *Acceptance and Action Questionnaire-II* (AAQ-II; Bond et al., 2011). Participants rated items such as “My painful experiences make it difficult for me to live a life that I would value” on a Likert-type scale from 1 (*never true*) to 7 (*always true*). Because the total scores reflect the opposite of acceptance (i.e., psychological inflexibility), the scores were reversed to capture acceptance and ease interpretation of results. The scale has demonstrated adequate internal consistency, with a mean alpha coefficient of .84 (Bond et al., 2011). Evidence of construct validity includes relationships between greater psychological inflexibility on the AAQ-II and higher levels of depressive symptoms, anxiety, stress, and other psychopathology (Bond et al., 2011). Recent studies with cancer patients have found the internal consistency of the AAQ-II to be acceptable (α s ranging from 0.78 to 0.87 during the course of the study) (Feros et al., 2013; Labelle et al., 2015). Internal consistency for the AAQ-II in the current sample was good ($\alpha = 0.86$).

Self-compassion

Attitudes associated with self-compassion were assessed with the 12-item Self-Compassion Scale-Short Form (SCS-SF; Neff, 2003). The measure contains 3 positive subscales (self-kindness, common humanity, and mindfulness) and 3 reverse-scored negative subscales (isolation, self-judgment, and over-identification), which are typically

summed to create a total composite score for overall level of self-compassion.

Participants rated each item (e.g., “When I’m going through a very hard time, I give myself the caring and tenderness I need”) on a Likert-type scale ranging from 1 (*almost never*) to 5 (*almost always*). The SCS-SF has shown good internal consistency with Cronbach’s alphas of .86 or higher and is highly correlated with the long-form of the scale ($r \geq 0.97$ in all samples) (Raes, Pommier, Neff, & Van Gucht, 2011). The SCS-SF also has demonstrated good discriminant validity, as it is not related to social desirability (Neff, 2003b). In addition, the SCS-SF is negatively correlated with self-criticism and positively correlated with social connectedness, providing evidence of construct validity (Neff, 2003b). Recent studies using the SCS with cancer populations found high internal consistency for both the full length scale ($\alpha_s = 0.96$ and 0.92) (Nakamura et al., 2013; Przezdziecki et al., 2013) and the short form ($\alpha = 0.91$) (Sherman, Woon, French, & Elder, 2016). In the current sample, internal consistency of the SCS-SF was high ($\alpha = 0.90$).

Symptom Outcomes

Fatigue interference

Fatigue interference was assessed using the *Fatigue Symptom Inventory* (FSI; Hann et al., 1998) 7-item interference subscale (items 5-11). Each item is rated on an 11-point Likert-type scale from 0 (*no interference*) to 10 (*extreme interference*). A sample item for fatigue interference is “Rate how much, in the past week, fatigue interfered with your ability to concentrate.” The FSI has been validated in samples of men and women with different types of cancer (Hann, Denniston, & Baker, 2000). Construct validity was evidenced by negative correlations with life satisfaction and positive correlations with

depressive symptoms. Additionally, patients undergoing cancer treatment showed higher FSI scores than those who were less than one year post-treatment. Convergent validity also was evidenced by strong positive correlations of the FSI with an existing measure of fatigue. The overall internal consistency for the interference subscale was excellent ($\alpha = 0.94$). In the current sample, internal consistency for the interference subscale was also excellent ($\alpha = 0.95$).

Sleep Disturbance

Sleep disturbance was assessed using the 7-item *Insomnia Severity Index* (ISI; Morin, 1993). The measure assesses perceived severity of insomnia as well as the impact of sleep difficulties on daily functioning over the course of the previous two weeks. The ISI employs a 5-point Likert-type scale from 0 (*none*) to 4 (*very*) with varying anchors (e.g., interference, satisfaction). A sample item asks for level of “difficulty falling asleep.” Construct validity for cancer patients was evidenced by positive correlations with other established measures of sleep and negative correlations with quality-of-life (M. H. Savard, Savard, Simard, & Ivers, 2005). Cronbach’s alpha for the ISI in a sample of 1,634 cancer patients was .90 (M. H. Savard et al., 2005). The current sample also had high internal consistency on the ISI ($\alpha = 0.90$).

Distress

Distress levels were calculated by summing the z-scores of a depressive symptoms measure and an anxiety symptoms measure. Levels of depressive symptoms were measured with the 8-item *Patient Health Questionnaire-8* (PHQ-8; Kroenke, Spitzer, & Williams, 2001). The PHQ-8 omits the suicidality item in the PHQ-9 because



the endorsement of the item is low, and the present trial did not have a core focus on depression. Furthermore, the PHQ-9 and PHQ-8 do not significantly differ in sensitivity, specificity, and positive predictive value in diagnosing probable depression in the general population (Kroenke & Spitzer, 2002). Participants rated each of the 8 items, such as how often they were bothered by “feeling down, depressed, or hopeless” in the past two weeks, on a Likert-type scale. Response options were 0 = *not at all*, 1 = *several days*, 2 = *more than half the days*, and 3 = *nearly every day*. Cronbach’s alpha for the PHQ-9 in prior research was 0.89 (Kroenke et al., 2001). While this instrument has not been normed specifically for cancer populations, it has undergone rigorous validity testing in many other large samples of medical populations (Arroll et al., 2010; Kroenke et al., 2009; Martin, Rief, Klaiberg, & Braehler, 2006). Construct validity was determined through linking higher PHQ-9 scores to lower functional status, more disability days, greater symptom-related difficulty, and increased used of health services (i.e., clinic visits) (Kroenke et al., 2001). The PHQ-8 has also been administered to cancer populations with evidence of good internal consistency (e.g., $\alpha = .87$) (Gonzalez et al., 2014; Mosher et al., 2016; Reyes-Gibby, Anderson, Morrow, Shete, & Hassan, 2012). In the current sample, internal consistency for the PHQ-8 was adequate ($\alpha = 0.83$).

Level of anxiety was assessed using the 7-item *Patient Health Questionnaire Generalized Anxiety Disorder Scale* (GAD-7) (Kroenke, Spitzer, Williams, Monahan, & Lowe, 2007). This scale is useful for detecting symptoms of generalized anxiety disorder, among other related disorders, such as panic disorder, social anxiety disorder, and posttraumatic stress disorder. For each item, respondents rated how often in the past two weeks they were bothered by certain emotions, such as “not being able to stop or

control worrying” on a 4-point Likert-type scale. Response options were 0 = *not at all*, 1 = *several days*, 2 = *more than half the days*, and 3 = *nearly every day*. The GAD-7 demonstrated good construct validity in general population samples through correlations with other related constructs, such as depression, life satisfaction, and self-esteem (Löwe et al., 2008), and has been used in studies with cancer patients (L. F. Brown, Kroenke, Theobald, Wu, & Tu, 2010; Kroenke, Theobald, Wu, Loza, et al., 2010; Kroenke, Theobald, Wu, Norton, et al., 2010). Cronbach’s alpha for the GAD-7 in the general population is .89 (Löwe et al., 2008). In the current sample, Cronbach’s alpha for the GAD-7 was 0.85.

Demographics

Participants reported their age, gender, race, education, marital status, income, work status, and history of mental health treatment. This treatment was assessed via two questions regarding whether the participant had received mental health care within the last 6 months (current treatment) or the past 5 years (past treatment). Types of mental health treatment were not collected.

Medical Information

Diagnosis date and cancer treatment history, including treatment types and dates, were collected via medical record review following informed consent.

Data Analysis

Data analysis was completed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). There were minimal missing data. Series mean imputation was employed to handle the three missing values to optimize use of all existing data. Prior to completing

the analyses, all continuous data were examined for normality violations. These were determined by cutoffs of the absolute values of 3 and 10 for skewness and kurtosis, respectively (Kline, 2011). There were no normality violations and, therefore, no variable transformations were performed.

To begin, baseline comparisons (*t*-tests and Chi-square analyses or Fisher's exact tests) of demographic and medical characteristics and study variables between the MBSR and WC groups were conducted. To examine the impact of the MBSR intervention on five facets of mindfulness (i.e., observing, describing, acting with awareness, nonjudging of inner experience, nonreactivity to inner experience), self-compassion, and acceptance in cancer survivors (study aim #1), I employed a linear mixed-modeling approach in SPSS. An intent-to-treat framework was selected to make use of all available data; however, this was not employed due to lack of participant drop-out. Each model included the main effects of time (T1, T2, and T3) and study group (MBSR or WC) and the time \times group interaction. Both time and study group were treated as categorical variables in these models, focusing the analyses on average differences between groups and across time. A significant treatment effect is evidenced either by a significant study group main effect or a significant time \times group interaction.

