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University of Iowa

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INVESTIGATING EXPERIENTIAL AVOIDANCE AS A MECHANISM OF ACTION
IN A MINDFULNESS INTERVENTION

by
Aliza Zahava Weinrib

An Abstract

Of a thesis submitted in partial fulfillment
of the requirements for the Doctor of Philosophy
degree in Psychology (Clinical Psychology)
in the Graduate College of
The University of Iowa

May 2011

Thesis Supervisor: Professor Susan K. Lutgendorf

ABSTRACT

Mechanisms of change in psychotherapy must be empirically investigated to shed light on *how* particular therapies work, as well as common mechanisms that may be at work across modalities. The current study investigated a proposed mechanism of change in a mindfulness intervention; this proposed mechanism, experiential avoidance (EA), may function more broadly as a mediator of change across multiple therapies. The primary hypothesis was that gains in mindfulness over the course of Mindfulness-Based Stress Reduction (MBSR) would be associated with reductions in negative affect, and that changes in EA would mediate the relation between changes in mindfulness and negative affect. The role of EA in mediating the effect of mindfulness on positive affect, disability, and life satisfaction was also investigated. Participants ($N = 106$) completed questionnaires before and after an 8-week MBSR program. A subset of participants ($n = 74$) completed questionnaires at the mid-point of treatment, and recorded time spent on mindfulness practice and level of relaxation after homework completion. Mediation analyses were conducted in which relations between change in predictor (mindfulness), mediator (EA), and outcome measures over the course of the intervention were assessed using regression steps, followed by PRODCLIN. Participants reported significant improvements in mindfulness, reductions in EA and disability, and improved affect and life satisfaction from pre- to post-MBSR. The relation between increased mindfulness and reduced negative affect over the course of the intervention was partially mediated by reduced EA. No evidence was found for relaxation as an additional mediator of the relation between mindfulness and negative affect. The relation between increased mindfulness and positive affect over the course of the intervention was fully mediated by

decreased behavioral avoidance. Reductions in behavioral avoidance also fully mediated the relation between increased mindfulness and reduced disability. The relation between increased mindfulness and increased life satisfaction was mediated by EA. More mindfulness practice was linked with greater positive affect; the relation between practice and positive affect was mediated by EA. This study offers support for EA as a mediator of the effect of mindfulness on multiple outcomes, while highlighting a mechanism of change that may pertain across psychotherapeutic modalities.

Abstract Approved: _____
Thesis Supervisor

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Graduate College
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CERTIFICATE OF APPROVAL

PH.D. THESIS

This is to certify that the Ph.D thesis of

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ABSTRACT

Mechanisms of change in psychotherapy must be empirically investigated to shed light on *how* particular therapies work, as well as common mechanisms that may be at work across modalities. The current study investigated a proposed mechanism of change in a mindfulness intervention; this proposed mechanism, experiential avoidance (EA), may function more broadly as a mediator of change across multiple therapies. The primary hypothesis was that gains in mindfulness over the course of Mindfulness-Based Stress Reduction (MBSR) would be associated with reductions in negative affect, and that changes in EA would mediate the relation between changes in mindfulness and negative affect. The role of EA in mediating the effect of mindfulness on positive affect, disability, and life satisfaction was also investigated. Participants ($N = 106$) completed questionnaires before and after an 8-week MBSR program. A subset of participants ($n = 74$) completed questionnaires at the mid-point of treatment, and recorded time spent on mindfulness practice and level of relaxation after homework completion. Mediation analyses were conducted in which relations between change in predictor (mindfulness), mediator (EA), and outcome measures over the course of the intervention were assessed using regression steps, followed by PRODCLIN. Participants reported significant improvements in mindfulness, reductions in EA and disability, and improved affect and life satisfaction from pre- to post-MBSR. The relation between increased mindfulness and reduced negative affect over the course of the intervention was partially mediated by reduced EA. No evidence was found for relaxation as an additional mediator of the relation between mindfulness and negative affect. The relation between increased mindfulness and positive affect over the course of the intervention was fully mediated by

decreased behavioral avoidance. Reductions in behavioral avoidance also fully mediated the relation between increased mindfulness and reduced disability. The relation between increased mindfulness and increased life satisfaction was mediated by EA. More mindfulness practice was linked with greater positive affect; the relation between practice and positive affect was mediated by EA. This study offers support for EA as a mediator of the effect of mindfulness on multiple outcomes, while highlighting a mechanism of change that may pertain across psychotherapeutic modalities.

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CHAPTER I

INTRODUCTION

Over the past twenty years, a new direction in behavior therapy has emerged (Hayes, 2004). This new wave of psychotherapies is characterized by an emphasis on mindfulness and acceptance (Hayes, Follette, & Linehan, 2004). Mindfulness-influenced behavioral interventions include: Mindfulness-Based Stress Reduction, which aims to reduce stress and improve coping in patients with chronic medical problems (Kabat-Zinn, 1990); Mindfulness-Based Cognitive Therapy for the prevention of depression relapse (Segal, Williams, & Teasdale, 2002); Dialectical Behavior Therapy, originally developed to treat borderline personality disorder (Linehan, 1993a); and Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 1999), which has been used to treat psychological issues from psychosis to depression, as well as behavioral issues associated with medical problems such as diabetes and chronic pain (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). There is growing interest in both behavioral medicine and clinical psychology in the utility of mindfulness interventions in reducing suffering and increasing functioning for individuals with a wide variety of medical and psychiatric disorders (Hayes, Follette, & Linehan, 2004). Although there is a growing body of research documenting the effectiveness of outcomes in mindfulness-influenced interventions, there is a need for empirical investigation regarding the mechanisms by which mindfulness interventions effect behavior change.

Mindfulness

What is Mindfulness?

The fundamental starting point of mindfulness is awareness. At its simplest, mindfulness can be defined as moment-to-moment awareness of one's experience

(Germer, 2005b). Nyanaponika Thera (1972) has defined mindfulness as “the clear and single-minded awareness of what actually happens to us and in us at the successive moments of perception” (p. 5, cited in Brown & Ryan, 2003). Mindfulness training often starts with awareness of the sensations associated with breathing, then expands to include awareness of bodily sensations and perceptions, thoughts, and emotions. Preliminary research suggests that mindfulness practice can, in fact, increase attention capacities (MacLean et al., 2010; Slagter et al., 2007). When mindfulness skills are used with therapeutic intentions, the definition of mindfulness often incorporates overtones of nonjudgment of one’s experience (Germer, 2005b). Thus, Kabat-Zinn defines mindfulness as an orientation of nonjudgmental awareness to the experiences of the present moment (Kabat-Zinn, 1994).

Historically, mindfulness techniques have been taught within a variety of religious institutions in order to develop equanimity. For example, within the Buddhist tradition, mindfulness exercises were designed to help the practitioner to deal skillfully and adaptively with the suffering that was seen as an intrinsic part of life, as each individual is touched by aging, illness, and bereavement (Armstrong, 2001). Most mindfulness techniques taught as components of modern, Western psychologically-based interventions have their origins in traditional Buddhist awareness exercises; however, awareness-based approaches can be found in other religious traditions, such as Christianity (e.g., De Mello, 1990). Despite their origins in spiritually-based traditions, mindfulness exercises do not have religious content. The exercises themselves consist of simple awareness of one’s breath, bodily sensations, thoughts and emotions. (See Appendix E examples of prototypical mindfulness exercises.) In the Western context, traditional mindfulness exercises have been adapted so that they are accessible to a wide range of people who are coping with physical and emotional pain and suffering.

Mindfulness can be defined and described, as above; however, the essence of mindfulness cannot be fully captured by language, as mindfulness is a nonverbal experience (Gunaratana, 2002). Mindfulness is a skill that can be acquired by practicing meditative, experiential exercises. Students often practice mindfulness in daily meditation sessions; however, the main goal of practice is generally not to become an expert in meditation per se. Rather, the goal is to master the skill of mindfulness so that it can be generalized to daily life (Kabat-Zinn, 1994).

Meditation has been studied by psychologists for some time; however, up until the last ten years, meditation research focused on a type of meditation called concentration meditation (Germer, 2005b). In concentration meditation (e.g., transcendental meditation), the practitioner aims to focus the mind on one specific object of concentration by repeating a word or phrase, and considers thoughts, memories, emotions, and sensations that might arise as distractions. Germer (2005b) writes, “Concentration meditation can be compared to a *laser* light beam, which illuminates whatever object to which it is directed” (p. 15). The goal of concentration meditation, such as transcendental meditation, is to induce an alert yet relaxed mental state (Jevning, Wallace, & Beidebach, 1992). In contrast, the practitioner of mindfulness meditation aims to expand awareness to take in the myriad of sensations, thoughts, and emotions that are presented in each moment. Accordingly, “mindfulness meditation can be compared to a *searchlight* that illumines a wider range of objects as they arise in awareness, one at a time” (Germer, 2005b, p. 15). This trains the practitioner to be an observer of his or her experience as it unfolds. Preliminary evidence suggests that different forms of meditation, such as concentration and mindfulness meditations, induce different physiological changes in the central nervous system (Cahn & Polich, 2006).

Mindfulness and Relaxation

Questions have arisen as to how mindfulness training differs from relaxation training. Like mindfulness-based protocols, relaxation training has been found to improve mood and to assist in coping with medical illness (Carlson & Hoyle, 1993). Some have hypothesized that mindfulness exercises are another form of relaxation exercise. There are several potentially important distinctions in how mindfulness and relaxation are practiced. First, in mindfulness practice, there is no explicit intention to relax. If a muscle is tense, mindfulness practitioners are instructed to just observe this tension, whereas relaxation practitioners are instructed in techniques that are meant to relax the muscle (Jain et al., 2007). In addition, in contrast to relaxation exercises, mindfulness practice involves mentally approaching, rather than avoiding, unpleasant sensations (Kabat-Zinn, 1990). Therefore, while mindfulness practice may at times lead to relaxation, but it may also have “quite the opposite [effect] when the object of awareness is disturbing” (Germer, 2005b, p. 16).

There is evidence of distinct physiological changes associated with mindfulness versus relaxation practice. Ditto, Eclache, and Goldman (2006) randomly assigned novice participants to a mindfulness or relaxation exercise in the laboratory. In comparison to those who practiced relaxation, participants who practiced the mindfulness exercise (body scan) had increased cardiac sympathetic activity (as assessed by cardiac pre-ejection period) and higher vagal activity (as assessed by cardiac respiratory sinus arrhythmia). These results support the hypothesis that mindfulness meditation “involves active, arousal-promoting processes as well as relaxing processes” (Ditto et al., 2006, p. 227). In addition, in order to compare the psychological impact of relaxation and mindfulness, Jain and colleagues (2007) conducted a randomized controlled trial in which 83 participants were assigned to one month of either mindfulness training or relaxation training. Participants in both groups experienced reductions in distress;

however, mindfulness meditation practitioners had larger decreases in rumination and increases in positive states of mind than those in the relaxation group. Therefore, there were some differences in psychological outcomes between the two groups. Taken together, preliminary findings suggest both psychological and physiological differences in outcomes in mindfulness and relaxation practice.

Further research is needed to delineate the physiological and psychological effects of mindfulness practice in contrast to those of relaxation training. Research on the active ingredients of mindfulness and relaxation would also shed light on the differences between the two approaches. Relaxation is thought to have its effects on mood because it reduces physiological tension and arousal. Mindfulness may lead to reduced tension at times; however, mindfulness is thought to lead to improved mood and functioning primarily through other mechanisms. Research examining potential mechanisms of mindfulness, including relaxation, would help to shed light on this issue.

Mindfulness in Behavioral Interventions

Mindfulness-Based Stress Reduction

Mindfulness interventions first came to the attention of Western health professionals through the work of Jon Kabat-Zinn, who established the Center for Mindfulness at the University of Massachusetts Medical School in 1979 (Kabat-Zinn, 1990). Kabat-Zinn developed the Mindfulness-Based Stress Reduction (MBSR) program to treat patients with symptoms that could not be eased by traditional medical interventions (e.g., patients with chronic pain). This behavioral medicine intervention consists of 8 -10 weekly meetings that last for approximately two hours each, during which groups of up to 30 participants gather to learn mindfulness skills. In addition, an all-day mindfulness meditation retreat of approximately 7 hours is usually conducted towards the end of the intervention. The mindfulness exercises practiced include the

body scan, a 45 minute exercise during which participants lie down, close their eyes, and turn their attention to observing sensations in various parts of the body. During sitting meditation, participants sit in a stable sitting position, and attend nonjudgmentally to the sensations associated with breathing, as well as any other sensations, thoughts, or emotions that arise. In the class, participants practice mindfulness during everyday activities, such as walking or eating. Finally, gentle yoga postures are also practiced to further awareness of bodily sensations; yoga has been termed “mindfulness in motion” (Germer, 2005b, p. 10). In addition to practicing these exercises in class, participants are encouraged to practice mindfulness exercises at home for 45 minutes per day at least six days per week. As of 1997, 240 hospitals and clinics around the world were offering mindfulness-based stress reduction programs and the number has grown since then (Salmon, Santorelli, & Kabat-Zinn, 1998).

In 1982, Kabat-Zinn published his pilot study on mindfulness-based treatment for patients with chronic pain. The MBSR intervention was intended to facilitate detached observation of pain. Participants ($N = 51$) showed an average of a 33% reduction in their pain ratings after the MBSR intervention. Further research indicated that patients also showed statistically significant reductions in the inhibition of activity by pain and decreased use of pain medication (Kabat-Zinn, Lipworth, & Burney, 1985). Changes in pain ratings were accompanied by reductions in mood disturbance (Kabat-Zinn et al., 1985). Kabat-Zinn compared patients who participated in MBSR with chronic pain patients who received medical treatment as usual (patients were not randomly assigned). He found that the comparison group did not experience significant improvements in pain intensity, pain-related disability, or mood over a comparable time period (Kabat-Zinn et al., 1985). The MBSR group maintained many of their treatment gains at follow-up (Kabat-Zinn, Lipworth, Burney, & Sellers, 1987).

Since then, MBSR has been used with other medical patient populations. For example, Speca, Carlson, Goodey, and Angen (2000) conducted a randomized, wait-list controlled study of a Mindfulness-Based Stress Reduction program in a heterogeneous group of 90 cancer patients. After the intervention, participants reported a 65% reduction in total mood disturbance and a 31% reduction in stress symptoms in comparison to the control group. In addition, Sephton and colleagues (2007) conducted a randomized, wait-list controlled clinical trial of a MBSR program for women with fibromyalgia, a chronic pain disorder. Fibromyalgia has been linked with neuroendocrine dysregulation and symptoms of depression are common in this population (Fishbein, Cutler, Rosamoff & Rosamoff, 1997; Weissbecker, Floyd, Dedert, Salmon, & Sephton, 2006). Over the course of the intervention, both somatic and cognitive symptoms of depression improved in patients randomized to MBSR, but not in the control group.

Several studies have examined the effects of MBSR on stress-related physiological outcomes. For example, psoriasis is a skin condition that can be exacerbated by stress. Kabat-Zinn and colleagues (1998) randomly assigned patients with psoriasis ($n = 37$) who were undergoing either ultraviolet phototherapy or photochemotherapy to two treatment groups. The first group consisted of medical treatment as usual, while the second group received phototherapy while listening to audiotaped instructions aimed at promoting mindfulness. Participants who listened to the audiotape while receiving treatment had an increased rate of resolution of their psoriatic lesions. Other investigators have found effects of MBSR on immune functioning. In a randomized trial, Davidson and colleagues (2003) found that individuals who participated in an MBSR group at work had greater antibody titers in response to an influenza vaccine after the intervention than a wait list control group.

As the research literature on MBSR continues to grow, randomized controlled trials have been conducted with promising results (e.g., Kabat-Zinn et al., 1998;

Lengacher et al., 2009); Sephton et al., 2007; Shapiro et al., 1998; Speca et al., 2000; Williams, Kolar, Reger, & Pearson 2001). In addition, several meta-analyses have been conducted. Baer (2003) found that the mean MBSR effect size at post-treatment was .59; Grossman, Niemann, Schmidt, and Walach (2004) found that it was .50. (A Cohen's d of 0.50 indicates an effect size of medium magnitude.) Mean effect sizes were similar for studies with pre-post and between-group designs (Baer, 2003; Grossman et al., 2004). More recently, Hofmann, Sawyer, Witt, and Oh (2010) conducted a meta-analysis on 39 studies with over one thousand participants all together (these studies included MBSR and MBCT trials; for more information on MBCT, see below). Participants had a wide range of conditions, including medical illnesses (e.g., cancer, stroke, arthritis, diabetes) and psychiatric disorders (e.g., generalized anxiety disorder, depression, binge eating disorder). Hofmann and colleagues found that mindfulness-based therapy was moderately successful in improving anxiety and mood symptoms in the overall sample from pre- to post-treatment. In addition, they found large effect sizes for improvement in anxiety and depression for individuals with anxiety and mood disorders. Hofmann (2010) concluded that mindfulness-based therapy "may not be diagnosis-specific but, instead, may address processes that occur in multiple disorders by changing a range of emotional and evaluative dimensions that underlie general aspects of well-being" (p. 180).