To examine the extent to which change in mindfulness facets (i.e., observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience), predicted change in symptom outcomes (fatigue interference, sleep disturbance, and distress) (study aim #2), I first merged data collected from the WC group at T3 with data collected from the intervention group at T1; thus, the new variables reflected all data collected just prior to starting the MBSR courses. Data collected from

the WC group at T4 were merged with data collected from the intervention group at T2 to reflect post-treatment data collected from both groups. Following data reorganization, I utilized multiple linear regression models to determine the relationship between change in each of the five facets of mindfulness and change in each of the three symptom outcomes. Thus, I examined a total of 15 models. To evaluate intra-individual level change, I calculated residualized change scores for each facet of mindfulness. This method was selected over simple change scores because the latter is associated with baseline scores, while residualized change scores are measures of relative change rather than absolute change (Hauser-Cram & Krauss, 1991). In accordance with Cronbach and Furby (1970), I first computed a raw change score by subtracting the baseline value of each facet of mindfulness from the post-treatment value of each facet. Second, a linear regression model was used to calculate predicted post-treatment values of each facet of mindfulness from the baseline values. Next, a predicted change score was calculated from the difference of these two values. The predicted change score was then subtracted from the actual change score to calculate the residualized change score. Each of the 15 models had the pre-treatment symptom level in step 1, the residualized change score for the mindfulness facet in step 2, and the post-treatment symptom level as the dependent variable.

CHAPTER 3. RESULTS

Preliminary Analyses

Participant Characteristics

Table 1 shows participant characteristics for the MBSR and WC groups.

Participants were primarily diagnosed with breast cancer (83% MBSR, 88% WC). The sample was, on average, White (83% MBSR, 76% WC), female (94% in both MBSR and WC), middle-aged (58.8 years MBSR, 55.7 years WC), and college educated (61% MBSR, 76% WC). Nearly half (50% MBSR, 47% WC) of participants were employed, and the majority (61% MBSR, 59% WC) were married. Fifty percent of the MBSR group and 71% of the WC group reported having a comfortable income (versus just enough or not enough to make ends meet). About 23% (6% MBSR, 41% WC) of participants reported receiving mental health treatment in the past 6 months.

Chi-square analyses were conducted to examine participant characteristics by group assignment, unless cells had expected counts of less than 5, in which case Fisher's exact test was used. There were no significant demographic or medical differences between the groups, except for the higher rate of mental health treatment at baseline for WC participants compared to MBSR participants (see Table 1).

Table 1: Comparison of Baseline Characteristics by Group Assignment

Baseline Characteristics	MBSR (n = 18)	WC (n = 17)	χ^2 / t	df	P
	Number of Participants (%)	Number of Participants (%)			
Age, mean (SD)	58.8 (9.3)	55.7 (9.3)	-0.99	33	0.84
White race ^a	15 (83)	13 (76)	--	--	0.34
Female gender ^a	17 (94)	16 (94)	--	--	1.00
College graduate	11 (61)	13 (76)	0.96	1	0.33
Married ^a	11 (61)	9 (59)	0.24	1	0.63
Employed (full or part-time)	9 (50)	8 (47)	0.03	1	0.86
Comfortable income	9 (50)	12 (71)	1.54	1	0.21
Recent mental health treatment ^a	1 (6)	7 (41)	--	--	0.02*
Cancer type					
Breast ^a	15 (83)	15 (88)	--	--	1.00
Esophageal ^a	2 (11)	0 (0)	--	--	0.49
Leukemia ^a	1 (6)	0 (0)	--	--	1.00
Lymphoma ^a	1 (6)	2 (12)	--	--	0.60
Thyroid ^a	1 (6)	0 (0)	--	--	1.00
Melanoma ^a	1 (6)	0 (0)	--	--	1.00
Treatment type					
Chemotherapy	11 (61)	12 (71)	0.35	1	0.56
Radiation therapy	10 (56)	12 (71)	0.85	1	0.36
Chemotherapy + radiation therapy	7 (39)	8 (47)	0.24	1	0.63
Endocrine therapy	12 (67)	8 (47)	1.37	1	0.24
Surgery ^a	14 (78)	15 (88)	--	--	0.66
Bone marrow / stem cell transplant ^a	1 (6)	0 (0)	--	--	1.00

Note. MBSR = Mindfulness-based stress reduction; WC = waitlist control; SD = standard deviation.

^aFisher's Exact Test was used due to small cell sizes.

* $p < 0.05$.

Study Variables

Independent samples *t*-tests were used to examine whether the main study variables differed between the MBSR and WC groups at baseline (see Table 2). Levels of acceptance, observing, and nonreactivity were significantly lower for WC participants compared to MBSR participants. All other study variables did not differ between groups.

Table 2: Comparison of Main Study Variables at Baseline by Group Assignment

Variable at Baseline	MBSR (n = 18)	WC (n = 17)	<i>t</i>	df	<i>P</i>
Mindfulness facet					
Observing	28.11 (5.29)	24.35 (5.27)	-2.10	33	0.04*
Describing	29.94 (5.87)	27.06 (7.91)	-1.23	33	0.23
Acting with Awareness	26.78 (6.32)	22.00 (8.66)	-1.87	33	0.07
Nonjudging	31.61 (6.09)	28.35 (7.75)	-1.39	33	0.18
Nonreactivity	23.78 (3.57)	20.65 (3.72)	-2.54	33	0.02*
Acceptance ^a	53.50 (8.33)	46.29 (11.94)	-2.08	28.42	0.05*
Self-compassion ^a	42.67 (6.52)	36.73 (11.87)	-1.82	24.53	0.08
Fatigue interference	4.34 (2.19)	4.46 (2.02)	0.16	33	0.88
Sleep disturbance	11.17 (6.67)	13.29 (7.05)	0.92	33	0.37
Distress	-.32 (1.83)	.34 (1.84)	1.07	33	0.29

Note. MBSR = Mindfulness-based stress reduction; WC = waitlist control; SD = standard deviation.

Distress scores are standardized.

^aLevene's test determined variances were unequal across groups. Therefore, t-tests were conducted with no assumption of equal variance.

**p* < 0.05.

Normality Assumptions

Normality of the study variables was assessed by examining skewness and kurtosis. All variables were within Kline's (2011) recommended normality guidelines (i.e., skewness indices were $< |3.0|$ and kurtosis indices were $< |10.0|$) (see Table 3). There were three missing responses across all study questions (i.e., three participants did not answer one question each). Missing responses were addressed using the series mean imputation approach, in which the missing value was replaced by the mean value of the variable.

Table 3: Skewness and Kurtosis of Study Variables

Variable	Skewness			Kurtosis		
	Baseline (T1)	Post- (T2)	1-Month Post- (T3)	Baseline (T1)	Post- (T2)	1-Month Post- (T3)
			Intervention			Intervention
Mindfulness						
Observing	-.39	-.33	-.55	.41	-.57	.73
Describing	-.98	-.88	-1.09	.55	.64	1.71
Acting with Awareness	-.28	-.30	-.32	-.74	-.53	-.55
Nonjudging	-.84	-.84	-1.04	.47	.61	.65
Nonreactivity	.85	-.37	-.54	1.43	.29	1.57
Acceptance	-.81	-.92	-.89	-.08	.62	.24
Self-compassion	-.51	-.60	-.69	-.20	-.32	-.17
Fatigue Interference	-.40	.39	.72	.03	-.19	-.48
Sleep Disturbance	.39	.60	.66	-.48	-.26	-.51
Distress	.38	1.16	.73	-.49	1.88	-.66

Study Hypothesis 1

Seven linear mixed models were conducted to examine the impact of MBSR on five facets of mindfulness, acceptance, and self-compassion. The first study hypothesis was that MBSR would lead to increased levels of the five facets of mindfulness (i.e., observing, describing, acting with awareness, nonjudging of inner experience, nonreactivity to inner experience), self-compassion, and acceptance as compared to the WC condition.

This hypothesis was supported. Mixed model analyses revealed significant main effects of group in favor of MBSR for all facets of mindfulness (observing, describing, acting with awareness, nonjudging, and nonreactivity), acceptance, and self-compassion (see Figures 2-8 and Table 4).

Analyses also showed significant group \times time effects for observe ($F(2,66) = 4.86, p = 0.01$), acting with awareness ($F(2,66) = 3.54, p = 0.04$), nonjudging ($F(2,66) = 4.27, p = 0.02$), and self-compassion ($F(2,66) = 6.55, p < 0.01$) (see Table 4). The interaction means found in Figures 2, 4, 5, and 6 show steady increases in each of these psychological processes for the MBSR group, whereas the mean scores for the WC group remained relatively stable or slightly declined over time.

Table 4: Intent-To-Treat Results of Mixed Models Predicting Effects of MBSR on Psychological Processes

Outcome Fixed Effect	MBSR			WC			<i>df</i>	<i>F</i>	<i>P</i>
	Post-Intervention		1-Month Post-Intervention	Post-Intervention		1-Month Post-Intervention			
	Baseline (T1)	(T2)	(T3)	Baseline (T1)	(T2)	(T3)			
Mindfulness: <i>Observing</i>	28.10 (5.29)	30.56 (5.52)	31.78 (4.62)	24.35 (5.28)	23.00 (6.57)	23.88 (5.54)			
Group							33	15.05	0.00**
Time							66	2.43	0.10
Group × Time							66	4.86	0.01**
Mindfulness: <i>Describing</i>	29.94 (5.87)	32.00 (4.93)	31.78 (5.00)	27.06 (7.91)	26.35 (9.13)	26.77 (7.63)			
Group							33	4.26	0.05*
Time							66	0.74	0.48
Group × Time							66	2.20	0.12
Mindfulness: <i>Acting with Awareness</i>	26.78 (6.32)	27.78 (4.67)	29.33 (5.29)	22.00 (8.66)	23.00 (8.95)	21.00 (8.95)			
Group							33	6.69	0.01**
Time							66	0.93	0.40
Group × Time							66	3.54	0.04*
Mindfulness: <i>Nonjudging</i>	31.61 (6.09)	32.89 (4.27)	34.11 (4.96)	28.35 (7.75)	27.12 (8.51)	25.94 (9.52)			
Group							33	6.91	0.01**
Time							66	.001	0.10
Group × Time							66	4.27	0.02*

Table 4 continued

Mindfulness:								
<i>Nonreactivity</i>	23.78 (3.57)	24.17 (3.60)	25.83 (3.63)	20.64 (3.72)	21.00 (5.94)	21.06 (4.45)		
Group							33	9.46
Time							66	1.78
Group × Time							66	0.98
Acceptance	53.50 (8.33)	55.67 (7.78)	55.5 (9.94)	46.29 (11.95)	47.94 (12.67)	45.82 (13.92)		
Group							33	5.64
Time							66	1.41
Group × Time							66	0.65
Self-Compassion	42.67 (6.52)	44.89 (7.61)	47.28 (7.00)	36.73 (11.87)	37.37 (12.02)	35.35 (13.10)		
Group							33	6.88
Time							66	2.13
Group × Time							66	6.55
								0.00**

Note. MBSR = Mindfulness-based stress reduction; WC = waitlist control; *df* = degrees of freedom; *SD* = standard deviation.

p* < 0.05. *p* < 0.01.

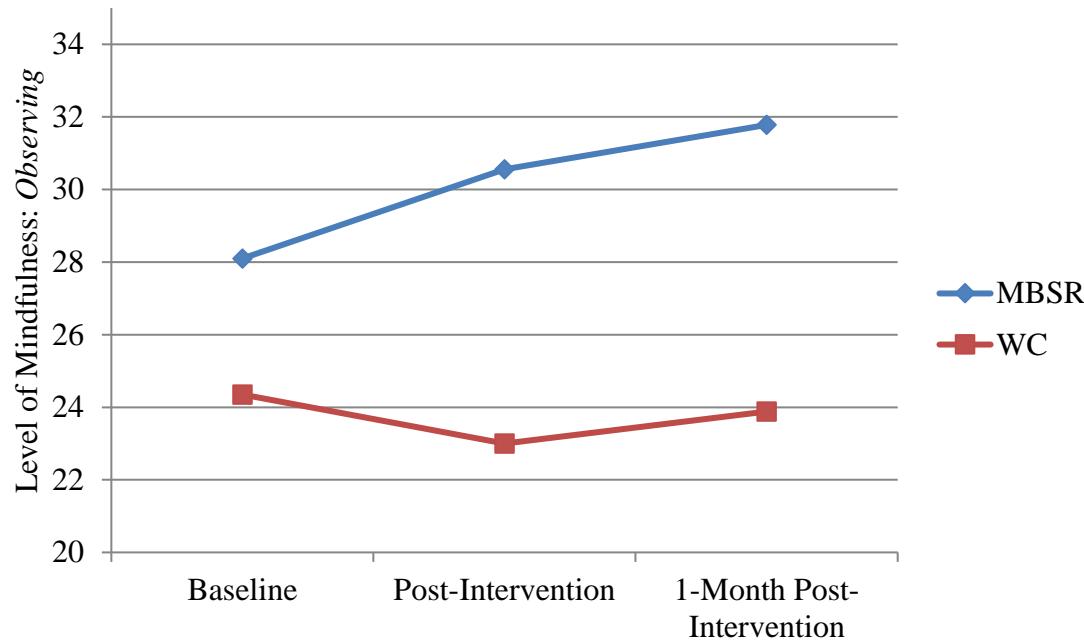


Figure 2: Plotted mean mindfulness: observing score (FFMQ subscale) by study time point. FFMQ = *Five Facet Mindfulness Questionnaire*; MBSR = Mindfulness-based stress reduction; WC = waitlist control.

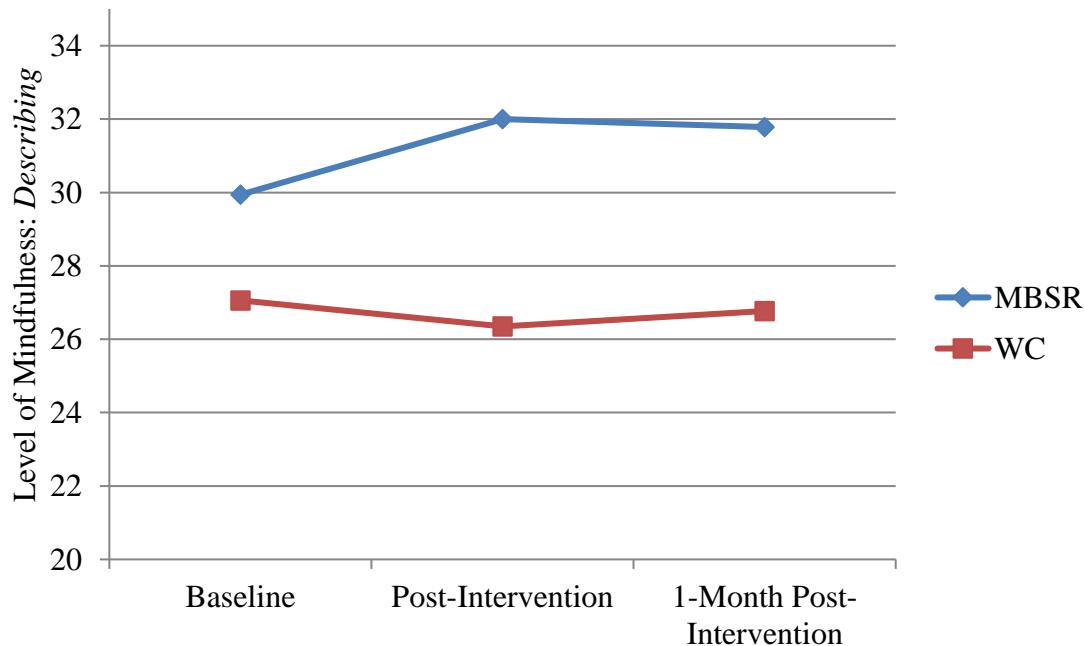


Figure 3: Plotted mean mindfulness: describing score (FFMQ subscale) by study time point. FFMQ = *Five Facet Mindfulness Questionnaire*; MBSR = Mindfulness-based stress reduction; WC = waitlist control.

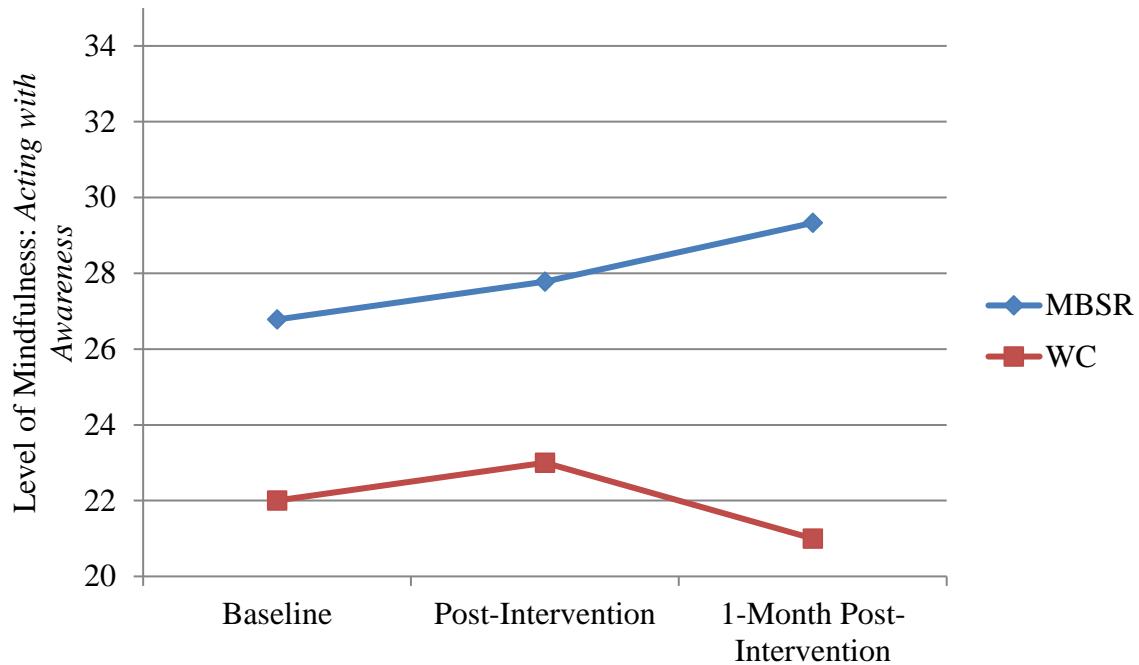


Figure 4: Plotted mean mindfulness: acting with awareness score (FFMQ subscale) by study time point. FFMQ = *Five Facet Mindfulness Questionnaire*; MBSR = Mindfulness-based stress reduction; WC = waitlist control.