Mindfulness-Based Cognitive Therapy

Mindfulness-Based Stress Reduction was adapted for the treatment of patients with a history of depression and called Mindfulness-Based Cognitive Therapy (Segal, Williams, & Teasdale, 2002). MBCT incorporates extensive mindfulness training with a cognitive therapy protocol for patients with a history of depressive episodes. It is designed to prevent future episodes of depression. This intervention teaches patients to observe their depressogenic thoughts mindfully and treat these thoughts as transient

mental events, with the goal of preventing rumination, which could lead to relapse. In two randomized controlled trials in which MBCT plus treatment as usual has been compared to treatment as usual for patients with a history of depression, MBCT has been shown to reduce the risk of depression relapse among participants who have had 3 or more multiple prior episodes of depression (Ma & Teasdale, 2004; Teasdale, Segal, Williams, Ridgeway, Soulsby, & Lau, 2000). For example, Ma and Teasdale (2004) found that only 38% of MBCT participants relapsed in the year after treatment, while 100% of patients in the control group relapsed over the same period (patients in this study were in recovery/remission and not on anti-depressant medication at baseline or for the 12 weeks prior to study entry; however, they could begin medication if depression recurred over the one year follow-up period). It is not clear why MBCT does not appear to be helpful to patients with 2 or less previous episodes of depression. Preliminary research suggests that MBCT may be helpful for patients who are currently depressed (Kenny & Williams, 2007), in addition to those who have recovered from depression and wish to engage in relapse prevention. A recent randomized controlled trial, with a waitlist comparison group, found that MBCT was effective in reducing anxiety, depression, and general distress among individuals with a cancer diagnosis (Foley, Baillie, Huxter, Price & Sinclair, 2010).

MBSR and MBCT require patients to participate in considerable mindfulness meditation practice. However, other forms of psychotherapy have been influenced by the tradition of mindfulness (e.g., DBT, ACT), yet do not require extensive mindfulness meditation and instead focus on teaching participants principles that are influenced by mindfulness.

Dialectical Behavior Therapy

While Kabat-Zinn introduced mindfulness techniques into behavioral medicine, Marsha Linehan (1993a, 1993b) independently incorporated mindfulness techniques into

a form of cognitive-behavioral therapy called Dialectical Behavior Therapy (DBT). DBT originated as a treatment for patients with borderline personality disorder (BPD), a disorder which is characterized by marked emotional reactivity and intensity of mood. Mindfulness is one of the techniques used in this intervention to help these patients to regulate emotions and cope with their intensity (Linehan, 1993a).

Mindfulness-based skills, such as nonjudgmental observation of thoughts and feelings, are taught as part of the treatment package; however, extended periods of mindfulness meditation are not required, as severely impaired patients may not be willing or able to participate in challenging periods of silent meditation (Linehan, 1994). DBT has been found to be an efficacious treatment for BPD in several randomized, controlled trials and can be regarded as a well established empirically supported treatment (Lynch, Chapman, Rosenthal, Kuo, & Linehan, 2006). Due to its success in treating BPD, DBT is now being studied as a treatment for other disorders, including depression and eating disorders (Lynch et al., 2006).

Acceptance and Commitment Therapy

Like Dialectical Behavior Therapy, Acceptance and Commitment Therapy (ACT) is a modern behavior therapy that incorporates elements of mindfulness training. ACT has been called “an experiential approach to behavior change” (Hayes, Wilson, & Strosahl, 1999) because it combines experiential and behavioral techniques. According to the ACT model, mindfulness is regarded as an adaptive behavioral skill that clients can learn by engaging in experiential exercises.

ACT interventions grow out of a theoretical framework that aims to explicate the basic processes by which psychopathology is developed and maintained (for a comprehensive description, see Hayes, Luoma, Bond, Masuda, & Lillis, 2006). These basic processes are then targeted using specific clinical interventions (Hayes et al., 2006). According to the ACT model, one of the core processes associated with psychopathology

is lack of contact with the experiences of the present moment, or lack of mindful awareness (Fletcher & Hayes, 2005; Hayes et al., 2006). For example, ruminative clients may be lost in their thoughts regarding the past and anxious clients may be preoccupied by the future (Germer, 2005a). Many of the therapeutic techniques within ACT aim to bring the client to a greater mindful awareness of the experiences of the present moment. Clients must be in contact with the here and now in order to respond effectively to the contingencies of their present environment, rather than acting out of reified habits based on past learning.

Formal mindfulness meditation practice can be incorporated into therapy (Dahl & Lundren, 2006; Hayes, 2005); however, ACT does not require hours of formal practice, as do MBSR and MBCT. Fletcher and Hayes (2005) write, “ACT recognizes the benefits of formal practice but emphasizes informal practices... ACT is attempting to develop new mindfulness methods in hopes that the functional core of mindfulness will be able to reach as many people as possible” (p. 327). While ACT therapists do not require formal meditation by their clients, they recognize that mindfulness is a nonverbal skill and cannot be taught solely through verbal description (Gunaratana, 2002). Accordingly, ACT therapists use experiential exercises to engender experiences of mindful awareness (Hayes, Strosahl, & Wilson, 1999). For example, clients are asked to imagine leaves floating down a stream (Fletcher & Hayes, 2005). Then, as thoughts naturally arise, clients are asked to imagine placing each thought on a leaf, and watching it float down the stream. In addition, over the course of therapy, the ACT therapist repeatedly prompts the client to bring attention to the experiences of the present moment (Fletcher & Hayes, 2005).

Since ACT emphasizes mindful awareness of present experiences, the ACT outcome literature may shed light on whether guiding clients to greater contact with the present moment is beneficial to psychological well-being. The outcome literature on

ACT is growing rapidly (Hayes et al., 2006). So far, ACT has shown promising results in behavioral medicine by improving mood and functioning in patients with diabetes (Gregg, Callahan, Hayes, & Glenn-Lawson, 2007), end-stage cancer (Branstetter, Wilson, Hildebrandt, & Mutch, 2004), epilepsy (Lundgren, Dahl, Melin, & Kies, 2006), and chronic pain (Dahl, Wilson, & Nilsson, 2004). ACT has also shown promise in the treatment of depression (Zettle & Rains, 1989), substance abuse (Hayes, Wilson, et al., 2004; Smout et al., 2010), psychosis (Bach & Hayes, 2002), and obsessive-compulsive disorder (Twohig et al., 2010).

Awareness and Psychological Well-Being

An emphasis on awareness of present experiences is not unique to ACT. Many schools of psychotherapy have emphasized the importance of awareness to mental health. In the early days of psychotherapy, Freud encouraged clients to practice free association, “a state of receptive awareness wherein attention ‘evenly hovers’ over the psychological landscape” (Brown & Ryan, 2003, p. 823; Freud 1912/1963). Fritz Perls, the founder of Gestalt therapy, encouraged clients to be aware of the experiences of the here and now. In Gestalt therapy, “awareness is cognitive, sensory and affective. The person who verbally acknowledges his situation but does not really see it, know it, react to it and feel in response to it is not fully aware and is not in full contact” (Yontef, 1993). Similarly, the client in Rogerian therapy is thought to “become more openly aware of his own feelings and attitudes as they exist in him at an organic level” (Rogers, 1961, p. 115, cited in Hayes et al., 1996). Modern process-experiential therapists also discuss the role of awareness in psychopathology; Greenberg & Safran (1989) state, “Dysfunction occurs when emotions are interrupted before they can enter awareness” (p. 20, cited in Hayes et al., 1996). Historically, the therapeutic orientations that have focused on the importance of awareness have been less empirically oriented and therefore have not investigated the evidentiary basis of these theoretical positions.

The growing interest in mindfulness within empirically oriented therapies, however, has led to scientific investigation of the relation between awareness and psychopathology. Brown and Ryan (2003) developed a measure of mindfulness called the Mindful Attention Awareness Scale (MAAS), which assesses “the presence or absence of attention to and awareness of what is occurring in the present” (p. 833). In a sample of 313 college students, greater mindful awareness (as indicated by higher scores on the MAAS) was associated with less neuroticism ($r = -.56, p < .001$), less negative affect ($r = -.39, p < .001$), and less depression ($r = -.41, p < .001$) and anxiety ($r = -.40, p < .001$). Greater mindful awareness was also associated with more positive affect ($r = .30, p < .001$), vitality ($r = .40, p < .001$), and life satisfaction ($r = .26, p = .001$). These results were replicated in multiple large student samples. Brown and Ryan conclude that scores on the MAAS are related to both negative and positive affect; however, they are more strongly related to negative affect.

In addition, Brown & Ryan (2003) report on early-stage breast and prostate cancer patients ($N = 41$) who participated in an MBSR intervention. On average, participants had been diagnosed with cancer two years prior to the intervention. Participants completed the MAAS and measures of psychological distress immediately before and after the intervention. Increased mindful awareness, as assessed by changes in MAAS scores from pre- to post- MBSR treatment, predicted decreased stress and mood disturbance.

Evidence is accumulating that greater awareness of present experience is associated, both cross-sectionally and longitudinally, with greater psychological well-being. Empirical investigations suggest that perhaps Freud, Perls, Rogers, and others were correct in observing that awareness is related to psychological well-being (Brown & Ryan, 2003). The question remains: if this is so, why is it so? What psychological processes, what intervening mechanisms, may account for the relations between

awareness and affect? One candidate mechanism, experiential avoidance, will be examined in the next section.

Mindfulness and Experiential Avoidance

Several investigators have theorized that mindfulness skills have their effect by reducing experiential avoidance (Fletcher & Hayes, 2005; Hayes et al., 2006). Experiential avoidance has been formally defined as “the phenomenon that occurs when a person is unwilling to remain in contact with particular private experiences (e.g., bodily sensations, emotions, thoughts, memories, behavioral predispositions) and takes steps to alter the form or frequency of these events” (Hayes et al., 1996, p. 1154). Experiential avoidance is the *opposite* of acceptance, the willing experience of thoughts, emotions, and bodily sensations (i.e., private experiences) as they arise, without efforts to avoid or control them (Hayes et al., 1996). Experiential avoidance is a general term that encompasses more specific kinds of avoidance, such as cognitive avoidance (e.g., distracting from worry), emotional avoidance (e.g., attempting to suppress sadness), and behavioral avoidance (e.g., avoiding situations that induce physiological arousal and the accompanying interoceptive sensations).

Mindfulness is thought to teach participants how to accept difficult experiences. Mindfulness involves cultivating a stance of openness and awareness towards the variety of one’s experiences. Private experiences, such as thoughts, emotions, and physical sensations, are not avoided, but neutrally observed as they arise and pass. This helps to counter-act habitual tendencies to control or avoid experiences that are considered aversive, which would be considered non-acceptance. The link between mindfulness and acceptance has been supported by research – for example, Weinstein, Brown, and Ryan (2009) found that individuals who report higher levels of mindfulness also report less use of avoidant coping strategies in response to both a laboratory stressor and stressful situations in daily life.

Reduced avoidance is thought, perhaps paradoxically, to reduce distress over time. For example, in mindfulness training, patients are taught to observe physical pain just as it is in each moment, without adding painful emotional content to the experience (Siegel, 2005). Over time, this appears to reduce emotional distress and increase functioning, and may eventually reduce pain sensations themselves, as pain sensations are mediated through the central nervous system, and can be amplified by emotional reactions. The same approach can be taken with emotional reactions themselves. Linehan (1993a) encourages clients with borderline personality disorder to dispassionately observe the physical sensations that come with intense emotion; this encourages awareness of emotion, but since emotion is observed in a neutral way, this awareness does not elicit reactivity to the emotion itself, and emotional intensity is reduced over time.

Mindfulness-based therapies aim to increase acceptance and reduce experiential avoidance through the particular skills and exercises that are characteristic of mindfulness training. These are by no means the only methods of addressing problematic avoidance and other therapeutic modalities have targeted experiential avoidance using their own methods. Indeed, decreasing experiential avoidance may be a common pathway that unites many therapeutic approaches to reducing human suffering.

The History of Experiential Avoidance as a Target of Therapy

The problematic nature of experiential avoidance has been addressed by many of the main schools of psychotherapy. Freud, the originator of psychoanalytic psychotherapy, stated that avoidance is at the root of many psychological problems. At an unconscious level, the ego develops defense mechanisms to protect the self from anxiety-provoking thoughts; for example, the defense mechanisms of suppression and repression are meant to prevent certain mental contents from coming into awareness.

The goal of psychotherapy was to bring avoided thoughts, memories, and emotions to awareness (Freud, 1920/1966). In terms of experiential therapy, Perls believed that one of the core features of psychological problems was the avoidance of painful or unwanted emotion (Perls, Hefferline, & Goodman, 1951). For Rogers, one of the goals of therapy was for the client to be able to live more fully, without attempting to avoid elements of experience (Rogers, 1961). Thus, addressing avoidance of experience has been a theme of treatment throughout the history of psychotherapy.

In terms of cognitive behavioral therapy, interest in the role of experiential avoidance has grown in recent years. The recognition of the role of experiential avoidance by cognitive therapists has grown out of empirical research on treatments for panic disorder. Patients with panic disorder avoid situations in which they might experience anxiety and have panic attacks. Over the years, psychologists have grown to understand that patients with panic disorder are not only avoiding the external contexts that may trigger panic, but also the internal or interoceptive bodily sensations associated with anxiety (Barlow, 1988). Therefore, there has been a shift from a focus on avoiding particular places, to avoiding particular internal sensations. Barlow, an expert in panic disorder and a leading innovator in cognitive-behavioral therapy research, has now stated that parallel forms of avoidance appear to be at the core of other emotional disorders (Barlow, Allen, & Choate, 2004; Moses & Barlow, 2006).

Experiential Avoidance and the Emotional Disorders

According to Barlow and others, emotional avoidance strategies are core features of many of the mood and anxiety disorders, including panic disorder, generalized anxiety disorder, posttraumatic stress disorder, social phobia, and depression (Barlow, Allen, & Choate, 2004; Hayes et al., 2006; Moses & Barlow, 2006). Barlow writes, “Emotional disorders seem characterized to some degree by attempts to control both positive and negative emotions... Individuals concerned about the expression and experience of their

feelings may attempt to suppress, hide, or ignore them, with unintended consequences” (Barlow et al., 2004, p. 216).

Experimental evidence on avoidance in the emotional disorders supports this conclusion. Campbell-Sills, Barlow, Brown, and Hofmann (2006) compared patients with anxiety and mood disorders to individuals with no history of emotional disorders. In their first study, participants watched a film that induced negative mood. Patients in the clinical sample demonstrated less acceptance of their emotions and more emotional suppression. Greater suppression of emotion was associated with elevated heart rate during the film and inhibited recovery from distress after the film. In a second study, patients with anxiety and mood disorders were divided into two groups; one group was asked to engage in emotional acceptance activities during the film, and the second group was asked to engage in emotional suppression activities. Patients who engaged in acceptance behaviors showed decreased heart rate from anticipation to termination of the film, suggesting that they habituated to the experience, whereas patients who engaged in suppression had higher heart rate from anticipation to termination of the film, indicating sustained arousal. These studies suggest that patients with clinical disorders are more inclined to engage in emotional avoidance strategies to cope with emotion, and that these strategies may prolong emotional arousal, rather than curtailing it. Thus, attempts to avoid emotion appear to be counter-productive.

In a parallel vein, there is growing evidence that efforts to control or avoid unwanted thoughts can be counter-productive. Laboratory studies have demonstrated that efforts to suppress an unwanted thought lead to a temporary decrease in the targeted thought, followed by a period of increased frequency (Wegner & Zanakos, 1994). Thus, although the behavior is reinforcing in the short term, it has negative consequences in the long-term. The paradoxical effects of thought suppression have been linked to mood: when a suppressed thought returns due to a rebound effect, the thought will come to

produce the mood that was present during the original suppression (Wenzlaff, Wegner & Klein, 1991). Consequently, efforts to control thoughts and emotions may result in a positive feedback loop, in which attempts at cognitive and emotional avoidance lead to more frequent unwanted thoughts and more intense emotional distress, resulting in further attempts at avoidance, and constituting a vicious cycle (Barlow et al., 2004; Hayes et al. 1996).