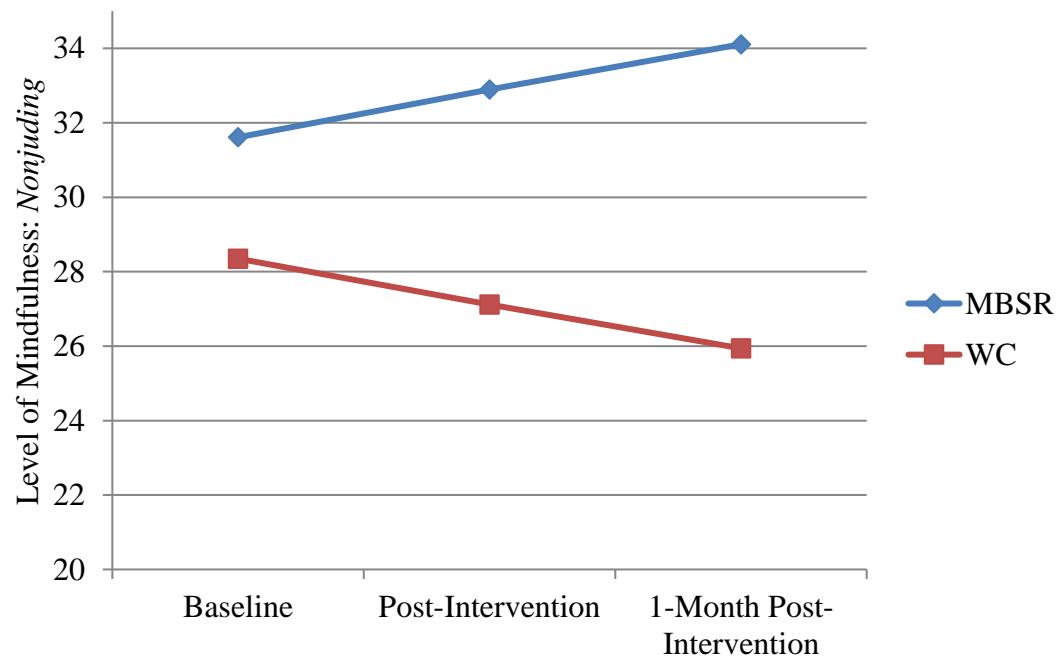


Figure 5: Plotted mean mindfulness: nonjudging score (FFMQ subscale) by study time point. FFMQ = *Five Facet Mindfulness Questionnaire*; MBSR = Mindfulness-based stress reduction; WC = waitlist control.

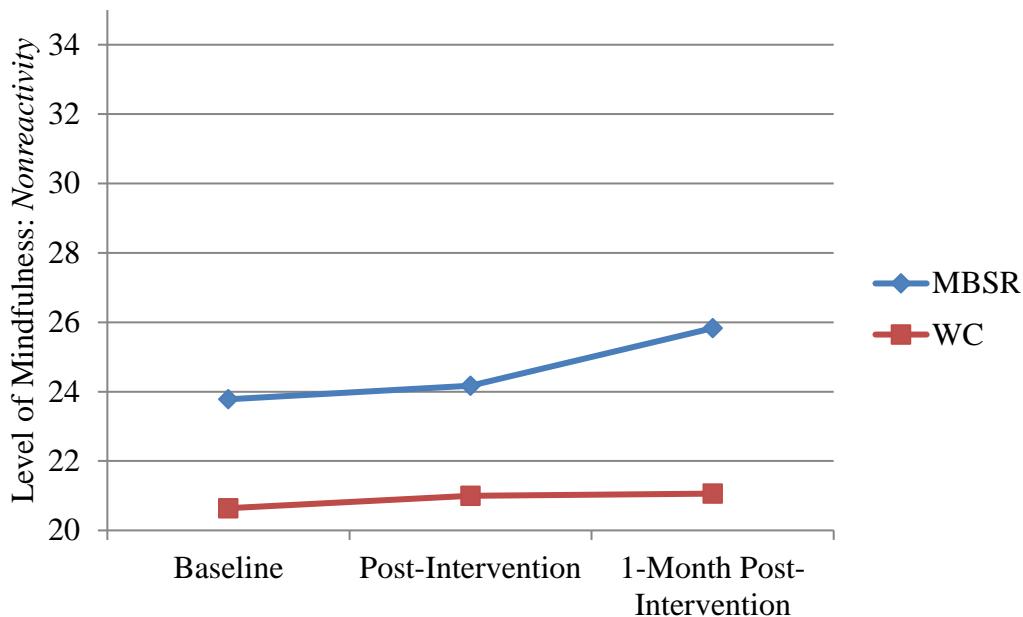


Figure 6: Plotted mean mindfulness: nonreactivity score (FFMQ subscale) by study time point. FFMQ = *Five Facet Mindfulness Questionnaire*; MBSR = Mindfulness-based stress reduction; WC = waitlist control.

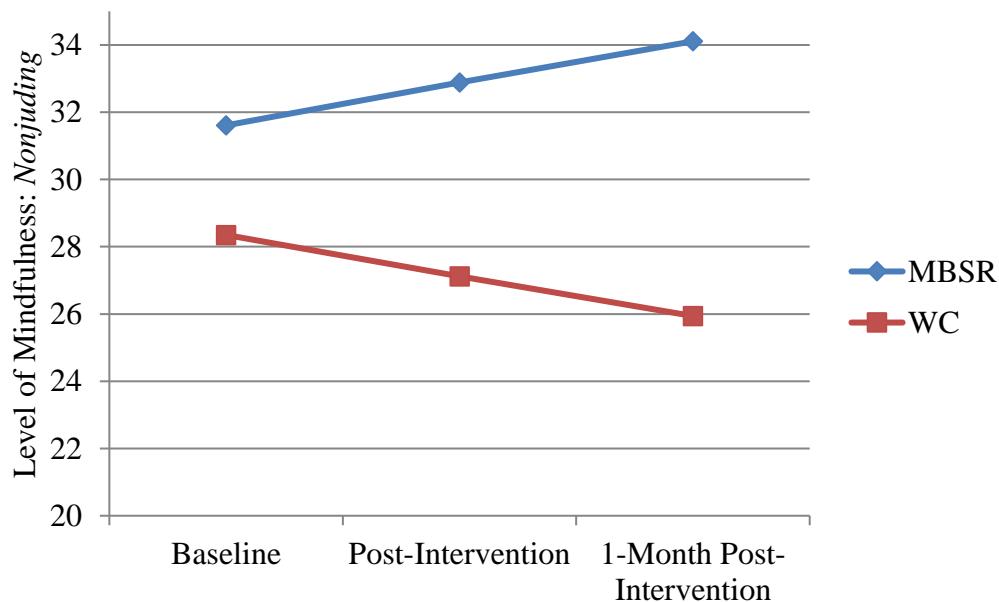


Figure 7: Plotted mean acceptance score (AAQ-II) by study time point. AAQ-II = *Acceptance and Action Questionnaire-II*; MBSR = Mindfulness-based stress reduction; WC = waitlist control.

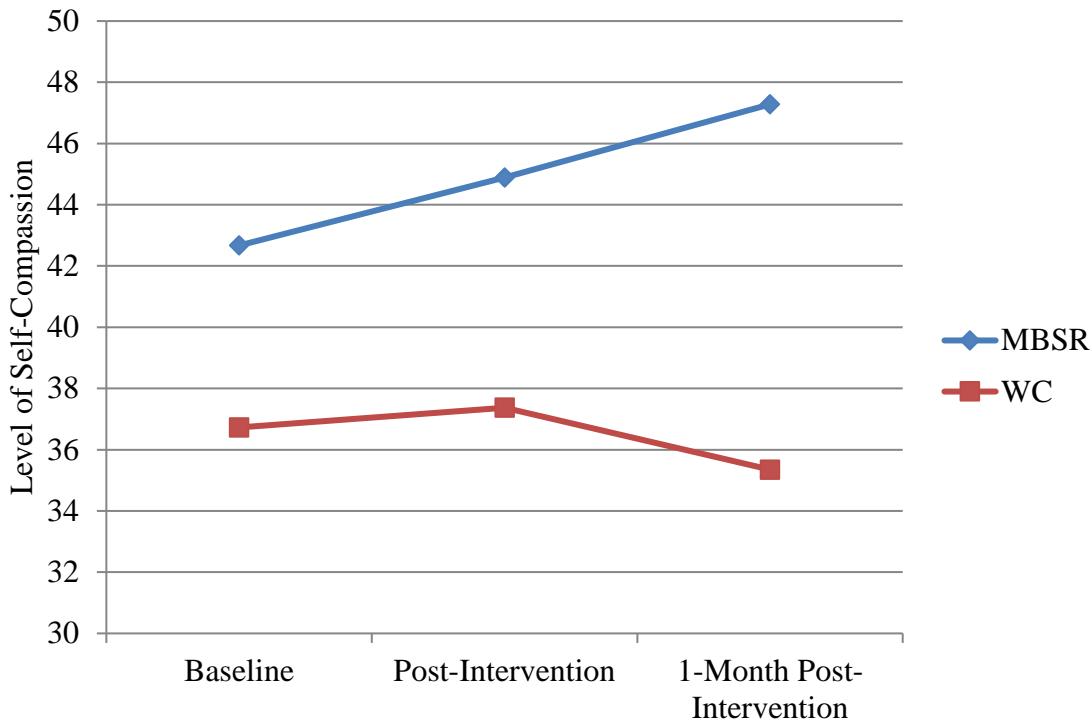


Figure 8: Plotted mean self-compassion score (SCS-SF) by study time point. SCS-SF = *Self-Compassion Scale-Short Form*; MBSR = Mindfulness-based stress reduction; WC = waitlist control.

Study Hypothesis 2

The second study hypothesis was that positive change in the five facets of mindfulness would be linked to reduced fatigue interference, sleep disturbance, and distress. This hypothesis was tested using 15 multiple linear regression models, with residualized change in each of the five facets of mindfulness examined as predictors of change in each of the three symptom outcomes.

Results partially supported my hypothesis. As shown in Table 5, acting with awareness showed a modest negative association with fatigue interference ($\beta = -.24$); however, this result fell short of statistical significance ($p = .07$). Changes in other aspects of mindfulness were not related to change in fatigue interference. Results also demonstrated that increases in acting with awareness and nonjudging were significantly

associated with lower levels of sleep disturbance post-intervention (acting with awareness: $\beta = -.31, p = .02$; nonjudging: $\beta = -.39, p < .01$) (see Table 6). Change in other facets of mindfulness did not predict change in sleep disturbance. The third set of analyses found that increases in observing, acting with awareness, nonjudging, and nonreactivity were significantly associated with decreases in distress post-intervention (observing: $\beta = -.30, p = .02$; acting with awareness: $\beta = -.36, p < .01$; nonjudging: $\beta = -.27, p = .03$; nonreactivity: $\beta = -.26, p = .04$), but describing was unrelated to change in distress (see Table 7).

Table 5: Regression of Post-intervention Fatigue Interference on Residualized Change in Mindfulness Facet Scores, Controlling for Pre-intervention Fatigue Interference

Predictors	Standardized β	Unstandardized β	SE	R^2	ΔF	P
Step 1						
Pre-intervention fatigue interference	.64	.50	.53	.41	23.00	.00**
Step 2						
Residualized change in mindfulness: <i>Observing</i>	-.02	-.01	.06	.41	.03	.87
Step 1						
Pre-intervention fatigue interference	.64	.50	.10	.41	22.99	.00**
Step 2						
Residualized change in mindfulness: <i>Describing</i>	.04	.02	.06	.41	.10	.76
Step 1						
Pre-intervention fatigue interference	.64	.50	.10	.41	22.99	.00**
Step 2						
Residualized change in mindfulness: <i>Acting with Awareness</i>	-.24	-.08	.05	.47	3.45	.07
Step 1						
Pre-intervention fatigue interference	.64	.50	.10	.41	22.99	.00**
Step 2						
Residualized change in mindfulness: <i>Nonjudging</i>	.02	.01	.05	.41	.01	.91
Step 1						
Pre-intervention fatigue interference	.64	.50	.10	.41	22.99	.00**
Step 2						
Residualized change in mindfulness: <i>Nonreactivity</i>	-.08	-.04	.08	.42	.31	.58

Note. SE = standard error. * $p < 0.05$. ** $p < 0.01$.

Table 6: Regression of Post-intervention Sleep Disturbance on Residualized Change in Mindfulness Facet Scores, Controlling for Pre-intervention Sleep Disturbance

Predictors	Standardized β	Unstandardized β	SE	R^2	ΔF	P
Step 1						
Pre-intervention sleep disturbance	.61	.64	.15	.37	19.10	.00**
Step 2						
Residualized change in mindfulness: <i>Observing</i>	-.14	-.23	.25	.38	.85	.36
Step 1						
Pre-intervention sleep disturbance	.61	.64	.15	.37	19.10	.00**
Step 2						
Residualized change in mindfulness: <i>Describing</i>	-.04	-.06	.25	.37	.06	.80
Step 1						
Pre-intervention sleep disturbance	.61	.64	.15	.37	19.10	.00**
Step 2						
Residualized change in mindfulness: <i>Acting with Awareness</i>	-.31	-.43	.18	.46	5.81	.02*
Step 1						
Pre-intervention sleep disturbance	.61	.64	.15	.37	19.10	.00**
Step 2						
Residualized change in mindfulness: <i>Nonjudging</i>	-.39	-.55	.17	.52	10.30	.00**
Step 1						
Pre-intervention sleep disturbance	.61	.64	.15	.37	19.10	.00**
Step 2						
Residualized change in mindfulness: <i>Nonreactivity</i>	-.21	-.46	.30	.41	2.34	.14

Note. SE = standard error. * $p < 0.05$. ** $p < 0.01$.

Table 7: Regression of Post-intervention Distress on Residualized Change in Mindfulness Facet Scores, Controlling for Pre-intervention Distress

Predictors	Standardized β	Unstandardized β	SE	R^2	ΔF	P
Step 1						
Pre-intervention distress	.69	.55	.10	.47	29.63	.00**
Step 2						
Residualized change in mindfulness: <i>Observing</i>	-.30	-.11	.04	.56	6.26	.02*
Step 1						
Pre-intervention distress	.69	.55	.10	.47	29.63	.00**
Step 2						
Residualized change in mindfulness: <i>Describing</i>	-.14	-.05	.05	.49	1.06	.31
Step 1						
Pre-intervention distress	.69	.55	.10	.47	29.63	.00**
Step 2						
Residualized change in mindfulness: <i>Acting with Awareness</i>	-.36	-.11	.03	.60	10.31	.00**
Step 1						
Pre-intervention distress	.69	.55	.10	.47	29.63	.00**
Step 2						
Residualized change in mindfulness: <i>Nonjudging</i>	-.27	-.08	.04	.54	4.99	.03*
Step 1						
Pre-intervention distress	.69	.55	.10	.47	29.63	.00**
Step 2						
Residualized change in mindfulness: <i>Nonreactivity</i>	-.26	-.12	.06	.54	4.69	.04*

Note. SE = standard error. * $p < 0.05$. ** $p < 0.01$.

CHAPTER 4. DISCUSSION

This present study aimed to expand our understanding of MBSR's effects on mindfulness, acceptance, and self-compassion and the specific facets of mindfulness that may be related to symptom reduction in cancer survivors. Previous studies with cancer and non-cancer samples have found a positive effect of MBSR on global mindfulness (K. W. Brown & Ryan, 2003; Gu et al., 2015), but the impact of MBSR and other mindfulness-based interventions on specific facets of mindfulness and other theory-driven psychological processes (e.g., acceptance) is largely unknown. The present study also provides initial information on the degree to which changes in individual facets of mindfulness following MBSR predict changes in common cancer-related symptoms. This information will inform the design of future MBSR interventions for symptomatic cancer survivors.