Vicious cycles of this kind are implicated in several emotional disorders. For example, individuals with panic disorder systematically avoid fear and other intense emotions, along with associated interoceptive sensations. In order to avoid the internal sensations associated with these strong emotions, they engage in behavioral avoidance of activities (e.g., exercise) and external contexts (e.g., public places) that may trigger these bodily sensations. Excessive efforts to avoid fear sensations are counter-productive, however, as they lead to hyper-vigilance and arousal, and increase the likelihood of future panic attacks (Craske, Miller, Rotunda, & Barlow, 1990). The importance of avoidance in the maintenance of symptoms should not be underestimated:

Evidence on the deleterious use of avoidant techniques extends to calming procedures so much a part of our own earlier protocols for treating anxiety and panic. Specifically, when calming techniques such as relaxation and breathing control are conceptualized to the patient as a specific strategy for reducing negative emotions and distress, in which the focus is to “cope” with the emotions and distress (rather than as a noncontingent calming exercise), the results seem counterproductive. For example, Schmidt et al. (2000) concluded that breathing retraining did not add any clear benefits to a treatment package consisting of education, cognitive restructuring, and exposure-based techniques for patients with panic disorder. In fact, a trend in the data indicated that patients who received breathing retraining showed lower end-state functioning on both self-report and clinician-rated measures. Similar results have been obtained from... prior work evaluating distraction strategies... and safety signals. (Barlow et al., 2004, p. 220)

The most effective therapy for panic disorder involves complete and undefended contact with the feared sensations and situations that engender them, without avoidance.

Exposure-based treatment for panic disorder, based on this insight, is the most effective treatment for panic disorder, with a mean effect size of .88 (Gould, Otto, & Pollack, 1995).

The emphasis on experiential avoidance as a core feature of psychopathology has spread to the study of Generalized Anxiety Disorder (GAD). Borkovec (2002) defines worry, the central feature of GAD, as “a cognitive avoidance response to perceived threat” (p. 77). Individuals with GAD are distinguished by marked difficulty tolerating uncertainty, which they tend to interpret as threatening (Dugas, Gagnon, Ladouceur, & Freeston, 1998); worrying appears to be an attempt to control the uncertain future. In addition, individuals with GAD acknowledge worrying over relatively minor concerns in order to distract their thoughts from more distressing topics (Borkovec & Roemer, 1995). Finally, individuals with GAD often superstitiously believe that worrying reduces the likelihood of future negative events (Craske, 1999). Thus, for individuals with GAD, worry is negatively reinforced because it reduces the unpleasant experience of uncertainty, distracts from more major concerns, and is perceived to result in avoidance of future negative outcomes (Roemer & Orsillo, 2002). In support of this conceptualization, experimental evidence suggests that worry reduces distress in the short term. However, “worry itself becomes an unwanted internal experience, prompting attempts to avoid it, which may paradoxically increase its frequency... In this way, individuals with GAD are trapped in a cycle of experiential avoidance” (Roemer & Orsillo, 2002, p. 58). Indeed, patients with GAD report higher levels of experiential avoidance than demographically matched non-anxious controls (Lee, Orsillo, Roemer, & Allen, 2009), and reductions in experiential avoidance predict responder status at the end of acceptance-based treatment for GAD over and above changes in worry (Hayes, Orsillo, & Roemer, 2010).

Other anxiety disorders are also strongly associated with avoidance. According to the DSM-IV, one of the core features of PTSD is avoidance of experiences associated with a traumatic event, such as thoughts, feelings, and memories (APA, 1994). Clearly, PTSD is associated with avoidance once it has developed (Kashdan, Breen, & Julian, 2010; Orsillo, Roemer, & Litz, 2001; Roemer, Litz, Orsillo & Wagner, 2001). Avoidance has also been implicated in the development of PTSD (Shalev, Peri, Canetti, & Schreiber, 1996). One of the most successful treatments for PTSD (Schnurr et al., 2007) involves repeatedly describing the traumatic event in great detail as if one was re-experiencing it. Thus, avoidance is a key feature of PTSD and countering this avoidance through exposure is an effective treatment. Another anxiety disorder, social phobia, is marked by avoidance of people and social situations. Individuals with social anxiety may engage in several types of avoidance, including cognitive avoidance (e.g., tuning out during a conversation) and behavioral avoidance (e.g., avoiding eye contact; Moses & Barlow, 2006). Exposure-based treatments, which explicitly counter-act avoidance of social situations, are among the most effective treatments of social phobia (Barlow, Raffa, & Cohen, 2002).

Many of the anxiety disorders, including panic disorder, GAD, PTSD, and social phobia, can be conceptualized as disorders involving the core feature of experiential avoidance, and the leading empirical treatments involve countering that avoidance through exposure. In addition to its central role in the anxiety disorders, avoidance has also been implicated in the mood disorders, particularly depression. According to Ferster (1973), individuals suffering from depression engage in avoidance behaviors, such as withdrawal. This withdrawal involves avoidance of challenging situations and interactions that may elicit negative affect (Barlow et al., 2004). Ruminative thinking, which is characteristic of depression, has also been conceptualized “as an escape or avoidance behavior” (Martell, Addis, & Jacobson, 2001, p. 21) because it takes the place

of actively engaging with the environment to address problems. Countering avoidant patterns of rumination and inactivity using behavioral activation is an effective treatment for depression (Dimidjian et al., 2006; Martell, Addis, & Jacobson, 2001).

In conclusion, avoidance of private experiences (thoughts, emotions, bodily sensations, memories, etc.) is a core feature of many forms of psychopathology, particularly in terms of the mood and anxiety disorders, and may perpetuate negative affect (Moses & Barlow, 2006). One way to treat experiential avoidance is through exposure techniques and, indeed, exposure has become a powerful, empirically supported approach in cognitive-behavioral therapy. Acceptance-based techniques in psychotherapy appear to be closely related to exposure techniques, as exposure and acceptance both counter-act experiential avoidance by eliciting undefended psychological contact with private experiences. However, while exposure has been applied largely within the anxiety and fear disorders, acceptance-based techniques are being used more broadly in behavioral interventions, including in behavioral medicine (Hayes et al., 2006).

Experiential Avoidance and Acceptance in Medical Illness

While interest in acceptance-based interventions in behavioral medicine is a relatively recent development, there has long been interest in the role of avoidance in coping with medical illness. Chronic and life-threatening medical illnesses constitute major stressors, and stressful events are known to elicit negative affect (Watson, 1988). The way that individuals cope with stressful events, and the concomitant rise in negative affectivity, has an impact on long-term outcomes. Coping strategies have been divided into active strategies, which include making a plan to address the problem, and avoidant strategies, which include avoiding thoughts and reminders related to the stressful event, using distraction techniques, mentally disengagement, and denial (Moos & Shaefer, 1993). Avoidant coping strategies can be understood as forms of experiential avoidance.

Avoidant coping strategies can be useful in dealing with short-term stressors, but they are detrimental in dealing with long-term stressors (Suls & Fletcher, 1985). In the context of serious and chronic illnesses, which can be considered long-term stressors, there is a large body of evidence documenting the detrimental effects of avoidant coping. For example, studies of long-term adjustment among cancer patients indicate that cognitive and behavioral avoidance are associated with poorer psychological outcomes (Carver et al., 1993; Friedman, Nelson, Baer, Lane, & Smith, 1990). There are also some suggestions in the literature that avoidant coping may be associated with poorer health outcomes in cancer patients (e.g., Epping-Jordan, Compas, & Howell, 1994). Conversely, interventions that are thought to counter avoidance have been found to lead to improved health outcomes. In college students, writing about stressful events leads to enhanced psychological and physical health (Smyth, 1998). Indeed, Lavender, Jardin and Anderson (2009) showed that decreases in experiential avoidance when writing narratives were associated with general improvement in mental health.

In recent years, acceptance-based techniques have been incorporated into behavioral medicine in order to help individuals to cope adaptively with stressful medical illnesses. Much of the research on experiential avoidance and acceptance in medically ill patients has been done with individuals suffering from chronic pain. The relation between pain and acceptance has been examined in laboratory research, as well as naturalistically and through interventions. Laboratory research has shown that acceptance of pain sensations is associated with higher pain tolerance (Gutierrez et al., 2004, Hayes et al., 1999). Correlation studies (McCracken, 1998; McCracken & Eccleston, 2003) have shown that patients with chronic pain who report higher levels of pain acceptance have less distress and less disability (e.g., more daily uptime, better work status), even when controlling for pain intensity. McCracken and Eccleston (2003)

found that acceptance of chronic pain accounted for more variance in regression models predicting adjustment to chronic pain than more traditional coping variables.

Studies of interventions for patients with chronic pain also provide evidence of the importance of acceptance. McCracken, Vowles, and Eccleston (2005) conducted an acceptance-based intervention for 108 patients with chronic pain conditions. The acceptance intervention focused on “willingness to have pain present without responding to it” and “engagement in daily activities regardless of pain.” While on the waiting list for the intervention, patients showed no changes in pain or functioning over a period of approximately four months. After the intervention, patients’ reported pain decreased by 18.3%. At the same time, their mean depression score decreased by 41% and physical disability decreased by 25%. Most gains were maintained at three-month follow up. In addition, changes in pain acceptance scores were significant predictors of change in depression, anxiety, and disability. Vowles and McCracken (2010) found that psychological flexibility, a construct which includes acceptance, was a better predictor of outcomes after a chronic pain intervention than more traditional approaches to pain management (e.g., challenging dysfunctional thinking, activity management training).

Acceptance-based interventions may also help patients to cope with the emotional impact of serious medical illness. Cancer patients experience significant distress upon diagnosis and during treatment, as do patients with a variety of serious medical illnesses (Katon & Sullivan, 1990). Patients with advanced cancer were randomized to either 12 sessions of ACT or CBT (Branstetter, Wilson, Hildebrandt, & Mutch, 2004). Patients in the ACT group were taught acceptance-based strategies for dealing with thoughts and feelings related to their illness, while patients in the CBT group were taught relaxation and cognitive restructuring. At the end of 12 sessions, patients in the ACT group were significantly less distressed than patients in the CBT group. Reductions in distress in the ACT group were mediated by reduced avoidance of

thoughts about cancer. In contrast to patients in the ACT group, patients in the CBT group showed increased mental disengagement and greater distress from pre-intervention to post-intervention. (It is probably natural that distress increased over this time, as the patients in this study were so seriously ill that follow-up assessment could not be conducted due to high mortality after the intervention was complete.) The results of this study suggest that acceptance-based techniques show promise in terms of reducing the distress associated with highly stressful medical conditions, including terminal illness.

Acceptance-based interventions also show promise in assisting patients to behave effectively with regard to management of their medical conditions. Many patients with diabetes are not compliant with the medical regimen required to maintain glycemic control (Koro, Bowlin, Bourgeois, & Fedder, 2004). In addition, patients with diabetes often experience considerable distress and have rates of depression above population norms (Anderson, Freedland, Clouse & Lustman, 2001). Avoidance of negative thoughts and feelings related to diabetes has been associated with greater depression in this population (Boey, 1999), as well as lower adherence to the medical regimen needed for diabetes care (Weijman, Ros, & Rutten, 2005). Gregg, Callaghan, Hayes, and Glenn-Lawson (2007) conducted a randomized, controlled trial of Acceptance and Commitment Therapy for 81 patients with Type 2 diabetes. Patients were randomized to either 7 hours of diabetes education or to 4 hours of education plus 3 hours of ACT. Patients who were randomized to the ACT intervention group were taught acceptance of diabetes-related emotions and cognitions. For example, patients were taught that acceptance of diabetes includes “making room” for your thoughts and feelings about having diabetes; in contrast, trying to forget that you have diabetes or trying to “get rid” of thoughts and feelings about diabetes is not acceptance (J. Gregg, personal communication, March 27, 2006). Three months after the intervention, patients who had participated in the ACT group showed greater acceptance of their diabetes; patients in the education group

showed no such change. Only patients in the ACT group had decreased levels of HbA1c (an objective indicator of better glycemic control) three months later. Finally, increased acceptance of diabetes mediated the impact of the intervention on changes in glycemic control. Thus, in this study, an acceptance-based intervention assisted patients in behaving more effectively to manage their medical regimen.

In summary, acceptance-based treatments for medical disorders show promise in helping patients to cope adaptively with serious illness. These therapies are useful in helping patients to cope with intense physical symptoms, reduce distress, improve health behaviors, and improve functioning.

From Acceptance to Change

The power of acceptance-based therapies to induce behavioral change may be surprising given that, in everyday language, “acceptance” is often associated with resignation, and not with change. Acceptance-based interventions *do* aim to induce change in clients; however, they do so by a different route than more traditional CBT interventions. Hayes and colleagues (1996) explain: “An acceptance approach does not abandon direct change efforts: It simply targets them toward more readily changeable domains, such as overt behavior or life situations, rather than personal history or automatic thoughts and feelings” (p. 1163). In other words, “acceptance” approaches have both an acceptance component and a change component. The acceptance component involves experiencing cognitions and emotions as they arise, without defense or struggle. This approach originates, in part, out of concern that attempts to change thoughts and emotions directly are part of the client’s problem and are sustaining distress (as reviewed above). Thus, the therapist does not encourage strategies targeted at changing cognitions or mood directly. Instead, the client is taught to “act his way into a new way of feeling” (Izard, 1971, p. 410) by changing his overt behaviors. This is the change component of acceptance-based therapies.

The strategy of changing overt behavior in order to change emotion is based on emotion science (Izard, 1971; Barlow, Allen & Choate, 2004; Moses & Barlow, 2006). Moods are part of biobehavioral systems with at least four components: the affective component (subjective mood state), the cognitive component (thoughts that tend to accompany the mood state), the biological component (physiological changes associated with the emotion), and the behavioral component (the characteristic behavioral impulse; Watson, 2000). These components contain feedback loops that keep them working in synchrony with one another (Watson, 2000). One result of these feedback loops is that a meaningful change in any one part of the system tends to induce changes in the other parts of the system; thus, for example, depressed mood can be treated by changing thoughts using CBT, changing biological states using anti-depressant medication, or changing behavior using Behavior Activation therapy or exercise.

Based on this understanding of the biobehavioral systems underlying mood, Barlow has emphasized that emotions can be changed by targeting their behavioral components, i.e., *action tendencies* (Barlow et al., 2004) or *emotion-driven behaviors* (Moses & Barlow, 2006). For example, the emotion of fear is accompanied by the action tendency of escape. This action tendency is adaptive -- when in danger, running away tends to increase the likelihood of survival. In emotional disorders, however, emotions can be elicited due to “false alarms” (Bouton, Mineka, & Barlow, 2001), such that a person can have a strong fear reaction (i.e., panic) when no danger exists. Under these circumstances, action tendencies can become maladaptive (Barlow et al., 2004), as the individual repeatedly escapes and avoids stimuli that are not truly threatening, and avoids learning that they are not dangerous.

Basic research in emotion science has shown that the most efficient way to change emotion is to change motor behavior associated with the action tendency (Izard, 1971). Barlow conceptualizes exposure as a treatment targeted, in part, at action

tendencies: “It is possible that the crucial function of exposure in the treatment of phobic disorders is to prevent the action tendencies associated with fear and anxiety and facilitate different action tendencies” (Barlow et al., 2004, p. 221). Exposure involves experiencing the emotion (fear), without engaging in the action tendency (escape). In treating emotional disorders more generally, Barlow believes the goal should be to have patients “experience... the [disordered] emotion without engaging in the associated action tendencies” (Barlow et al., 2004, p. 223). This is consistent with the position of acceptance-based behavior therapies that the goal is for the client to accept the experience of emotion, while not allowing the emotion to determine behavior (Hayes et al., 1996). Instead, behavior is chosen based on other factors, such as the client’s goals, values, and commitments (Hayes, Strosahl, & Wilson, 1999; Linehan, 1993a).