Consistent with my hypothesis, MBSR resulted in higher levels of observing, acting with awareness, nonjudging, and self-compassion as compared to the WC condition. Specifically, the MBSR group showed steady increases in each of these psychological processes over time, whereas the means for the WC group remained relatively stable or slightly declined over time. This result converges with prior research, which has shown that mindfulness-based interventions for cancer populations lead to increases in global mindfulness (Boyle et al., 2017; Foley, Baillie, Huxter, Price, & Sinclair, 2010; Garland et al., 2013; Labelle et al., 2010) as well as specific facets of mindfulness (Bränström et al., 2010; Labelle et al., 2015, 2014). Because theory suggests that MBSR participants become less avoidant and more flexible in their approach towards their illness or disorder (Kabat-Zinn, 1990), the increases in psychological processes that

would facilitate psychological flexibility were expected. As participants develop mindfulness skills through intervention exercises, they are better able to observe internal experiences, such as fatigue, in a non-judgmental fashion and engage in valued activities despite their symptom burden. For example, through practicing the awareness of breath sitting meditation, participants learn to acknowledge symptoms without trying to change them and return their attention to their breath. Similarly, exercises such as the guided lovingkindness meditation promote a sense of kindness and patience for oneself, thus improving self-compassion as this practice permeates into daily life (e.g., during times of high symptom burden). Together, the MBSR exercises and didactics facilitate the development of key psychological processes that can potentially reduce suffering related to symptom burden.

In contrast, both the MBSR and WC groups showed stability in describing, nonreactivity, and acceptance across study time points, with the MBSR group having higher levels of these psychological processes. The lack of change in describing may be explained by its relatively high scores at baseline (29.94 for the MBSR group and 27.04 for the WC group), creating a ceiling effect. Thus, most participants endorsed the ability to describe their internal experiences throughout the study. Conversely, ceiling effects do not explain the lack of change in nonreactivity and acceptance, as there was ample room for positive change in both variables (approximately 12-14 points for nonreactivity and 17-24 points for acceptance).

MBSR's standardized curriculum was designed to reinforce the development of all facets of mindfulness, including nonreactivity and acceptance; thus, the lack of change in these two variables does not appear to be explained by the intervention components.

For example, the body scan is one of the core activities in MBSR and targets all mindfulness facets. Participants begin by noticing sensations in different parts of the body (observing) and then sharing with the group what they noticed (describing). For example, a participant might have noticed neuropathic pain and allowed herself to recognize that this is a persistent side effect of treatment and feel sad in that moment (acceptance). If the participant was able to practice mindfulness, this sadness would not be judged as weakness (nonjudging), and thoughts and feelings would be noticed without getting caught up in them (nonreactivity). In addition, the participant would be able to fully engage in the body scan exercise without attempts to avoid this experience (acting with awareness). Thus, as illustrated by this exercise, the nature of the intervention is unlikely to explain the lack of change in nonreactivity and acceptance.

The measurement of nonreactivity and acceptance also should be considered when interpreting the stable findings. When examining the nonreactivity subscale of the FFMQ, the majority of the items (five out of seven) require the endorsement of negative experiences (e.g., “When I have distressing thoughts or images, I am able to just notice them without reacting”). In addition, the items refer to what is “generally true” for the participant without specifying a time frame. Thus, participants were recalling their responses to challenges at varying time frames, which may have rendered the measure insensitive to intervention effects. The AAQ-II measure of acceptance also does not reference a time frame. Developing measures of acceptance and nonreactivity that assess state psychological processes rather than traits is an important direction for future research.

Next, I examined whether positive change in the five facets of mindfulness (i.e., observing, describing, acting with awareness, nonjudging of inner experience, nonreactivity to inner experience) would predict change in fatigue interference, sleep disturbance, and distress in cancer survivors. The observing facet was linked to decreased distress, but not fatigue interference or sleep disturbance. This particular facet has performed poorly in prior research (Baer et al., 2006; Desrosiers, Klemanski, & Nolen-Hoeksema, 2013). Specifically, the five-factor model of mindfulness that included the observing facet had poor fit for a meditation-naïve sample (Baer et al., 2006). The current group of participants did not have a history of meditation experience at baseline; thus the observing subscale may not have been a psychometrically sound measure for this group. Additionally, in previous research, the observing facet has been related to both adaptive and maladaptive psychological characteristics (Baer et al., 2006; Desrosiers et al., 2013). For example, one cross-sectional study of undergraduate students found that observing was positively associated with openness, emotional intelligence, and self-compassion, but was also positively associated with dissociation, absent-mindedness, psychological symptoms, and thought suppression (Baer et al., 2006). Another cross-sectional study of people seeking mental health treatment found that observing was positively correlated with anxious arousal (Desrosiers et al., 2013), which has been associated with increased interoceptive awareness (Dunn et al., 2010). Thus, one possible explanation for negative findings is that higher levels of observing without the practice of other facets of mindfulness (e.g., nonjudging, nonreactivity) may lead to heightened awareness of negative internal experiences that is followed by attempts to control these experiences (e.g., thought suppression). Indeed, in prior research, higher

levels of observing were associated with lower levels of nonjudging in samples without meditating experience (Baer et al., 2006), whereas this association was positive for those with this experience (Baer et al., 2008). These findings suggest that higher reported levels of observing correspond with less judgment of one's experiences following mindfulness training. In the present study, participants engaged in exercises targeting all facets of mindfulness; thus, it is not surprising that positive change in observing was associated with decreased distress. Future research may examine interaction effects between observing and other facets of mindfulness to elucidate its contribution to the experience of physical and psychological symptoms.

Contrary to my hypothesis, the describing facet of mindfulness did not predict changes in distress, sleep disturbance, or fatigue. Although labeling internal experiences with words is a core feature of various exercises within the MBSR framework, this ability on its own may not lead to significant reductions in symptoms. For example, higher levels of describing may bring more awareness to the unpleasant sensation or experience, but if one continues to judge and react to that experience, the negative experience may become *more* salient for the individual. In future research it may be important to examine whether other facets of mindfulness (e.g., nonjudging) moderate the association between describing and symptom outcomes. In addition, the measurement of describing warrants attention in future studies. To date, research utilizing both the full-length and short-form versions of the FFMQ has shown average scores for describing to be consistently high (Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011; Bränström et al., 2010; Carmody & Baer, 2008), and average scores for describing were relatively

high at baseline in the current study. Therefore, there may have been little room for positive change in this facet of mindfulness.

A key finding of this study is that increases in acting with awareness predicted decreases in distress and sleep disturbance, as well as a modest decrease in fatigue interference that fell short of statistical significance ($p = .07$). The negative relationship between acting with awareness and distress is consistent with findings from previous cross-sectional studies with samples who had varying levels of meditation experience (Baer et al., 2008, 2006; Cash & Whittingham, 2010). This result is also consistent with findings from a MBSR intervention study with cancer patients, where acting with awareness accounted for the decrease in specific symptoms of stress (peripheral manifestations, muscle tension, and emotional irritability) (Garland et al., 2013). The relationship between acting with awareness and distress may be a function of increased satisfaction and meaning in activities as one purposefully attends to them. In addition, all items in the acting with awareness subscale of the FFMQ reference being on autopilot. This state may be interpreted as emotional disengagement from important activities, which may be linked to distress.

Increases in acting with awareness were also associated with decreased perceptions of sleep disturbance. Cancer survivors who develop the skill of acting with awareness may notice that their daily activities are not as hindered by their sleep problems as previously thought. Acting with awareness also involves conscious, deliberate actions, which may include health behaviors that help modulate sleep and emotional distress (e.g., regular exercise) (Speck, Courneya, Mâsse, Duval, & Schmitz, 2010).

Acting with awareness was the only aspect of mindfulness to show a modest association with fatigue interference; correlations between other facets of mindfulness and fatigue interference were close to zero. Given the sample size, statistical power may have been inadequate to detect the effect of acting with awareness on fatigue interference. One explanation for this effect is that cancer survivors may perceive that fatigue has less of an impact on their activities if they are able to fully attend to activities in the present moment. Furthermore, as mentioned previously, all items in the acting with awareness subscale reference being “on autopilot,” which may be similar to the experience of fatigue.

Increases in nonjudging were linked to decreased distress and sleep disturbance. Results are consistent with cross-sectional findings of negative associations between nonjudging and distress in a sample seeking mental health treatment, as well as general population samples with mixed levels of meditation experience (Baer et al., 2006; Cash & Whittingham, 2010; Desrosiers et al., 2013). Findings are also consistent with prior research linking nonjudging to fewer ruminative thoughts that may exacerbate depression and distress (Baer, 2003; Nolen-Hoeksema et al., 2008). Ruminative thoughts about insomnia are also positively related to sleep disturbance (Carney, Harris, Falco, & Edinger, 2013); thus, a more nonjudgmental attitude toward these thoughts may help lessen their impact on sleep. This explanation is plausible, given the strong correlation between distress and the severity of sleep-wake disturbances in cancer populations (Otte et al., 2010; Palesh et al., 2010).