This position is clearly articulated in several modern behavior therapies. Lynch, Chapman, Rosenthal, Kuo, and Linehan (2006) conducted a theoretical review of the many techniques and strategies used in Dialectical Behavior Therapy and concluded that the central mechanism of effect in DBT is “the reduction of ineffective action tendencies linked with dysregulated emotions” (p. 475). For example, in DBT, patients are encouraged to observe the action tendencies associated with emotion and then act in the opposite manner (Linehan, 1993b). If they feel angry, their anger may include the urge (the action tendency) of striking out or attacking. Instead, patients are encouraged to engage in the “opposite action” by doing something nice for the person they are angry at. The idea here is not to repress the emotion, as the emotion is allowed to be present, but rather to change behavior and thus have clients ‘act their way into a new feeling.’ Similarly, patients who are depressed tend to feel withdrawn and uninterested in engaging in activities. In Behavior Activation, patients who are depressed are asked to engage in activities associated with important life goals (Dimidjian et al., 2006). This change in overt behavior is an effective treatment for depression, even if negative

thoughts are not directly addressed in therapy (Dimidjian et al., 2006; Jacobson et al., 1996). This paradigm can be extended from the realm of emotions to the treatment of chronic pain. For example, in ACT protocols for chronic pain, patients are taught to observe their pain without struggle, while engaging in activities that are important to them (e.g., activities related to parenting or employment; Dahl & Lundgren, 2006). This kind of intervention leads to marked improvements in functional status (Dahl, Wilson, & Nilsson, 2004). Thus, perhaps paradoxically, a core feature of the acceptance-based therapies is behavior change.

Behavior change seems to be an implicit facet of mindfulness practice as well. During mindfulness meditation, participants are encouraged to be aware of thoughts and emotions, without struggling against them. This is the acceptance component of mindfulness training. In addition, mindfulness practitioners are encouraged to simply observe these experiential phenomena, *without acting on them*. Maladaptive action tendencies and conditioned responses are replaced with simple observation, and *observing* functions as a new, alternative action. The ultimate goal is for observation to bring awareness to behavior, which gives the individual the opportunity to consciously choose their next action in accordance with their personal intentions (Kabat-Zinn, 2006), rather than ingrained and possibly maladaptive impulses. It seems that interrupting the action tendency can be conceptualized as part of both mindfulness practice and exposure therapy; however, in exposure this technique is specifically targeted at intense, dysregulated emotional responses, whereas in traditional Buddhist mindfulness practice (Armstrong, 2001) this approach is applied more generally to habitual and conditioned thoughts, emotions, and actions that are not considered ‘wholesome’ or ‘skillful.’ This approach seems to have carried over into acceptance-based therapies, as the ultimate goal of mindfulness work in ACT (Fletcher & Hayes, 2005) and DBT (Dimidjian & Linehan, 2003) is to facilitate effective action.

Action tendencies: Avoidance and Approach

It seems that the most effective psychotherapy would be based, in part, on discoveries in the basic science of emotion (Barlow et al., 2004). Moods and their associated action tendencies are the result of two main biobehavioral systems, the Behavioral Inhibition System (BIS) and the Behavioral Activation System (BAS; Depue & Iacono, 1989; Grey, 1987). The BIS is primarily responsible for the subjective experience of negative affect, which is characterized by distress (Grey, 1987; Watson, 2000). Negative affect is a broad category that subsumes more specialized negative emotions, including sadness, fear, and anger. In contrast, the BAS is primarily responsible for the subjective experience of positive affect (Depue & Iacono, 1989; Watson, 2000). Positive affect has been described as a ‘zest for life,’ and encompasses many subjective states including excitement, interest, happiness, and alertness (Watson, 2000). While common sense models of mood often involve one continuum of ‘good’ to ‘bad’ mood, structural research suggests that, in fact, negative and positive mood tend to fluctuate relatively independently of one another due to their differential biological substrates (i.e., the BIS and the BAS; Watson, 2000). The differentiation of negative and positive affect has led to a deeper understanding of the structure of the mood and anxiety disorders. Whereas high levels of negative affect (and BIS activation) are associated with the anxiety disorders, depression is characterized by both high negative affect and low positive affect (low BAS activation; Mineka, Watson, & Clark, 1998).

The BIS and the BAS have evolved through a process of natural selection and serve an adaptive purpose (Watson, 2000). The BIS functions to “keep the organism out of trouble” (Watson, 2000, p. 26) by inhibiting behavior that might result in danger, injury, or death. Thus, the BIS is responsive to cues associated with pain and punishment. For example, if an animal is foraging for food and hears a sound associated with a predator, the animal will stop its food-seeking behavior and take action to avoid

the predator, increasing the probability of survival. Notably, “the primary function of this system is to help the organism *avoid* various types of aversive stimuli” (Watson, 2000, p. 26, emphasis in original). In other words, the overarching action tendency associated with the Behavioral Inhibition System, and negative affect, is avoidance. Whereas the BIS functions to help the organism avoid threats, the BAS functions to help the organism attain materials needed for survival, such as food, water, and shelter. Fowles (1987) describes the BAS as “a reward-seeking or *approach* system that responds to positive incentives by activating behavior” (p. 418, emphasis added, cited in Watson, 2000). Accordingly, the main action tendency associated with the BAS, and positive affect, is approach.

While the BIS and the BAS are most often discussed in the context of basic research on emotion and the foundations of psychopathology, they may have relevance to psychotherapy. For example, BIS activation leads to avoidance behavior. As reviewed above, many of the emotional disorders, which are associated with negative affect and thus BIS activation, appear to have avoidance as a core feature. Notably, in the context of basic research, the BIS is often discussed as a system of response to real and present danger in the environment. However, BIS activation can be conditioned (e.g., Bouton, Mineka, & Barlow, 2001), as it is adaptive to have the ability to learn about stimuli in the environment that are associated with danger. In the mature human being, conditioned cues for avoidance may or may not be associated with a real danger in and of themselves. This may be the case, in particular, when the conditioned cue for avoidance is emotion – in other words, the emotion itself is reacted to as if it is dangerous. The counterpoint to this kind of conditioning are techniques like exposure and acceptance, in which clients experience distressing thoughts, emotions, and bodily sensations without avoidance or escape, and without any serious negative consequences (Lynch et al., 2006).

In addition, in order to change the pattern of emotional response, rather than engage in the avoidance action tendency associated with the negative emotion, the client is encouraged to engage in an alternative behavior. More specifically, in the treatment of panic disorder and phobias, “encouraging approach behavior in place of avoidance is an important step” (Barlow et al., 2004, p. 223). Many of the modern behavior therapies seem to apply this same principle more broadly, beyond the fear and anxiety disorders, to emotional disorders in general (Hayes et al., 1999; Linehan, 1993a; Martell et al., 2001). A central thesis within ACT is the substitution of approach behavior for avoidance behavior (Wilson & Murrell, 2004) – this method is used to successfully treat many psychological disorders (Hayes et al., 2006). This is also a core feature of Behavioral Activation for the treatment of depression (Martell et al., 2001). Depressed patients have low positive affect, and thus low activation of the BAS. In order to increase positive affect, Behavioral Activation aims to increase approach behavior and activity level. Thus, basic emotion research on the biobehavioral substrates of mood suggests that negative and positive affect have separate biological underpinnings and opposite action tendencies, and this suggests different treatments. If negative affect is associated with the action tendency of avoidance, it makes sense that this tendency could be countered through exposure and acceptance based techniques. In turn, positive affect is associated with the action tendency of approach, and evidence suggests that low positive affect can be countered by reducing behavioral avoidance and increasing approach behavior. Indeed, both of these conclusions, which are suggested by basic research, are supported by applied research in psychotherapy. It is not yet known whether mindfulness training leads to reduced avoidance and increased approach behavior, and whether these changes in behavior lead to change in negative and positive affect, respectively.

Summary of Literature Review

Mindfulness and acceptance therapies, such as MBSR, MBCT, DBT, and ACT, constitute a new-wave of psychotherapy (Hayes, 2004). Research to date suggests that mindfulness-influenced interventions are effective in improving mood and functioning for a variety of mood disorders and medical conditions (Hayes et al., 2004). These therapies incorporate elements of traditional meditative practices, with the goal of cultivating the moment-to-moment awareness of experience (Kabat-Zinn, 1990). Mindful awareness is cultivated because it is thought to be a cornerstone of mental health (indeed, recent empirical research has suggested relations between awareness and psychological well-being; Brown & Ryan, 2003). The importance of awareness to psychological health is not a new idea in psychology, as it is a central tenet of the psychoanalytic and experiential schools of therapy (Freud 1912/1963; Greenberg & Safran, 1989; Rogers, 1961; Yontef, 1993). However, mindfulness-based therapies add a new layer to the emphasis on awareness by incorporating specific techniques and exercises (i.e., behaviors) that are intended to develop the skill of awareness of the present moment.

By offering behavioral techniques for nonjudgmental awareness of experience, mindfulness-based interventions are thought to teach acceptance of physiological sensations, emotions, and cognitions (Fletcher & Hayes, 2005). Thus, mindfulness training is thought to operate through the psychological mechanism of acceptance, rather than simply by reduction of physiological arousal or relaxation. Psychological acceptance is the opposite of experiential avoidance, which has been defined as attempts to avoid or control physiological sensations, emotions, and cognitions (Hayes et al., 1996). Experiential avoidance has long been a target of therapy, particularly in the psychodynamic and experiential therapeutic orientations (Freud, 1920/1966; Perls et al., 1951; Rogers, 1961). In recent years, experiential avoidance has become a target of

cognitive-behavioral therapy as well, due in large part to Barlow's critical insight into the key role of avoidance of interoceptive sensations in panic disorder (Barlow, 1988). More recently, Barlow and others have proposed that avoidance may be a core feature of the emotional disorders more generally (Barlow et al. 2004). Certainly, avoidance is known to be a core feature of anxiety disorders, such as panic disorder (with or without agoraphobia), PTSD, and social anxiety, and evidence suggests that avoidance is an important feature of worry in generalized anxiety disorder. Exposure-based treatments, which address avoidance, are highly effective for the anxiety disorders. In terms of the mood disorders, some have suggested that avoidance is a core feature of depression (Ferster, 1973; Martell et al., 2001); this avoidance can be addressed by behavioral activation, which has been found to be an effective treatment for depression (Dimidjian et al., 2006). Laboratory studies have offered another line of evidence that cognitive and emotional avoidance are associated with prolonged distress and emotional disorders (Campbell-Sills et al., 2006; Wegner & Zanakos, 1994). In summary, there is a growing body of theoretical and empirical work that suggests that emotional disorders are both characterized and maintained by experiential avoidance.

Basic research on emotion may shed light on the reasons for the association between emotional disorders and avoidance. Emotional disorders are characterized by high levels of negative affect, which arise out of a biological substrate that has been called the Behavioral Inhibition System (BIS; Grey, 1987). In addition to constituting the biological underpinning of negative affect, the BIS is associated with action tendencies that lead to the *avoidance* of aversive (and potentially dangerous) stimuli (Watson, 2000). Avoidance is an effective strategy when used in response to aversive stimuli in the external environment, but avoidance may be an ineffective strategy when used in response to aversive internal stimuli (i.e., it is possible to physically escape from a bear, but not a painful memory). Moreover, reliance on avoidance as a strategy for

coping with aversive cognitions, emotions, and memories may be counter-productive, as it has been suggested that experiential avoidance may, paradoxically, lead to vicious cycles that encourage maintenance of distress over time.

The relation between mood and action tendencies may not only help us to understand the relation between negative affect and avoidance; it may also help in the treatment of emotional disorders. Basic research on emotion suggests that one of the most effective ways to change emotional experience is to target action tendencies (Izard, 1971; Moses & Barlow, 2006). Acceptance-based interventions target change efforts at the *behavior* associated with the emotion, which is thought to be more amenable to change than the emotion itself (Hayes et al., 1996). This dynamic is implicit in mindfulness as well. During mindfulness practice individuals are instructed to be aware of thoughts, emotions, sensations, and impulses, as they observe them without acting on them. One goal of this practice is greater freedom to choose behavior based on personal values and goals, rather than emotion-driven impulses.

According to this review of the literature, then, it appears that mindful awareness may lead to reduced experiential avoidance. Mindfulness may not only decrease avoidance of cognitions and emotions; it may lead to reductions in behavioral avoidance, allowing increased goal-related behavioral activation. Accordingly, the main hypotheses of the current investigation were that increased mindfulness would be associated with decreased experiential avoidance, which in turn would be associated with reduced negative affect, increased positive affect (particularly as a result of decreased behavioral avoidance), and improved functional status and increased life satisfaction.

These are hypotheses regarding how therapy works, which is the domain of therapy mechanism research. Before describing the current investigation, the methodology of mechanism research will be briefly reviewed.

Mechanism Research in Psychotherapy

The Need for Mechanism Research

At this point in the research literature, mindfulness-based therapies have gained empirical support (Hayes, 2004). The next step is to empirically investigate how mindfulness interventions work (Baer, 2003; Kazdin & Nock, 2003; Shapiro, Carlson, Astin, & Freedman, 2006). Studying mechanisms is an important part of psychotherapy research (Lynch et al., 2006). Empirical work on mechanisms of change is an essential step in developing and refining effective behavioral interventions (Lynch et al., 2006). Mechanism work can also serve as a bridge between more basic science and clinical outcome research (Lynch et al., 2006), as hypothesized mechanism of change should be “situated within and supported by a broader scientific knowledge base” (Kazdin & Nock, 2003). Indeed, we can make some hypotheses as to how mindfulness may work by drawing on previous research in the fields of emotion, psychopathology, and psychotherapy.

While mechanism research is important, it has been relatively rare in clinical psychology (Kazdin & Nock, 2003). Kazdin (2005) states, “Perhaps the most neglected question in therapy research is the mechanisms by which treatment leads to change” (p. 186). Randomized controlled trials (RCTs), as they are most often carried out, show *that* therapy works by examining whether or not certain treatment packages, as a whole, lead to change. Fewer studies have empirically examined the processes by which treatments effect change – in other words, *how* therapy works (Kazdin & Nock, 2003). In addition, much of the mediation research that has been conducted thus far has examined nonspecific mediators that are common to all treatments, such as treatment adherence and therapeutic alliance (Franklin & Cahill, 2006). Doss (2004) calls these kinds of proposed mediators *change processes*, which he distinguishes from *change mechanisms*. Change processes are aspects of therapy that occur during the treatment session and

which subsequently lead to improvement in change mechanisms, whereas change mechanisms are changes in client characteristics or skills that are not directly controlled by the therapist and are expected to lead to improvements in the target outcomes (Doss, 2004). For example, greater therapeutic alliance (a change process) may be associated with greater changes in cognitions (a proposed change mechanism); changes in cognitions could, in turn, lead to changes in depressed mood (the targeted outcome). Following this distinction, much of the existing research investigating how therapy works has focused more on change processes than change mechanisms. Psychotherapy outcome research could be enriched by moving beyond generalized change processes and toward treatment-specific change mechanisms that are based on specific theoretical frameworks, such as those of Cognitive-Behavioral Therapy or Interpersonal Psychotherapy (Franklin & Cahill, 2006).

Furthermore, given the large number of available treatments, it is unlikely that each treatment works by a different mechanism. Programmatic mechanism research may allow investigators to bring parsimony to the profusion of treatments available by identifying a simpler set of change mechanisms underlying the multiplicity of current techniques. Several investigators have emphasized the importance of investigating the “empirically supported principles of change” (Rosen & Davidson, 2003) that may apply across schools of psychotherapy. Delineation of the principles of change in psychotherapy could lead to a greater understanding of the active ingredients of psychotherapy, which would improve the effectiveness of behavioral interventions. In addition, it would result in greater treatment efficiency, as elements of treatment that may be superstitious (i.e., we believe that they are related to outcome, but they are not) can be pared down (Kazdin, 2006).

There has recently been greater emphasis on mechanism research due to concerns that the lack of such research may lead to serious gaps in our knowledge base.

Controversy has focused on the surprisingly small body of mechanism research on cognitive therapy (Longmore & Worrell, 2007). Cognitive therapy is characterized by techniques designed to identify and correct distorted and maladaptive thoughts (Beck, Rush, Shaw & Emery, 1979). Behavioral techniques are often incorporated into cognitive therapy; however, within the framework of cognitive theory, the goal of behavioral techniques is to change cognitions, which are considered to have “primacy” in contributing to psychopathology (Beck et al., 1979, p. 19). Hundreds of studies have been performed examining the efficacy of cognitive therapy. In terms of depression research, for example, research has shown that cognitive therapy is as effective as other forms of psychotherapy and pharmacotherapy in treating depression (e.g., Elkin et al., 1989). As a result of RCTs of this kind, cognitive therapy is widely regarded as an empirically supported treatment for a wide variety of psychiatric disorders.

Nonetheless, “the status of targeted cognitive modification as the *sine qua non* of patient improvement in CBT remains in doubt” (Ilardi and Craighead, 1999, p. 298).