Increased nonreactivity was also linked to decreased distress. This relationship may be explained by the relaxation response. By not being overly reactive to negative

cognitions and sensations, one may experience reduced sympathetic nervous system response (J. W. Hoffman et al., 1982), which, in turn, decreases arousal and physical tension, both of which lead to less distress. In addition, stepping back from distressing thoughts, feelings, or images may allow an individual to simply notice them without being overwhelmed by them. Previous literature has also demonstrated that attempts to avoid unpleasant cognitions and emotions (i.e., thought suppression) may have paradoxical rebound effects, resulting in stronger or more frequent unpleasant internal experiences (Abramowitz, Tolin, & Street, 2001). Adopting a nonreactive stance towards such thoughts may reduce emotional avoidance and lead to decreases in distress.

Despite MBSR's large effects on fatigue interference in the parent trial, the only facet of mindfulness to have a modest association with fatigue interference was acting with awareness. As noted previously, observing may not have been related to change in fatigue interference due to limitations in its measurement. For example, observing had unexpected positive associations with maladaptive psychological characteristics in nonmeditating samples at the time of measure development (Baer et al., 2008). Levels of describing in the present study were relatively high at baseline, which may help explain its lack of association with fatigue interference. Nonjudging and nonreactivity may not be linked to changes in fatigue interference because this attitude towards fatigue does not necessarily mean that one will be able to carry out important activities with ease. Conversely, a person with high levels of acting with awareness is actively engaging in activities, which may reduce perceptions of fatigue interference. Thus, the varying results at the facet level of mindfulness underscores the importance of assessing and specifically targeting mindfulness facets in future MBSR intervention studies.

Limitations, Strengths, and Implications

Several limitations of the present study must be considered. First, the sample size was limited for a RCT, which reduced statistical power for detecting effects. In terms of design, MBSR was tested against a waitlist control group, which has limitations relative to an active comparator group. Having an attention control group would enable the study of possible nonspecific factors (e.g., group context, instructor likeability, expectations for improvement) that influence the efficacy of the intervention, and may help determine whether development of mindfulness, acceptance, and self-compassion is limited to MBSR interventions. Additionally, the current sample was relatively homogenous, consisting of primarily Caucasian women who had been diagnosed with early-stage breast cancer. Thus, study findings may not generalize to men, ethnic minorities, and people with other cancer types and stages. In terms of data collection, all the key variables were based on self-report measures, which can be susceptible to problems such as lack of construct validity, expectation and bias effects, social desirability, and lack of score sensitivity (Furr & Bacharach, 2013). Also, caution must be demonstrated for the use of residualized change scores of mindfulness facets, as these scores may be less reliable than their constituent parts (Rogosa, Brandt, & Zimowski, 1982). Residualized change scores also rely on the assumption that the final observed data is a linear function of the initial observed data, which may be problematic with outliers (Willett, 1988). Finally, reports of recent mental health treatment at baseline were significantly greater for the WC group as compared to the MBSR group ($n = 7$ vs. 1, respectively). However, bivariate correlations between mental health treatment and key study variables at baseline

only revealed a significant correlation between this variable and acting with awareness, which did not differ between groups.

This study has several notable strengths. First, retention in this study was excellent, with 100% retention through the first follow-up time point. Only one participant in the WC group did not complete the final assessment following the completion of the MBSR course. Second, all participants had clinically meaningful levels of fatigue at study entry; thus, results may generalize to a cancer population with greater need for services. Third, to my knowledge, this is the first study to analyze changes in individual facets of mindfulness across time as predictors of both physical and psychological symptom changes in a cancer population. Given the popularity of mindfulness-based interventions for cancer patients and survivors, these results may help guide the development of future MBSR interventions for this population.

Several directions for future research on MBSR in cancer survivors warrant consideration. First, future studies should be conducted with larger sample sizes, an active comparator group, and more assessment time points over a longer period to expand and replicate these results. A possible active comparator group for future studies with MBSR may be the Health Enhancement Program (HEP), which was designed to match several key characteristics of the MBSR course, such as course length and group context (MacCoon et al., 2012). The length of HEP would need to be shortened in future studies if compared to this particular adaptation of MBSR for fatigued cancer survivors. Formal mediation analyses should also be conducted to further assess the relationships between theory-based psychological processes thought to underlie MBSR and symptoms. Given mixed results regarding relations between aspects of mindfulness and symptoms, future

research should also explore interactive effects of these aspects to more fully examine the contribution of each process in predicting symptom improvement. In addition, studies may include assessment time points *during* the intervention to gain a better understanding of the temporal patterns of these psychological processes and how they relate to symptoms.

Furthermore, MBSR curriculum in future studies may compare versions of the intervention that emphasize different psychological processes to identify the critical ingredients of the intervention. Based on the current findings, future studies of MBSR may include more home practice assignments that target acting with awareness. Findings also suggest that future studies should emphasize intervention components thought to target processes linked to reduced sleep disturbance and distress (i.e., observing, acting with awareness, nonjudging, and nonreactivity). Although MBSR exercises theoretically impact all facets of mindfulness, some exercises may facilitate greater development of certain facets. For example, being instructed to observe an object or scene may help develop the observing facet of mindfulness, but may not necessarily involve nonjudging or nonreactivity. These facets of mindfulness may be more fully developed in exercises such as the body scan. During this exercise, survivors are instructed to attend to different aspects of their body (e.g., surgically altered body parts) in a nonjudgmental way. Additionally, to develop the skill of acting with awareness, participants could be instructed to be fully present when engaging in an activity that is important to them, such as spending time with loved ones.

Course adaptations to facilitate the development of specific facets of mindfulness could also be adjusted for participants, depending on their symptom presentation. For

instance, emphasis on the aforementioned mindfulness processes could occur during didactics on sleep or distress if participants have high levels of either symptom. Future studies may also examine MBSR in samples of varying characteristics, such as individuals who are male or those who have invasive or metastatic disease. If researchers expand this line of work to other cancer populations and identify mechanisms underlying MBSR's effects, clinicians will have a stronger evidence base for relieving the suffering of the ever-growing population of cancer survivors.

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APPENDIX A. MEASURES

Screening Questionnaire

1. Are you 18 or older?
 - a. No—Ineligible
 - b. Yes—Continue interview

2. Have you ever participated in a teacher-instructed class that was focused on mindfulness meditation (e.g., MBSR)?
 - a. Yes—Ineligible
 - b. No—Continue interview

3. Have you had chemotherapy, radiation therapy, surgery, or a bone marrow or stem cell transplant within the past 3 months (those on hormonal therapies are okay)?
 - a. Yes—Ineligible
 - b. No—Continue interview

4. Are you currently enrolled in Hospice care?
[IF PATIENT DOESN'T KNOW WHAT HOSPICE IS SAY: "It's a program of care at home or in a hospital for persons who are quite ill, so it sounds like this doesn't apply to you."
 - a. Yes—Ineligible
 - b. No—Continue interview

5. Fatigue is a common symptom for people who have been diagnosed with cancer.
 Have you felt tired or fatigued in the last week?
 - a. No—Ineligible
 - b. Yes—Continue interview

6. Have you felt tired or fatigued for at least 8 weeks?
 - a. No—Ineligible
 - b. Yes—Continue interview

7. I'd like to ask you three questions now about the severity of your fatigue. For each question, please rate the severity of your fatigue on an 11-point scale, with 0 = not at all fatigued to 10 = as fatigued as you could be.
 - a. Rate your level of fatigue on the day you felt most fatigued during the past week:



0 1 2 3 4 5 6 7 8 9 10

Not at all fatigued

As fatigued as I could be

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

0 1 2 3 4 5 6 7 8 9 10

Not at all fatigued

As fatigued as I could be

- c. Rate your level of fatigue on the average during the past week:

0 1 2 3 4 5 6 7 8 9 10

Not at all fatigued

As fatigued as I could be

Baseline and Follow-up Questionnaires

Demographic Information

1. Ethnicity (*check all that apply*)

- White
- Black or African American
- Asian
- American Indian or Alaska Native
- Native Hawaiian or Other Pacific Islander
- Other _____

2. Hispanic, Spanish or Latino?

- Yes
- No

3. Date of birth _____ / _____ / _____

4. What is your highest level of education?

- 1. Eighth grade or less
- 2. Some high school
- 3. High school graduate or GED
- 4. Some college
- 5. Technical or trade school
- 6. College graduate
- 7. Advanced graduate or professional degree
- 8. Other _____

5. What is your current employment status?

- 1. Employed for wages
- 2. Self-employed
 - Part-time
 - Full-time
- 3. Out of work for more than 1 year
- 4. Out of work for less than 1 year
- 5. Homemaker
- 6. Student
- 7. Retired
- 8. Unable to work (health/disability)
- 9. Other _____

6. Gender: Male Female

7. Marital Status:

- Married Divorced
- Never married
- Widowed Separated
- Member of an unmarried couple

8. When you consider your household income from all sources today, would you say that you are comfortable, Have just enough to makes ends meet, or Do NOT have enough to make ends meet?