Kazdin and Nock (2003) write (p. 1118):

There are few psychotherapies as well established for depression as cognitive behavior therapy (CBT). By all counts, this treatment is evidenced-based and then some in light of the range of trials. But why does CBT work, i.e., through what mechanism? We have read, taught, and used the rationale so often that it is heresy to raise the question in an empirical arena. In fact, little can be stated as to why treatment works, i.e., that changes in cognitions are the mechanisms operative to decrease depression. It is not so much that evidence refutes the original conceptual view, although the scant evidence has not been kind (Burns & Spangler, 2001; Whisman, 1993, 1999). Rather the suitable studies are rarely done. We have a firm basis for stating that CBT can change depression but no empirical basis for stating why.

More recently, the authors of a review of mechanism research in cognitive therapy concluded that “an important element of the rationale for cognitive interventions – that changes in cognition mediate therapeutic change in CBT – currently lacks empirical support”(Longmore & Worrell, 2007, p. 184). The authors conclude that this rationale

lacks support, in part, because of the paucity of studies that have examined the question; however, the few studies that examined this area at the time of this review paper offered mixed and limited support of the mediation hypothesis (Longmore & Worrell, 2007). More research is needed before final conclusions can be drawn; however, in the meantime, the gap between efficacy research and mechanism research poses a problem for the field of psychotherapy as a whole, and serves as a reminder of the importance of mechanism research. Perhaps this is why a recent National Institute of Mental Health (NIMH) working group concluded that now “the real challenge is to identify evidence-based explanations of treatment, rather than evidenced-based treatments” (National Institute of Mental Health, 2003, p. 1, cited in Doss & Atkins, 2006).

While a lack of mechanism research can lead to considerable problems in empirically-oriented theory-building, successful mechanism research can be quite fruitful. According to Kazdin & Nock (2003), mechanism research is probably the best strategy -- in both the short-term and the long-term -- for improving patient care. In the case of the new wave of mindfulness-influenced psychotherapies, if we can identify the clinically efficacious components of mindfulness training, we may be able to isolate important principles of adaptive behavioral and psychological change that are useful across disorders in both behavioral medicine and clinical psychology. Over time, this kind of work may be instrumental in the development of more effective behavioral approaches for improving quality of life and well-being across medical and psychological disorders. This kind of research may also expand the dialogue between applied and basic science, leading to a more integrated and effective behavioral science.

Methodology of Mechanism Research

Mechanism research is intended to shed light on the processes that *cause* therapeutic change (Kazdin & Nock, 2003). The term *mediator* is often used in psychotherapy research to refer to a cause or mechanism of change that explains the

relation between the intervention and the outcome (Baron & Kenny, 1986; Kazdin & Nock, 2003). In order for a construct to be considered a mediator, investigators must give evidence for a causal relation between the treatment, the proposed mediator, and outcomes of interest.

Though causality cannot be *proven* by the scientific method, causal explanations can gain plausibility by meeting certain empirical conditions (Kazdin & Nock, 2003). Kazdin and Nock (2003) describe several criteria that are important for inferring causality in mechanism research. The criteria consist of the following considerations.

Strong association. In order for mediation to be a possibility, the treatment must be strongly associated with the proposed mediator. There must also be a strong association between the proposed mediator and the outcome.

Specificity. The argument for mediation is strengthened if other plausible mediators do not explain the relation between the treatment and the outcome, thus suggesting specificity in the relation between the mediator of interest, treatment, and outcome.

Gradient. A higher “dose” of the proposed mechanism should lead to more improved outcomes, thus suggesting a dose-response relation. Notably, while it may be possible to control the dose in laboratory research, in clinical outcome research the dose is not experimentally manipulated (Kazdin, 2006). This means that the dose is not randomly distributed across participants and may be confounded with a selection factor. Even with this caveat in mind, a dose-response relation between mediator and outcome can add considerable strength to the argument for a particular mechanism of change (Kazdin, 2006).

Experiment. In an experiment, an investigator can vary the proposed mechanism of change and determine if doing so is associated with changes in the outcome.

Sequence of Change. It is ideal to demonstrate that changes in outcomes are preceded by changes in the proposed mechanism. This criterion is not met by many treatment studies, which examine both the proposed mechanism and outcome at the post-treatment time-point (Johansson & Hogland, 2007). Rather, investigators should assess whether changes in the proposed mediator at mid-treatment can be shown to predict changes in outcome at the end of treatment. Thus, investigators should utilize pre-mid-post designs to test mediation (Kazdin, 2006). Kazdin (2006) notes, however, that some mechanisms of change may be so intertwined with outcome effects that a change in the mechanism (e.g., distorted cognition) leads to nearly immediate change in outcome (e.g., mood). Therefore, while evidence of temporal precedence would add greatly to the argument for mediation, it may be very challenging to collect such evidence.

Consistency. Consistency is demonstrated by replication of mechanism findings across various samples and research designs.

Plausibility and coherence. There must be a plausible theoretical framework and empirical literature within which the proposed mediator can be understood.

Each of these criteria is important in its own right, yet the criteria act in concert to allow inference of causality. These criteria cannot all be met by a single investigation, so programmatic research and replication are required (Kazdin & Nock, 2003). The current study will attempt to meet the criteria of strong association, specificity, gradient, and sequence of change. The literature on mindfulness and experiential avoidance, reviewed previously, is intended to place the proposed mechanism within a plausible and coherent framework. The consistency (replication) and experiment conditions will need to be addressed by programmatic future research.

When considering these criteria, it is important to keep in mind that multiple mediators may be the norm in the social sciences. Therefore, full mediation (in which 100% of the effect of treatment on outcomes is accounted for by the proposed mediator)

is very rare in clinical psychology (Kendall, Holmbeck, & Verduin, 2004). Partial mediation, in which the mediator partially accounts for the relation between treatment and outcome, is more common.

Introduction to Dissertation Project

The current study aimed to empirically investigate the mechanisms by which mindfulness interventions have their effect. Based on a review of the available literature, to the best of our knowledge investigators have not empirically tested whether mindfulness training leads to reduced experiential avoidance and, if so, whether changes in avoidance mediate changes in outcomes after mindfulness training.

In order to investigate these issues, participants in the Mindfulness-Based Stress Reduction (MBSR) program at the University of Iowa Hospitals and Clinics (UIHC) were asked to complete self-report questionnaires prior to beginning MBSR, at the mid-point of the intervention, and at the end of their 8 classes in MBSR. Relations between mindfulness practice, avoidance, and several outcome variables were assessed.

The goal of the current study is to examine the correlates of increased mindfulness over time as experienced by MBSR participants. This approach stands in contrast to a randomized control trial (RCT) protocol, in which participants are randomly assigned to a treatment group or to a control group in order to determine if the treatment package is effective. In addition, while much psychological treatment research has been conducted with homogenous groups of patients with specific conditions (Nathan & Gorman, 2002), there is growing interest in the idea that the same principles of change may be utilized to concurrently treat individuals with a wide variety of disorders and problems in a single group (Barlow, Allen, & Choate, 2004). As interest in diagnostically heterogeneous treatment groups grows, initial investigations have suggested that mixed-diagnosis groups can be as effective as homogenous groups in treating emotional disorders, for example (McEvoy & Nathan, 2007). In mixed groups,

the diverse situations of the members of the group may help participants to practice distilling the common elements of the intervention that are relevant to all, thus emphasizing the most critical lessons being taught (Barlow et al., 2004). Accordingly, the current project will study heterogeneous participants over the course of the MBSR intervention to identify consistent psychological mechanisms of change at work across conditions and situations.

Hypotheses for Current Investigation

Predicting Negative Thoughts. The thought avoidance literature demonstrates that, under laboratory conditions, attempts at thought avoidance leads to an increase in negative thoughts over time (p. 17). Conversely, reductions in thought avoidance can be hypothesized to lead to reduced frequency of negative thoughts over time, even if negative thoughts are not explicitly challenged, as in cognitive therapy. Therefore, it was hypothesized that increased mindfulness would be associated with fewer negative thoughts and that this relation would be mediated by reductions in thought avoidance.

Predicting Negative Affect. The Mindfulness-Based Stress Reduction is, as its name implies, aimed at reducing stress in medical patients. The effects of stressful events on mood seem to center on increases in negative affect, whereas levels of positive affect are relatively unaffected by stress (Watson, 2000). Notably, mindfulness has been found to be more strongly related to negative affect than to positive affect (Brown & Ryan, 2003), and increased mindfulness over the course of a mindfulness intervention has been associated with reductions in negative affect (Brown & Ryan, 2003). However, the role of experiential avoidance as a mediator of the relation between mindfulness and negative affect has not been tested. Accordingly, it was hypothesized that experiential avoidance would mediate the effect of mindfulness on negative affect.

Predicting Positive Affect. Previous research has demonstrated that there is a relation between mindfulness and increased positive affect (Brown & Ryan, 2003).

Positive affect can be increased by behavioral activation (Dimidjian et al., 2006; Watson, 2000); however, behavioral activation can be inhibited by behavioral avoidance. In the current investigation, it was hypothesized that the effect of mindfulness on positive affect would be mediated by reductions in experiential avoidance, and particularly in behavioral avoidance.

Predicting Disability or Functional Impairment. Previous studies have suggested that mindfulness and acceptance-based interventions improve functioning (Lengacher et al., 2009; McCracken et al., 2005; Reibel et al., 2001). Mindfulness skills may reduce behavioral avoidance and, accordingly, may help individuals to pursue their goals even if intense or aversive emotional or medical symptoms are present, leading to improvements in functioning. Thus, it was hypothesized that the relation between mindfulness and functioning would be mediated by behavioral avoidance.

Predicting Satisfaction with Life. Previous research has suggested that mindfulness is associated with greater satisfaction with life (Brown & Ryan, 2003). Since acceptance of one's experience may improve life satisfaction, it was hypothesized that reductions in experiential avoidance would mediate the relation between mindfulness and satisfaction with life.

Relaxation as Alternative Mediator. The argument for experiential avoidance as a mediator of the effects of a mindfulness intervention can be strengthened by ruling out alternative mediators. Mindfulness exercises can lead to relaxation (Germer, 2005b; Kabat-Zinn, 1990), and relaxation is known to lead to reduced negative affect (Jain et al., 2007). Accordingly, relaxation was tested as an alternative mediator of the relation between mindfulness and negative affect.

Sequence of Change. The hypotheses discussed above were tested using the standard approach to mediation in which changes from pre- to post- intervention are examined. However, mediation analyses are strengthened if it can be shown that changes

in the proposed mediator precede subsequent changes in the outcome variable (Johansson & Hoglend, 2007; Kazdin, 2006). As such, additional analyses were planned in which changes in experiential avoidance up to the mid-point of the intervention would be regressed upon changes in the proposed outcome variables from mid-intervention to post-intervention.

CHAPTER II

METHOD

Participants

The sample for the current study was drawn from the Mindfulness-Based Stress-Reduction (MBSR) program at the University of Iowa Hospitals and Clinics (UIHC).

Participants were considered eligible for the MBSR program and the current investigation if they were over the age of 18, English speakers, and not currently abusing alcohol or drugs. Participants paid \$380 to enroll in MBSR; however, some participants were University of Iowa employees who had 75% of their fee paid by the University of Iowa's lifeWELL program, which aims to reduce health risks (<http://www.uihealthcare.com/depts/mindfulness>).

There were two waves of participant recruitment. In the first wave of recruitment, participants were asked to complete questionnaires at pre- and post-treatment and were not offered compensation. During this wave of recruitment, 107 people participated in MBSR. Of those participants, 39% ($n = 42$) agreed to participate in the research study. Of those who consented to participate in the research study at baseline, 76% ($n = 32$) completed the protocol. During this wave of recruitment, 30% of MBSR participants completed the research study. In the second wave of recruitment, participants were asked to complete questionnaires at pre-treatment, mid-treatment, and post-treatment, and were offered \$25 gift certificates for completion of the study. During this wave of recruitment, 142 people participated in MBSR. Of those participants, 62% ($n = 88$) agreed to participate in the current investigation. Of those who consented to participate at baseline, 84% ($n = 74$) completed all three assessments. During this wave of recruitment, 52% of MBSR participants completed the research study. In total, pre-

treatment and post-treatment assessments were completed by 106 participants, and mid-treatment assessments were completed by 74 of those participants.

Procedure

The MBSR program at UIHC was established in 1996 and is based on the MBSR program originated by Kabat-Zinn (1990). The MBSR program is designed to help individuals with a variety of medical and psychiatric conditions cope skillfully with stress (the MBSR program was previously described in more detail on p. 5). Participants in the MBSR program engage in various exercises that range in form from sitting to walking to eating mindfully; the goal of these exercises is to give the participant the opportunity to practice and develop the skill of mindful awareness. Kabat-Zinn (2006) stated that the various exercises in the MBSR program are “different doors into the same room.”

During the period of data collection, MBSR classes were taught by one of three instructors, Bev Klug, M.A., Chris Klug, M.A., and Christine Allen, LISW. Each of these instructors has practiced mindfulness for at least 10 years and has attended MBSR training with Jon Kabat-Zinn. In addition, each of these instructors has experience with psychotherapy or counseling (Bev Klug is a licensed marriage and family therapist, Christine Allen is a social worker, and Chris Klug is a grief counselor and serves as the Bereavement Coordinator at the Iowa City Hospice).

These instructors led groups of approximately 25 participants who met for 2-hour classes, once per week for 8 weeks. Participants were asked to do 45-60 minutes of mindfulness homework practice each day for the length of the program (prior investigations suggest that the majority of participants in MBSR engage in 15-30 minutes of practice at least three days a week, with many participants doing more; Astin, 1997; Kristeller & Hallet, 1999; Reibel, Greeson, Brainard, & Rosenzweig, 2001).

Participants were recruited for the current investigation at their initial information meeting, which took place approximately two weeks prior to the beginning of the intervention. At this meeting, MBSR participants who expressed interest in participating in this research study were given their pre-intervention assessment packet. They completed these packets at home and returned them to their MBSR instructor at the beginning of their first group MBSR session. Some participants were asked to complete a second assessment packet at the mid-point of the intervention. For the final time-point, participants were given an assessment packet at the end of their 7th MBSR class and asked to return it to their instructor at their last class. Throughout the intervention, participants completed weekly practice logs, in which they recorded how many minutes they spend in mindfulness practice. Participants were assigned a code number which was not linked to their names, thus information given in the assessment packets was anonymous. Participants were given the option of completing their questionnaires online and 51% of questionnaires were completed through the website.

Measures

All measures used in the current investigation are included in Appendix C. Predictor, mediator, and outcome measures are presented and summarized in Table A1.

Demographic Information

Participants were asked to report basic demographic data, including age, gender, ethnicity, education level, and family income.

Mindfulness Measures

Mindfulness Questionnaire. Mindfulness was assessed using the Five Facet Mindfulness Questionnaire (FFMQ), a 39-item self-report measure created by Baer, Smith, Hopkins, Krietemeyer, and Toney (2006). These investigators administered five available mindfulness questionnaires to a large group of undergraduate students ($N =$

613). Baer and colleagues (2006) then performed exploratory item-level factory analysis, followed by confirmatory factor analysis in another student sample. These analyses led to the creation of the Five Facet Mindfulness Scale (FFMQ), with the following five subscales: *observation of experience*, *acting with awareness*, *describing experience with words*, *nonjudging of experience* and *nonreactivity to inner experience*. Alpha coefficients for the subscales ranged between .75 (nonreactivity) and .91 (describing). The five factor model was later replicated in a sample of experienced meditators (Baer et al., 2008).

The measurement of mindfulness by self-report is still in early stages. Gamez (2010) expressed concern about the strength of correlations between subscales within mindfulness measures. Clark and Watson (1995) recommend that subscales should be correlated in the range of .2 to .6 to ensure that they are measuring different facets of the same construct. In Baer's sample of undergraduate students with little meditation experience, the correlations between the subscales for the FFMQ ranged from -.07 (observing with nonjudging) to .34 (acting with awareness to nonjudging, and nonreactivity with nonjudging).

In the current investigation, not all subscales of the FFMQ were used for analyses. The subscales regarding nonjudging and nonreacting to inner experience can be thought of as measures of the acceptance component of mindfulness (Baer et al., 2006). Since acceptance (albeit conceptualized and operationalized in a different way) is a proposed mediator in the current study, these subscales were not used as predictor variables. This leaves three subscales: observing, describing, and acting with awareness. It was decided *a priori* that if these subscales were correlated between .2 and .6 in the current investigation, then data from these subscales would be added to create a total mindfulness variable. In the final sample, the correlations between these subscales ranged between .26 and .48 at the three time points assessed; therefore the scores on the

three subscales were summed and the resulting mindfulness variable was used for analyses.

Mindfulness Practice Log. In addition to completing the mindfulness questionnaire described above (FFMQ; Baer et al., 2006), participants were asked to complete daily logs regarding how long they spend in formal mindfulness practice (the practice log form is shown in Appendix D). The amount of time spent engaged in mindfulness exercises is an indicator of the extent to which an individual has practiced and developed the skill of mindfulness.

Participants were asked to hand-in practice logs each week. The practice logs were described to participants in the first class, and the first set of logs were handed in at the second class. Thus, over the course of the 8-week MBSR program, participants had the opportunity to hand in seven weekly practice logs in total. These logs were reviewed by the instructor, who then gave participants feedback and advice on their practice. Few participants handed in logs for the final class, as the logs would not be returned with feedback. As such, a total of six logs for each participant (i.e., logs handed in at weeks 2, 3, 4, 5, 6, and 7) was a complete data set for the purpose of the following analyses.

If participants completed four or more of the six practice logs, then their data was included in the following analyses and missing data was dealt with using individual mean substitution. In total, 77% of the 74 respondents completed at least four practice logs (38% handed in 6 logs, 23% handed in 5 logs, and 16% handed in 4 logs). If participants did not complete at least four practice logs, their data was treated as missing. This method has the advantage of using individual data, rather than group data, to estimate missing values; however, the disadvantage is that it may over-estimate practice, as participants may have practiced less on weeks that they did not hand in the practice logs.

At the post-treatment assessment, participants were asked to retrospectively recall how much practice they had completed on average. This was done in order to get some information on how much practice was done by those who did not complete or return their weekly logs and sheds light on whether completion of the logs was associated with amount of daily practice.

One way ANOVAS were used to assess whether those who completed four or more logs differed in important characteristics before treatment from those who did not complete at least four practice logs. At the pre-treatment assessment, there were no significant differences between those who completed less than four weekly logs and those who completed four or more weekly logs on the questionnaire measures of mindfulness, experiential avoidance, or outcome measures, including dysphoria, well-being, disability, and satisfaction with life (all p 's > .05).

Avoidance Measures

White Bear Suppression Inventory. The White Bear Suppression Inventory (WBSI) is a 15-item scale designed to assess the tendency toward thought suppression (Wegner & Zanakos, 1994). Participants rate statements such as, "I have thoughts that I try to avoid" on a 5-point likert scale. Thought suppression, as assessed by the 15-item original scale, has been found to correlate with depressive and anxious symptoms, as well as obsessional thinking (Wegner & Zanakos, 1994).

The authors of the scale developed the scale through factor analytic methods and believed that it had a one factor structure (Wegner & Zanakos, 1994); however, in recent years, there has been some controversy over whether the scale has one, two, or three underlying factors (Blumberg, 2000; Hoping & de Jong-Meyer, 2003; Rassin, 2003; Wegner & Zanakos, 1994). Luciano and colleagues (2006) conducted confirmatory factor analyses in order to compare the various factor structures of the WBSI. They suggest that although none of the known factor solutions have excellent fit, their two

factor solution has better psychometric properties than the other models. The two factor solution leads to the iteration of two subscales, a thought suppression subscale and a thought intrusion subscale. The 7-item *thought suppression* subscale will be included in the present study in order to assess experiential avoidance in the form of thought avoidance.

Luciano and colleagues (2006) found that the thought suppression subscale had an alpha of .83 in a sample of 540 undergraduates and community adults. Greater thought suppression on this subscale was associated with higher BDI scores ($r = .40$) and greater worry ($r = .43$).

Acceptance and Action Questionnaire. The Acceptance and Action Questionnaire was designed to measure mechanisms thought to be at work in ACT (Hayes, Strosahl, et al., 2004). Versions of the AAQ have been found to mediate behavioral outcomes in ACT interventions (e.g., Bond & Bunce, 2000; Gregg et al., 2007). The AAQ measures experiential avoidance, but it also includes items assessing other processes thought to be active ingredients of ACT interventions (Hayes et al., 2006; Verra, Hayes, Roget, & Fisher, 2008). Accordingly, the content of the AAQ is somewhat heterogeneous and the internal consistency of the measure has proved to be low in the past, with coefficient alphas below .70 (Hayes, Strosahl et al., 2004; Marx & Sloan, 2005; Roberts, Wilson, & Roberts, 2005; Zvolensky & Forsyth, 2002).

In order to focus on items relevant to experiential avoidance, and to increase the internal consistency of the measure, the current investigation used a version of the AAQ based on factor analysis. Baer (2006; personal communication, July 13, 2006) performed exploratory factor analysis on a 49-item version of the AAQ in a sample of over 300 students. She found 4 factors, including two that are of interest in the current investigation. The first factor consisted of items assessing attempts to avoid internal experiences (e.g., "I try hard not to have bad feelings"). A second factor of interest

involved not engaging in behavioral avoidance (e.g., “I don’t avoid situations that make me feel jittery”). Baer found that these scales had good internal consistencies (Baer, 2006) and that higher scores on these factors were positively associated with more meditation experience (Baer, 2006). In the current investigation, these items were summed together to make one 20-item measure that assesses experiential avoidance as formulated by ACT theorists.

Multidimensional Experiential Avoidance Questionnaire. The Multidimensional Experiential Avoidance Questionnaire (MEAQ; Gamez, in press) was developed in order to provide researchers with a reliable, valid measure of experiential avoidance that was derived using factor analytic methods. An initial pool of 170 items, covering a broad range of hypothesized types of experiential avoidance, were administered to 312 undergraduates and then subjected to exploratory factor analysis in order to determine the preliminary factor structure. Subsequently, a revised pool of items was administered to a new sample of 314 undergraduates and 201 psychiatric outpatients. Principal axis factoring with oblique rotation was used to arrive at the final scale, which consisted of 62 items that load on 6 subscales: *Distress Devaluation, Behavioral Avoidance, Distraction/Suppression, Repression/Denial, Procrastination, and Distress Tolerance.*

The final measure detected significantly higher levels of experiential avoidance in the outpatient sample than in the student sample, as hypothesized. In both students and patients, experiential avoidance as measured by the MEAQ was associated with psychopathology, even after controlling for levels of neuroticism. In addition to psychopathology, higher experiential avoidance was also associated with poorer functional status.

Two of the final subscales – *Behavioral Avoidance* and *Distraction/Suppression* – were included in the current investigation. These subscales were selected because they highlight two of the main aspects of experiential avoidance thought to be targeted by

mindfulness practice. First, the *Distraction/Suppression* subscale assesses attempts to control thoughts and feelings using avoidance strategies such as distraction (“I usually try to distract myself when I feel something painful”). Second, the *Behavioral Avoidance* subscale focuses on avoidance of situations that may be uncomfortable or distressing (“I go out of my way to avoid uncomfortable situations”). These two subscales were correlated with each other at $r = .36$ in both student and patient samples (Gamez, 2010). In addition, these two subscales were significantly correlated with other measures of avoidance in both the student and outpatients samples; for example the correlation of these two subscales with the AAQ ranged from .37 to .50.

In the current investigation, the MEAQ subscales were added to the assessment package for the second wave of data collection, meaning that 74 participants had the opportunity to complete the MEAQ. This is because the MEAQ was under development and not yet available when the first wave of data collection was conducted.

Relaxation Assessment

In the current study, participants were asked to rate their level of relaxation once per week immediately after completing mindfulness practice at home. This questionnaire was included as part of the mindfulness practice log. Four items were administered to assess the extent to which mindfulness practice induces sensations associated with relaxation. These items were: (1) “I felt relaxed,” (2) “My arms and legs felt warm,” (3) “My arms and legs felt heavy,” (4) “My muscles felt loose and limp.” The items were rated on a 5-point Likert scale. These relaxation items were interspersed with items that participants may understand to be desired results of mindfulness practice (“I was able to focus on the experiences of the present moment”) and items that described experiences that would not have been encouraged in the MBSR program (“My mind wandered,” “I felt sleepy”), as it was thought that embedding relaxation items in a range of experiences possibly associated with mindfulness practice might reduce bias in reporting due to

demand characteristics. These relaxation items were derived from the Physical Assessment subscale of the Relaxation Inventory (Christ, Rickard, Prentice-Dunn, & Barker, 1989). This subscale was designed to assess the physiological components of relaxation using self-report.

Outcome Measures

Negative and Positive Affect. The Inventory of Depression and Anxiety Symptoms (IDAS) is a 64-item measure that assesses symptoms of psychopathology associated with the emotional disorders (Watson et al., 2007). This measure has a broader range of content than previous measures of anxiety and depression. In addition, it has subscales that focus on specific symptoms of anxiety and depression, so that these can be assessed independently. The IDAS subscales have good internal consistency, test-retest reliability, and convergent validity with other measures of depression and anxiety, including interview measures, such as the Hamilton Rating Scale for Depression (Watson et al., 2007). In fact, the IDAS captures the majority of the variance in the Beck Depression Inventory II and the Beck Anxiety Inventory, and yields more detailed information without undue participant burden (Watson et al., 2007).

The IDAS was developed using factor analysis in multiple samples, including undergraduate students, community residents, psychiatric patients, and postpartum women. Separate general factors consisting of anxiety and depression symptoms did not emerge. Rather, factor analysis yielded one higher order factor, *Dysphoria*, which assesses the core cognitive and emotional symptoms associated with depression and anxiety (Watson et al., 2007). Given emerging research on the relation between depression and anxiety (Mineka, Watson, & Clark, 1998; Watson, 2005), it is perhaps not surprising that the *Dysphoria* scale assesses the negative affectivity that is strongly related to many emotional disorders. In the current study, the *Dysphoria* scale was used to assess negative affect.

In addition to the broader *Dysphoria* scale, several specific symptom factors emerged. One of these scales, *Well-Being*, assesses positive affect.

Thought Questionnaire. Hollon and Kendall (1980) created the Automatic Thought Questionnaire (ATQ) in order to assess maladaptive cognitions associated with depression. This measure asks participants to rate the frequency of negative cognitions (e.g., “I’m no good”) over the past week on a 5-point likert scale. In order to create this scale, Hollon and Kendall (1980) asked undergraduate students to recall depressing experiences and to report cognitions that had occurred at those times. Items were retained for the final 30-item scale if they were found to discriminate between depressed and non-depressed individuals (Hollon & Kendall, 1980). The ATQ has demonstrated sensitivity to change in numerous treatment outcome studies (e.g., Simons, Garfield, & Murphy, 1984).

The ATQ correlates highly with measures of dysphoric mood; however, contrary to original expectations, it is associated equally strongly with both depressed and anxious mood (Hollon & Kendall, 1980). Given the high comorbidity between depression and anxiety, and the association of both with the higher-order factor of negative affectivity (Mineka, Watson, and Clark, 1998), in the current study this measure will be used in order to assess the cognitions associated with negative affectivity.

Netmeyer and colleagues (2002) created an 8-item version of the ATQ that will be used in the current study. They found that this measure has good internal consistency and correlates very highly with the original 30-item ATQ ($r = .97$), suggesting that the shorter version of the scale captures the majority of the variance of the longer scale.

Functional Impairment or Disability. The World Health Organization Disability Assessment Schedule II (WHO DAS II) is designed to assess behavioral functioning across a wide range of health problems seen in primary care (Rehm et al., 1999). The WHO DAS II is explicitly designed to assess functional impairments associated with

both mental and physical disorders. In contrast to other measures of functioning, this measure is specifically designed to assess behavioral functioning as a separate domain from symptoms of disease or subjective well-being (Rehm et al, 1999). The psychometric properties of the WHO DAS II have been studied in large international and North American populations (Rehm et al., 1999).

The WHO DAS II covers six content areas: understanding and communicating (e.g., concentrating for 10 minutes), getting around (e.g., standing for 30 minutes), self care (e.g., washing whole body), getting along with people (e.g., dealing with people you do not know), life activities (e.g., taking care of household responsibilities), work/school, and participation in society (e.g., joining in community activities). A single latent variable, disability status, has been found to explain more than 50% of the variance in WHO DAS II items (Rehm et al., 1999). The WHO DAS has demonstrated good internal consistencies (alphas of .95) in previous investigations in patients with depression or back pain (Chwastiak & Von Korff, 2003). It has also demonstrated sensitivity to change in functional status after treatment in these populations (Chwastiak & Von Korff, 2003).

The current study used the 12-item, self-administered version of the WHO DAS II; scores on this shortened version of the WHO DAS II are very strongly correlated with scores on the full 36 item version ($r = .95$; Rehm et al., 1999). Patients are asked to rate their level of difficulty in performing certain behaviors of daily living over the past month on a five-point scale ranging from no difficulty to extreme difficulty/cannot do. Scores are converted into a scale from 0 to 100 using an algorithm from the WHO, with higher scores indicating greater disability.

Satisfaction with Life. Subjective well-being is thought to consist of both affective and cognitive components (Diener, Emmons, Larson, & Griffin, 1985).

Affective components are best assessed with scales which assess negative and positive

affect (like the IDAS). The cognitive component of subjective well-being consists of the judgments that individuals make regarding satisfaction with life (Diener et al., 1985). In order to assess this cognitive component of well-being, the current study will utilize the Satisfaction with Life Scale (SWLS), a 5-item measure of global life satisfaction. The SWLS shows discriminant validity from measures of positive and negative affect and has shown sensitivity to change in intervention research (Pavot & Diener, 1993). The SWLS has demonstrated good internal consistency in numerous studies (Pavot & Diener, 1993).

Statistical Methodology

Mediation Methodology

The main objective of the current project is to empirically investigate a proposed mechanism, experiential avoidance, in a mindfulness intervention. The study of mechanisms in psychotherapy involves tests of statistical mediation. Multiple regression analyses are the most common statistical procedure used to demonstrate statistical mediation (Kazdin & Nock, 2003) and can be used to establish four conditions that have been considered necessary for mediation (Baron & Kenny, 1986; Judd & Kenny, 1981a, 1981b). In the following description of these four conditions, X represents the treatment variable, Y represents the outcome variable, and M represents the mediator variable (see Figure B1). The four conditions for mediation are as follows (Baron & Kenny, 1986; Fritz & MacKinnon, 2007):

1. The total effect of X on Y (τ) is significant.
2. The effect of X on M (α) is significant.
3. The effect of M on Y controlling for X (β) is significant.
4. The direct effect of X on Y controlling for M (τ') must be nonsignificant for full mediation (Judd & Kenny, 1981a, 1981b) or smaller than the total effect of X on Y (τ) for partial mediation (Baron & Kenny, 1986).

These four conditions can be established using three regression equations (Kendall, Holmbeck, & Verduin, 2004):

1. In the first equation, X is the predictor variable and Y is the criterion variable. (This regression equation addresses condition 1).
2. In the second equation, X is the predictor variable and M is the criterion variable. (This regression equation addresses condition 2).
3. In the third equation, X and M are predictor variables and Y is the criterion variable. X and M are entered into the regression equation simultaneously, not hierarchically (Kendall, Holmbeck, & Verduin, 2004). This means that the effect of X is examined after controlling for the effect of M, whereas the effect of M is examined after controlling for the effect of X. (This regression equation addresses conditions 3 and 4).

This method of establishing mediation has been called the causal steps method. This method is very popular, having been used approximately five times more than any other method in studies involving mediation (Fritz & MacKinnon, 2007). Kazdin and Nock (2003) note that this statistical methodology can be used to establish some of the criteria for mediation in psychotherapy mechanism research, including strong association, specificity, and dose-response relations.

The causal steps method outlined by Baron and Kenny (1986) has several limitations. Recent empirical examinations have provided evidence that the causal steps method has low statistical power (Fritz & MacKinnon, 2007; MacKinnon et al., 2002) and may lead to many Type II errors (i.e., failure to reject the null hypothesis when an effect is present). Furthermore, the Baron and Kenny steps leave some ambiguity as to how much reduction by M in the total effect of X on Y is necessary in order to conclude that mediation has occurred. Some investigators have used the following condition: X is a significant predictor of Y without M in the equation, but is no longer a significant

predictor of Y once M is entered into the model. However, this strategy is imperfect, as small coefficients can be statistically significant with large sample sizes, whereas large coefficients can fail to reach statistical significance with small sample sizes, even when mediation has occurred (Kenny, 2006).