- Comfortable
- Just enough to make ends meet
- NOT enough to make ends meet

9. Please read the list of chronic health problems below. If a doctor or other health care worker has diagnosed you with or treated you for any of the following in the past 3 years, please check.

- Asthma, emphysema, or chronic bronchitis
- High blood pressure or hypertension
- High blood sugar or diabetes
- Arthritis or rheumatism (inflammation of the joints)
- Angina, heart failure, or other types of heart disease
- Strokes, seizures, Parkinson's disease, or other neurological condition
- Liver disease
- Kidney or renal disease
- Chronic Fatigue Syndrome
- Fibromyalgia
- Other _____

10. Are you currently (within previous 6 months) receiving treatment from a psychiatrist, psychotherapist, or other mental health worker?

- Yes
- No

11. If not, have you received treatment from a psychiatrist, psychotherapist, or other mental health worker in the past 5 years?

- Yes
- No

12. Are you currently taking any of the following medications?

Erythropoiesis-Stimulating Agents (ESAs), such as epoetin alfa (marketed as Procrit or Epopen), or darbepoetin alpha (marketed as Aranesp)

- Yes
- No

Psychostimulants, such as methylphenidate [Ritalin or Concerta], dextroamphetamine [Dexedrine], Adderall, Strattera

- Yes
- No

Prescription wakefulness-enhancing drugs such as modafinil (Provigil) or armodafinil (Nuvigil)

- Yes
- No

Any prescription anti-anxiety medication
 Yes No

Any prescription anti-depressant medications
 Yes No

Fatigue Symptom Inventory (FSI)

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

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

0	1	2	3	4	5	6	7	8	9	10
Not at all fatigued					As fatigued as I could be					

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

0	1	2	3	4	5	6	7	8	9	10
Not at all fatigued					As fatigued as I could be					

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

0	1	2	3	4	5	6	7	8	9	10
Not at all fatigued					As fatigued as I could be					

4. Rate your level of fatigue right now:

0	1	2	3	4	5	6	7	8	9	10
Not at all fatigued					As fatigued as I could be					

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

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

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

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

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

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

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



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



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



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



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



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



Insomnia Severity Index (ISI)

For each answer, please CIRCLE the number that best describes your answer.

Please rate the CURRENT (i.e., last 2 weeks) SEVERITY of insomnia problem(s).

1. Difficulty falling asleep

None	Mild	Moderate	Severe	Very severe
0	1	2	3	4

2. Difficulty staying asleep

None	Mild	Moderate	Severe	Very severe
0	1	2	3	4

3. Problem waking up too early

None	Mild	Moderate	Severe	Very severe
0	1	2	3	4

4. How SATISFIED/DISSATISFIED are you with your CURRENT sleep pattern?

Very satisfied	Satisfied	Moderately satisfied	Dissatisfied	Very dissatisfied
0	1	2	3	4

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

Not noticeable at all	A little	Somewhat	Much	Very much noticeable
0	1	2	3	4

6. How WORRIED/DISTRESSED are you about your current sleep problems?

Not at all	A little	Somewhat	Much	Very much worried
0	1	2	3	4

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

Not at all interfering	A little	Somewhat	Much	Very much interfering
0	1	2	3	4

Patient Health Questionnaire-8 (PHQ-8)

Over the last 2 weeks, how often have you been bothered by any of the following problems? Read each item carefully, and circle your response.

a. Little interest or pleasure in doing things

Not at all Several days More than half the days Nearly every day

b. Feeling down, depressed, or hopeless

Not at all Several days More than half the days Nearly every day

c. Trouble falling asleep, staying asleep, or sleeping too much

Not at all Several days More than half the days Nearly every day

d. Feeling tired or having little energy

Not at all Several days More than half the days Nearly every day

e. Poor appetite or overeating

Not at all Several days More than half the days Nearly every day

f. Feeling bad about yourself, feeling that you are a failure, or feeling that you have let yourself or your family down

Not at all Several days More than half the days Nearly every day

g. Trouble concentrating on things such as reading the newspaper or watching television

Not at all Several days More than half the days Nearly every day

h. Moving or speaking so slowly that other people could have noticed. Or being so fidgety or restless that you have been moving around a lot more than usual

Not at all Several days More than half the days Nearly every day

Generalized Anxiety Disorder Scale (GAD-7)

For each item, please CIRCLE the number that represents the best answer.

Circle only one number.

Over the <u>last 2 weeks</u> , how often have you been bothered by the following problems	0	1	2	3
	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3

2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about little things	0	1	2	3
4. Having trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily bored or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

Five-Facet Mindfulness Questionnaire (FFMQ)

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes YOUR OWN OPINION of what is GENERALLY TRUE FOR YOU.

1. When I'm walking, I deliberately notice the sensations of my body moving.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

2. I'm good at finding words to describe my feelings.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

3. I criticize myself for having irrational or inappropriate emotions.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

4. I perceive my feelings and emotions without having to react to them.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

5. When I do things, my mind wanders off and I'm easily distracted.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

6. When I take a shower or bath, I stay alert to the sensations of water on my body.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

7. I can easily put my beliefs, opinions, and expectations into words.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

9. I watch my feelings without getting lost in them.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

10. I tell myself I shouldn't be feeling the way I'm feelings.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

12. It's hard for me to find the words to describe what I'm thinking.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

13. I am easily distracted.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

15. I pay attention to sensations, such as the wind in my hair or sun on my face.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

16. I have trouble thinking of the right words to express how I feel about things.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

17. I make judgments about whether my thoughts are good or bad.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

18. I find it difficult to stay focused on what's happening in the present.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

19. When I have distressing thoughts or images, I “step back” and am aware of the thought or image without getting taken over by it.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

21. In difficult situations, I can pause without immediately reacting.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

23. It seems I am “running on automatic” without much awareness of what I'm doing.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

24. When I have distressing thoughts or images, I feel calm soon after.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

25. I tell myself that I shouldn't be thinking the way I'm thinking.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

26. I notice the smells and aromas of things.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

27. Even when I'm feeling terribly upset, I can find a way to put it into words.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

28. I rush through activities without being really attentive to them.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

29. When I have distressing thoughts or images I am able just to notice them without reacting.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

32. My natural tendency is to put my experiences into words.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

33. When I have distressing thoughts or images, I just notice them and let them go.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

34. I do jobs or tasks automatically without being aware of what I'm doing.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

35. When I have distressing thoughts or images, I judge myself as good or bad, depending on what the thought/image is about.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

36. I pay attention to how my emotions affect my thoughts and behaviors.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

37. I can usually describe how I feel at the moment in considerable detail.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

38. I find myself doing things without paying attention.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

39. I disapprove of myself when I have irrational ideas.

Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1	2	3	4	5

Acceptance and Action Questionnaire (AAQ-II)

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.

1	2	3	4	5	6	7
never true	very seldom true	seldom true	sometimes true	frequently true	almost always true	always true

- | | |
|---|---------------------------|
| <p>1. It's okay if I remember something unpleasant.</p> <p>2. My painful experiences and memories make it difficult for me to live a life that I would value.</p> <p>3. I'm afraid of my feelings.</p> <p>4. I worry about not being able to control my worries and feelings.</p> <p>5. My painful memories prevent me from having a fulfilling life.</p> <p>6. I am in control of my life.</p> | 1 2 3 4 5 6 7 |
|---|---------------------------|

7. Emotions cause problems in my life.	1 2 3 4 5 6 7
8. It seems like most people are handling their lives better than I am.	1 2 3 4 5 6 7
9. Worries get in the way of my success.	1 2 3 4 5 6 7
10. My thoughts and feelings do not get in the way of how I want to live my life.	1 2 3 4 5 6 7

Self-Compassion Scale-Short Form (SCS-SF)

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

Almost Never	1	2	3	4	5	Almost Always
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- _____ 1. When I fail at something important to me I become consumed by feelings of inadequacy.
- _____ 2. I try to be understanding and patient towards those aspects of my personality I don't like.
- _____ 3. When something painful happens I try to take a balanced view of the situation.
- _____ 4. When I'm feeling down, I tend to feel like most other people are probably happier than I am.
- _____ 5. I try to see my failings as part of the human condition.
- _____ 6. When I'm going through a very hard time, I give myself the caring and tenderness I need.
- _____ 7. When something upsets me I try to keep my emotions in balance.
- _____ 8. When I fail at something that's important to me, I tend to feel alone in my failure.

- _____ 9. When I'm feeling down I tend to obsess and fixate on everything that's wrong.
- _____ 10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.
- _____ 11. I'm disapproving and judgmental about my own flaws and inadequacies.
- _____ 12. I'm intolerant and impatient towards those aspects of my personality I don't like.