Accordingly, several tests of mediation have been developed. These tests use regression coefficients and other information from the regression equations outlined in Baron and Kenny (1986). The most popular test of mediation, the Sobel test (Sobel, 1982, 1986), is a test of the product of coefficients α and β (divided by the standard error of the product) and has been recommended for use in psychotherapy mechanism research (Kendall et al., 2004). One problem with the Sobel test is that if α and β are normally distributed, then their product is not; however, the Sobel test assumes a normal distribution for the product, which reduces statistical power. In order to address this problem, MacKinnon and Lockwood (2001) developed a method of testing mediation by creating asymmetric confidence intervals based on the product of two normally distributed variables. MacKinnon, Fritz, Williams, and Lockwood (2007) have now created software, PRODCLIN, in order to assist investigators in utilizing this approach. The PRODCLIN program requires values of α and β , as well as the standard error of α and the standard error of β in order to ascertain the asymmetric confidence intervals; thus, before using PRODCLIN, the investigator must run the regression equations in conditions 2 and 3 of Baron and Kenny (1986). PRODCLIN is available as a free download from the website of David MacKinnon (Fritz & MacKinnon, 2007; MacKinnon, 2007) and was used in the current investigation.

Methodology for Examining Change Over Time

A key goal of the regression analyses used to examine mediation is to examine change over the course of the intervention. As such, the analyses need to take into account scores on independent, dependent, and mediator variables at pre-treatment. At

first glance, it appears logical to use raw change scores (i.e., subtract the pre-treatment level of the variables in question from the post-treatment level). However, there are several problems with this approach. First, raw change scores are known to have lower reliability than the reliability of the pre- and post measures individually (Cohen & Cohen, 1983), because measurement error in the pre- and post measurements are compounded when the change score is calculated. Second, change scores are known to be influenced by regression to the mean (Judd & Kenny, 1981). Individuals with pre-treatment scores that are lower than the mean would tend to have higher change scores, whereas individuals with pre-treatment scores that are higher than the mean would tend to have lower change scores. The third main criticism of raw change scores is that while the intention in using such scores is to produce a measure that reflects change in the variables of interest, at the same time removing the effect of the initial level of the variable, this goal is not accomplished. Rather, the correlation of the initial level of the variable and the change score variable would not be zero (see Cohen & Cohen, 1983, for a detailed explanation of why this is the case). Cohen and Cohen (1983) state that this third concern is the “heart of the problem” with simple change scores (p. 415).

In order to address these problems with raw change scores, Cohen and Cohen (1983) recommend using residualized change scores. To create residualized change scores, post-treatment scores are adjusted for their pre-treatment values (Cohen & Cohen, 1983; Judd & Kenny, 1981). The variance remaining can be called the residualized change in the post-treatment variable, which is certain not to be correlated with pre-treatment values due to the method of its construction (Cohen & Cohen, 1983). This addresses what Cohen and Cohen identify as the core problem with raw change scores. In addition, residualized change scores are less subject to regression to the mean effects (Tracy & Rankin, 1967). However, residualized change scores, like raw change scores, are vulnerable to distortion due to poor reliability of the pre- and post-treatment measures

(Cohen & Cohen, 1983; Woody & Costanzo, 1990). The main solution to this problem is to use measures that have good reliability; in that case, measurement error can be expected to have “negligible effects” on residualized change scores (Woody & Costanzo, 1990, p. 501).

In the current investigation, residualized change scores were calculated for each predictor, mediator, and outcome variable, reflecting change from pre-treatment to post-treatment. Then, in the first step of the mediation analysis, residualized change in mindfulness was used to predict residualized change in the outcome variable in question. Next, in the second step of the mediation analysis, the residualized change in mindfulness was used to predict change in experiential avoidance. Finally, consistent with Baron & Kenny’s (1986) mediation steps, the residualized change in mindfulness and the residualized change in experiential avoidance were entered into a third regression equation in order to predict residualized change in the outcome variable. This was the procedure followed for all analyses focused on examining predictor, mediator, and outcome variables at post-treatment.

For analyses which examined the role of the mediator at mid-treatment, residualized change scores for the predictor and mediator variables were calculated using mid-treatment (rather than post-treatment) and pre-treatment scores; the outcome variables were the post-treatment score regressed on the mid-treatment score, as the purpose of the design is to examine whether changes in the predictor and mediator variables precede changes in the outcome variable, providing additional support for the mediator as the mechanism of change.

Control Variables

Possible covariates, such as education level, income, and gender, were examined. Some significant correlations were found between these variables and *raw scores* of specific mediator and outcome measures during preliminary analyses. The predictor

variable, mindfulness, did not show any significant relations with the potential control variables. Potential control variables were not significantly correlated with *residualized change scores* of mediator and outcome measures. As a conservative measure, mediation models were tested with covariates that were significantly associated with raw scores on mediator and outcome measures; however, these covariates did not significantly predict the mediator or outcome variable when mediation analyses were conducted. Thus, to simplify the presentation of the results, covariates were not included in the final mediation models.

Power, Sample Size, and Mediation.

Statistical power is the probability that a test will reject the null hypothesis when an effect is present. By convention, power is considered adequate at .8 in psychology (Cohen, 1990). Fritz and MacKinnon (2007) conducted an empirical investigation using multiple simulated data sets to compare the statistical power of six different tests of mediation. They assessed the statistical power of each test for different effect sizes of α , β , and τ . They found that the Baron and Kenny tests were low in statistical power, particularly when τ^2 equals zero (full mediation). In contrast, the PRODCLIN test had higher statistical power given the same sample sizes. In Table A2, the results of Fritz and MacKinnon's analyses are summarized.

Preliminary analyses were conducted based on pilot data for the current project ($N = 23$) in order to estimate the sample size needed for power of .8 (Cohen, 1990) using steps 2 and 3 of Baron and Kenny, followed by the PRODCLIN test. Based on the pilot data, regression coefficients α were estimated to be in the medium effect size range, while coefficients β were estimated to be in the medium to large range. Given these effect sizes, according to Table A2 (adapted from Fritz & MacKinnon, 2007), the proposed analyses would be adequately powered with a sample of between 57 (for α of medium effect size; β of large effect size) and 74 (where α and β are both of medium

effect size) participants. In the final data set, coefficients α and β were in the medium to large range in the vast majority of mediation analyses, meaning that sample size of 74 would be more than adequate. In the current investigation, the sample size for pre-to-post data was 106, while mid-treatment assessments were completed by a subset of 74 participants. In addition, these 74 participants were asked to complete mindfulness practice logs. As only 57 of the 74 participants completed sufficient practice logs for their data to be included in the mindfulness practice analyses, the analyses involving practice logs may not have been adequately powered.

Statistical Analyses for the Current Investigation

Repeated Measures ANOVA

Prior to testing mediation, one-way repeated measures ANOVAs were conducted to determine if predictor, mediator, and outcome measures differed at pre-, mid-, and post-treatment. These analyses determined whether mean levels of mindfulness (FFMQ), experiential avoidance (MEAQ subscales; AAQ; WBSI), negative cognitions (ATQ), negative affect (IDAS Dysphoria), positive (IDAS Well-Being), and functional status (WHODAS II) significantly changed as the intervention progressed.

To examine pair-wise comparisons between time-points, follow up tests were conducted. These follow-up tests included planned comparisons of values from pre-treatment and mid-treatment, mid-treatment and post-treatment, and pre-treatment and post-treatment, respectively, using paired t-tests. To reduce the risk of Type I error, p -values were adjusted using Bonferroni's method to account for the number of tests performed.

In addition, an ANOVA was conducted to compare relaxation scores from the beginning of the intervention with scores from the end of the intervention, indicating

whether mean levels of relaxation after mindfulness practice changed over the course of the intervention.

It was hypothesized that mean levels of experiential avoidance and negative affect would decrease over the course of the intervention, while mean levels of mindfulness, relaxation, positive affect, functional status, and satisfaction with life would increase. Effect sizes for pre-post changes were also calculated. Expected mean level changes and effect sizes for the variables in question are primarily of interest in the current investigation as a contextual factor in interpreting the mediation analyses.

Correlation Analyses

Prior to mediation analyses, it is important to show that the variables of interest are strongly related (Kazdin & Nock, 2003). Pearson correlations were used to determine whether residualized change scores for predictor, mediator, and outcome variables were significantly associated. If they were not, then mediation analyses were not conducted.

Mediation Analyses

All mediation analyses began with the Baron and Kenny (1986) steps (described on p. 57). The second and third steps are generally considered the key steps (Kenny, 2006; Fritz & MacKinnon, 2007) and were used to obtain the coefficients α and β and their standard errors, SE_{α} and SE_{β} (see Figure B1). These values were then utilized to run the PROCLIN test of mediation.

The central hypothesis of the current investigation was that cognitive and emotional avoidance mediates the effect of mindfulness on negative affect and negative cognitions. Secondary hypotheses were that increased mindfulness, mediated through decreased avoidance (particularly behavioral avoidance), would be associated with increased positive affect and decreased functional impairment. Finally, mediation

models were tested with satisfaction with life as the outcome variable; here again, mindfulness was the predictor and experiential avoidance was the hypothesized mediator.

In order to investigate these hypotheses, residualized changes on hypothesized predictor, mediator, and outcome variables from pre-to-post intervention were tested in mediation models. Mindfulness, as the predictor variable, was operationalized in two ways: first, mediation was tested using the FFMQ scores, and then it was tested using mean minutes of daily mindfulness practice as the predictor variable. Experiential avoidance, the mediator variable, was assessed using the MEAQ *Distraction/Suppression* scale, the MEAQ *Behavioral Avoidance* scale, the WBSI, and the AAQ. These variables were tested independently in separate models in order to shed light on the role of specific aspects of experiential avoidance (cognitive and affective vs. behavioral avoidance, for example, as related to positive versus negative affect). Finally, the outcome variables were as follows: negative cognitions (ATQ), negative affect (IDAS Dysphoria), positive affect (IDAS Well-Being), disability (WHODAS-II), and satisfaction with life (SWLS). (Predictor, mediator, and outcome variables are summarized in Table A1 and Figure B2.)

In addition to the above described mediation models, which all focus on experiential avoidance as mediator, a mediation model in which relaxation was tested as an alternative mediator was conducted. In this model, the relation between residualized change in mindfulness and residualized change in negative affect over the course of the intervention was hypothesized to be mediated by gains in relaxation. Relaxation was assessed immediately after the first mindfulness practice session at home each week. In order to use the multiple data points for relaxation provided by participants, slope of relaxation scores was calculated as an indicator of change over time, rather than residualized change scores (which can only take into account two data points).

Finally, in an effort to demonstrate that changes in the predictor and mediator variables preceded changes in outcome variables, additional mediation models were

proposed in which residualized change scores for the predictor and mediator variables were calculated using scores from pre- to mid-treatment, whereas residualized change scores for the outcome variable were calculated based on changes from mid- to end of treatment. These analyses examined the sequence of change, as mediation is most strongly implied if changes in the mediator precede changes in the outcome (Kazdin & Nock, 2003).

CHAPTER III

RESULTS

Participant Characteristics

Table A3 contains a summary of participants' demographic information. The mean age of participants was 45.90 years ($SD = 11.43$), with ages ranging from 23 to 72 years. The majority of participants in the study were female (84.9%), which is representative of participants in the University of Iowa Hospitals and Clinics MBSR program. In addition, commensurate with the local population, the majority of participants were Caucasian (96.2%). Many participants were highly educated -- most participants (76.3%) had completed college and many had completed a postgraduate degree (44.3%).¹ The majority of participants (69.8%) worked full-time outside the home. The average household income was in the range of \$50,000 to \$60,000. Participants reported a range of medical conditions, including hypertension, diabetes, chronic back and neck pain, headaches, and arthritis. Some participants reported that they had been diagnosed with depression (28.3%) or an anxiety disorder (20.8%).

One-way analyses of variance and chi squared analyses were conducted to determine whether individuals who began but did not complete the study differed in demographic or other relevant characteristics from those who completed the study. In terms of demographic variables, those who completed the study were significantly older ($M = 45.90$ years, $SD = 11.43$) than those who did not complete it ($M = 38.61$ years, $SD = 11.89$), $F(1,125) = 7.56, p = .007$. Those who completed the study had, on average, completed college, while those who did not complete the study had, on average, completed college and some postgraduate training, $\chi^2(4, N = 124) = 10.02, p = .04$.

¹ The sample may have been highly educated due in part to the incentive that University of Iowa employees could take MBSR at a discount.

Those who completed the study had higher average household income than those who did not complete the study, $\chi^2(7, N = 106) = 16.29, p = .02$. There were no significant differences in gender, ethnicity, employment status, or relationship status between the two groups (p 's $< .05$). In addition, there were no significant differences in mindfulness (FFMQ), experiential avoidance (MEAQ Behavioral Avoidance, MEAQ Distraction/Suppression, AAQ, or WBSI), negative cognitions (ATQ), mood (IDAS Dysphoria or IDAS Well-Being), functional status (WHODAS II), or satisfaction with life (SWLS) between completers and non-completers.

Psychometric Data

Means and standard deviations of participants' scores on questionnaires are reported in Table A4. This table summarizes scores at pre-treatment, mid-treatment, and post-treatment.

All variables were examined and found to follow a normal distribution with the exception of the WHODAS II measure of disability. At the post-intervention data point, the WHODAS II was skewed to the right, with three individuals reporting significantly higher levels of disability than the majority of participants. In order to reduce skewness while retaining their data (which does reflect important variation within the sample), their scores on the WHODAS II measure were winsorized at two standard deviations above the mean (Hastings, Mosteller, Tukey & Winsor, 1947). Once winsorized, this variable displayed a normal distribution.

Scores on the Five Facet Mindfulness Questionnaire subscales at pre-treatment were commensurate with previous scores obtained from a community sample (Baer et al., 2008). Mindfulness scores at post-treatment were comparable to those previously reported by experienced meditators (Baer et al., 2008). Average scores on the MEAQ Behavioral Avoidance and Distraction/Suppression subscales at pre-treatment were equivalent to those previously obtained in a student sample and lower than those

obtained in a sample of psychiatric patients (Gamez, in press). Mean scores on the AAQ were in between those previously reported for university students and psychiatric patients (Gamez, in press). Participants' mean scores on the IDAS Dysphoria and Well-Being subscales at the outset of the study were commensurate with those previously reported in a community sample, whereas participants reported lower distress and greater well-being at pre-treatment than psychiatric patients (Watson et al., 2007). On the WHODAS-II, participants reported mild functional impairment on average; however, there was quite a range in functional status, with participant reports ranging from no impairment to severe disability. The average score on the Satisfaction With Life Scale at pre-treatment was similar to that of a local sample of university students and higher than that of a local sample of psychiatric patients (Gamez, 2010).

All measures had high reliability, which is particularly important given the use of residualized change scores. Alphas for all measures are reported in Table A4.

Mindfulness Practice

Participants who completed at least four weekly practice logs reported practicing an average of 37 minutes per day over the course of the treatment ($SD = 10$ minutes). In addition, participants were asked to report *retrospectively at the post-treatment* assessment how much practice they had completed. Participants who completed less than four weekly practice logs reported retrospectively at the post-treatment assessment that they had engaged in less formal mindfulness practice ($M = 20$ minutes daily practice, $SD = 12$ minutes) than individuals who completed at least 4 logs ($M = 27$ minutes, $SD = 10$ minutes; $p = .01$). This suggests that those who completed more weekly logs engaged in more mindfulness practice over the course of the intervention. Thus, missing data appears to be conflated with less practice and the results that follow should be interpreted with this consideration in mind.

Repeated Measures ANOVAs

One-way repeated measures ANOVAs were conducted to determine if mindfulness, avoidance, affect, functioning, and life satisfaction changed as the intervention progressed from pre-treatment to mid-treatment to post-treatment. Because these repeated measures analyses included data from the mid-point, which was collected only during the second wave of data collection, the maximum sample size for the repeated measures analyses was 74. Planned comparisons were conducted using paired sample t-tests. Bonferroni-adjusted p-values had to be below .016 to reject the null hypothesis (α of $.05/3 = .016$). (Table A4 provides a summary of means and standard deviations for all measures at the three time-points of data collection.)

Intervention effects on mindfulness, avoidance, and relaxation. A one-way within-subjects ANOVA was conducted with the factor being time-point of assessment and the dependent variable being mindfulness (FFMQ) scores. The results for the ANOVA indicated a significant time effect, Wilks's $\Lambda = .37$, $F(2,70) = 60.49$, $p < .001$, meaning that mindfulness scores changed over the course of the intervention. Planned follow-up tests indicated that mindfulness scores increased significantly from pre-treatment ($M = 72.86$, $SD = 13.26$) to mid-treatment ($M = 80.20$, $SD = 10.73$) and from mid-treatment to post-treatment ($M = 85.82$, $SD = 9.92$); they also significantly improved from pre-treatment to post-treatment (p 's $< .001$). (See Figure B3.)

In terms of avoidance measures, there were significant changes in WBSI scores over time, Wilks's $\Lambda = .46$, $F(2,70) = 41.62$, $p < .001$. Cognitive avoidance significantly decreased from pre-treatment ($M = 23.68$, $SD = 5.94$) to mid-treatment ($M = 21.88$, $SD = 5.74$), $p = .01$. Cognitive avoidance also significantly decreased from mid-treatment to post-treatment ($M = 17.35$, $SD = 6.26$), $p < .001$. The difference between scores at pre-treatment and post treatment was significant, $p < .001$.

Cognitive and affective avoidance as measured by the MEAQ-Distraction/Suppression changed significantly over the course of the intervention, Wilks's $\Lambda = .69$, $F(2,70) = 13.22$, $p < .001$. Though MEAQ-Distraction/Suppression did not change significantly from pre-treatment ($M = 24.13$, $SD = 8.77$) to mid-treatment ($M = 22.61$, $SD = 7.81$), $p = .08$, they decreased significantly from mid-treatment to post-treatment ($M = 18.40$, $SD = 7.60$), and from pre-treatment to post-treatment, p 's $< .001$.

Behavioral avoidance as measured by the MEAQ changed significantly as the intervention progressed, Wilks's $\Lambda = .69$, $F(2,70) = 13.22$, $p < .001$. Behavioral avoidance decreased from pre-treatment ($M = 24.13$, $SD = 8.77$) to mid-treatment ($M = 22.61$, $SD = 7.81$), and from mid-treatment to post-treatment ($M = 18.40$, $SD = 7.60$); behavioural avoidance also declined significantly from pre-treatment to post-treatment, all p 's $< .001$.

Experiential avoidance as assessed by the AAQ changed significantly over the course of the intervention, Wilks's $\Lambda = .45$, $F(2,71) = 42.94$, $p < .001$. Follow-up tests showed that avoidance decreased from pre-treatment ($M = 74.82$, $SD = 14.76$) to mid-treatment ($M = 67.90$, $SD = 13.88$), from mid-treatment to post-treatment ($M = 61.85$, $SD = 15.23$), and naturally also from pre-treatment to post-treatment, all p 's $< .001$.

With regard to the proposed alternative mediator, relaxation, participants reported significantly more relaxation after mindfulness practice at the end of the intervention ($M = 11.68$, $SD = 2.37$) compared to the first week of the intervention ($M = 10.94$, $SD = 2.68$), $t(59) = -2.43$, $p = .02$. Mean weekly relaxation scores are shown in Figure B4.

Intervention effects on outcome measures. With respect to outcome variables, participants reported changes in the frequency of negative cognitions (ATQ) over the course of the intervention, Wilks's $\Lambda = .60$, $F(2,71) = 24.19$, $p < .001$. Negative cognitions were significantly reduced from pre-treatment ($M = 18.11$, $SD = 6.97$) to mid-

treatment ($M = 15.13$, $SD = 5.30$), from mid-treatment to post-treatment ($M = 12.98$, $SD = 4.58$), and consequently from pre-treatment to post-treatment as well, all p 's $< .001$

Negative affect (IDAS Dysphoria) changed significantly over the course of treatment, Wilks's $\Lambda = .61$, $F(2,71) = 22.93$, $p < .001$. Negative affect did not decrease significantly from pre-treatment ($M = 23.37$, $SD = 7.99$) to mid-treatment ($M = 20.84$, $SD = 7.12$), $p = .03$. (The p -value must be below .016 to reject the null hypothesis due to the Bonferroni correction.) Negative affect did, however, decrease significantly from mid-treatment to post-treatment ($M = 17.92$, $SD = 5.90$), and from pre-treatment to post-treatment, p 's $< .001$

Positive affect (IDAS Well-Being) changed significantly over the time in MBSR, Wilks's $\Lambda = .62$, $F(2,71) = 21.60$, $p < .001$. Post-treatment levels of positive affect ($M = 26.93$, $SD = 6.76$) were significantly higher than pre-treatment levels ($M = 22.58$, $SD = 6.89$), $p < .001$. Pre-treatment and mid-treatment levels of positive affect ($M = 25.18$, $SD = 6.44$) were significantly different, $p < .001$; however, mid-treatment levels did not differ significantly from post-treatment levels with the Bonferroni correction, $p = .02$.

Participants reported significant change in their functional status (WHODAS II) over the course of the intervention, Wilks's $\Lambda = .68$, $F(2,93) = 21.60$, $p < .001$. Disability was reduced significantly from pre-treatment ($M = 18.70$, $SD = 14.89$) to mid-treatment ($M = 13.72$, $SD = 12.03$) to post-treatment ($M = 9.91$, $SD = 10.51$), all p 's $< .001$.

Satisfaction with life (SWLS) scores changed over the time spent participating in MBSR, Wilks's $\Lambda = .69$, $F(2,71) = 15.90$, $p < .001$. Life satisfaction improved from pre-treatment ($M = 21.03$, $SD = 7.03$) to mid-treatment ($M = 22.75$, $SD = 7.19$), $p < .001$. Life satisfaction also improved from mid-treatment to post-treatment ($M = 24.36$, $SD = 7.25$), $p = .003$. The increase in life satisfaction from pre-treatment to post-treatment was also significant, $p < .001$.

Effect sizes for all pre-post comparisons are reported in Table A5. All effect sizes were in the medium-large to large range.

Preliminary Pre-Mediation Analyses

Correlations of Raw Scores

Pearson correlation coefficients were computed in order to assess the relations between variables at each time point. The correlations between raw scores can be found in Table A6 for pre-treatment measures, Table A7 for mid-treatment measures, and Table A8 for post-treatment measures.

Correlations of Residualized Change Scores

As a precursor to mediation analyses, correlations were also computed for residualized change variables. The correlations for post-treatment scores, adjusted for their pre-treatment values, are shown in Table A9. As the relations between the mindfulness questionnaire, MEAQ distraction/suppression, MEAQ behavioral avoidance, AAQ, negative affect, positive affect, functional impairment, and satisfaction with life were all statistically significant (p 's < .05), all planned mediation analyses with the mindfulness questionnaire as the predictor variable were conducted.

Correlations Preliminary to Sequence of Change Analyses

As a precursor to sequence of change mediation analyses, which would attempt to demonstrate that changes in predictor and mediator variables precede and predict changes in outcome variables, residualized changes in mindfulness and experiential avoidance measures from pre- to mid-intervention were correlated with residualized changes from in outcome variables from mid- to post-intervention. (See Table A10.) Mindfulness from pre- to mid-intervention, as measured by the FFMQ, was not found to be significantly associated with changes in the outcome variables from mid- to end of

treatment, including negative affect (IDAS Dysphoria), positive affect (IDAS Well-Being), disability (WHO DAS II), or life satisfaction (SWLS; p 's < .05). In addition, pre-to mid-point changes in experiential avoidance measures did not significantly predict later changes in outcome variables (p 's < .05). Accordingly, sequence of change mediation analyses were not conducted.

Mindfulness Practice Effects

In terms of the mindfulness practice variables, there was a trend toward mean daily mindfulness practice over the course of the entire intervention being associated with gains on the mindfulness questionnaire (subscales included: observation of experience, acting with awareness, describing experience with words) over the course of the program ($r = .23, p = .09$), but this association was not statistically significant. There was a trend suggesting that more practice between the pre-treatment and post-treatment assessment was significantly associated with less experiential avoidance on the MEAQ-Distraction/Suppression ($r = -.27, p = .06$); however, there was no evidence of significant relations between more practice and other measures of avoidance (for MEAQ-Behavioral Avoidance, $r = -.24, p = .10$; for AAQ, $r = -.20, p = .14$; for WBSI, $r = .14, p = .30$). In terms of outcome variables, more practice was significantly associated with greater positive affect (IDAS Well-Being; $r = .27, p = .045$), but was not significantly correlated with negative cognitions, negative affect, disability, or life satisfaction (p 's < .50). Based on this pattern of significant relationships between variables, the only mediation model to be tested using mindfulness practice as the predictor variable involves MEAQ-Distraction/Suppression as the hypothesized mediator, and IDAS Well-Being as the outcome variable.

Relaxation Effects

Relaxation was proposed as a possible alternative mediator of the relation between change in mindfulness (as measured by the FFMQ) and change in negative affect (IDAS Dysphoria). The correlation between change in mindfulness and change in relaxation (operationalized by slope of weekly scores) was not significant, $r = .14, p = .30$. In addition, relaxation was not associated with change in negative affect, $r = .01, p = .92$. Consequently, mediation was not possible and the mediation model was not formally tested.

Mediation Analyses

All tested mediation models are summarized in Table A11. This table reports the results of the PRODCLIN test for significance of the mediated effect for each model. Thus, this table lists all mediation models and whether mediation was found for each.

Mediation model predicting negative cognition. A mediation model was tested (Model 1 in Table A11) in which change in cognitive avoidance (as measured by the WBSI) from pre- to post treatment was the hypothesized mediator of the relation between change in mindfulness and change in frequency of negative thoughts over the course of the intervention. (The changes included in this mediation model are residualized change scores, as are the change scores that follow in subsequent models.) Increases in mindfulness predicted decreases in negative cognitions ($\beta = -.45, p < .001$). Increases in mindfulness also predicted reductions in cognitive avoidance (WBSI; $\beta = -.45, p < .001$). When mindfulness was entered into the regression model, reductions in cognitive avoidance (WBSI) from pre-treatment to post-treatment significantly predicted reductions in negative cognitions over this time period ($\beta = .28, p = .004$). With cognitive avoidance (WBSI) in the regression model, mindfulness remained a significant predictor of negative cognitions ($\beta = -.33, p = .001$), indicating that partial mediation was found. (These results are presented in Figure B5.)

Mediation models predicting negative affect. Next, a mediation model was tested in which change in mindfulness was the predictor, MEAQ Distraction/Avoidance was the hypothesized mediator, and IDAS Dysphoria was the outcome variable (Model 2 in Table A11). Increases in mindfulness were significantly associated with decreases in negative affect ($\beta = -.54, p < .001$). Increases in mindfulness were also significantly associated with decreased cognitive and affective avoidance, as measured by the MEAQ Distraction/Suppression subscale ($\beta = -.48, p < .001$). With change in mindfulness entered into the regression equation, reductions in cognitive and affective avoidance (MEAQ Distraction/Suppression) predicted reductions in negative affect ($\beta = .25, p = .03$). Mindfulness remained a significant predictor of change in negative affect when cognitive and affective avoidance (MEAQ Distraction/Suppression) was entered into the equation ($\beta = -.50, p < .001$). The 95% confidence limits of the indirect effect did not include zero (-.1462, -.0145), indicating that PRODCLIN detected a statistically significant indirect effect of mindfulness on negative affect through cognitive and affective avoidance; however, the regression coefficient of the mindfulness to negative affect pathway did not show a large drop in magnitude once MEAQ Distraction/Suppression was entered into the regression model ($\beta = -.54$ to $\beta = -.50$). Accordingly, statistically significant partial mediation, though perhaps not of a clinically significant magnitude, was found.

A similar mediation model was tested using MEAQ Behavioral Avoidance as the measure of experiential avoidance (Model 3 in Table A11). Increases in mindfulness were significantly associated with a decline in negative affect ($\beta = -.54, p < .001$). Increases in mindfulness were associated with reductions in behavioral avoidance ($\beta = -.42, p = .001$). Reductions in behavioral avoidance predicted decline in negative affect ($\beta = .37, p = .001$), with mindfulness entered into the regression equation and remaining a significant predictor of negative affect ($\beta = -.46, p < .001$). Taken together, these Baron

and Kenny steps and the PRODCLIN results reported in Table A11, indicate that a partial mediation effect was detected.

In the next mediation model tested (Model 4 in Table A11), AAQ was the hypothesized mediator. Increases in mindfulness were significantly associated with reductions in negative affect, as previously stated ($\beta = -.54, p < .001$). Increased mindfulness predicted reduced avoidance, as measured by the AAQ ($\beta = -.57, p < .001$). Reductions in experiential avoidance (AAQ) scores predicted decline in negative affect ($\beta = .30, p = .002$), with change in mindfulness included in the regression model. When mindfulness and experiential avoidance (AAQ) were entered into the regression model, mindfulness remained a significant predictor of negative affect ($\beta = -.36, p < .001$), indicating partial mediation. (This mediation model is diagramed in Figure B6.)

Mediation models predicting positive affect. Next, mediation models with positive affect as the outcome variable were tested. Increases in mindfulness predicted increases in positive affect over the course of the intervention ($\beta = .41, p < .001$; Model 5 in Table A11). Increases in mindfulness predicted reductions in cognitive and affective avoidance (MEAQ Distraction/Suppression; $\beta = -.48, p < .001$). When mindfulness was entered into the regression model, reductions in cognitive and affective avoidance (MEAQ Distraction/Suppression) from pre-treatment to post-treatment significantly predicted increases in positive affect over this time period ($\beta = -.34, p = .01$); however, mindfulness was no longer a significant predictor of positive affect ($\beta = .18, p = .17$), indicating mediation.

A parallel mediation model was tested using MEAQ behavioral avoidance as a mediator variable (see Figure B7; Model 6 in Table A11). Increases in mindfulness were significantly associated with increases in positive affect ($\beta = .41, p < .001$), as previously stated. Increases in mindfulness were also a significant predictor of declines in MEAQ behavioral avoidance ($\beta = -.42, p = .001$). Reductions in behavioral avoidance were

predictive of increases in positive affect from pre-treatment to post-treatment ($\beta = -.44, p < .001$). When behavioral avoidance was entered into the regression model, mindfulness was no longer a significant predictor of positive affect ($\beta = .16, p = .18$), supporting mediation.

Next, a mediation model was tested in which experiential avoidance (as measured by the AAQ) was the mediator variable (Model 7 in Table A11). Increases in mindfulness were predictive of increases in positive affect ($\beta = .48, p < .001$). In addition, increases in mindfulness were associated with reductions in AAQ experiential avoidance ($\beta = -.57, p < .001$). Reductions in experiential avoidance (AAQ) scores still significantly predicted increased positive affect over the course of the intervention ($\beta = -.34, p = .001$), with mindfulness entered into the model. In addition, change in mindfulness remained a significant predictor of change in positive affect ($\beta = .29, p = .005$), when experiential avoidance (AAQ) was simultaneously entered into the model. Accordingly, partial mediation was found.

Mediation model predicting functional impairment. MEAQ behavioral avoidance was tested as a mediator of the relation between mindfulness and functional impairment or disability (results are presented in Figure B8; this is Model 8 in Table A11). Increases in mindfulness from pre-treatment to post-treatment predicted reductions in functional impairment ($\beta = -.28, p = .02$). Increases in mindfulness were associated with reductions in behavioral avoidance ($\beta = -.42, p = .001$). Declines in behavioral avoidance were significantly predictive of reduced disability ($\beta = .52, p < .001$), when mindfulness was included in the model, whereas change in mindfulness was no longer a significant predictor of disability impairment ($\beta = .01, p = .93$), indicating that full mediation was supported.

Mediation models predicting satisfaction with life. Next, mediation models with satisfaction with life (SWLS) as the outcome variable were tested (Model 9 in Table

A11). Increases in mindfulness predicted increases in satisfaction with life over the course of the intervention ($\beta = .31, p = .008$). Increases in mindfulness predicted reductions in cognitive and affective avoidance (MEAQ Distraction/Suppression; $\beta = -.48, p < .001$). When mindfulness was entered into the regression model, reductions in avoidance (MEAQ Distraction/Suppression) from pre-treatment to post-treatment did not significantly predict increased life satisfaction over this time period ($\beta = -.17, p = .23$). In addition, when cognitive and affective avoidance (MEAQ Distraction/Suppression) was entered into the regression model, mindfulness was no longer a significant predictor of life satisfaction ($\beta = .20, p = .15$), indicating that mediation was not found. The PRODCLIN test confirmed that mediation was not detected (Table A11).

A similar mediation model was tested using behavioral avoidance (MEAQ subscale) as a mediator variable (Model 10 in Table A11). Increases in mindfulness were significantly associated with increases in satisfaction with life ($\beta = .31, p = .008$), as previously stated. Increases in mindfulness were also a significant predictor of declines in behavioral avoidance (MEAQ subscale; $\beta = -.42, p = .001$). Reductions in behavioral avoidance were predictive of increases in life satisfaction from pre-treatment to post-treatment ($\beta = -.34, p = .01$), with mindfulness entered in the model. When behavioral avoidance (MEAQ) was entered into the regression model, mindfulness was no longer a significant predictor of life satisfaction ($\beta = .14, p = .27$), indicating a mediated effect.

Next, a mediation model was tested in which experiential avoidance (as measured by the AAQ) was the mediator variable (see Figure B9; Model 11 in Table A11). Increases in mindfulness were predictive of increases in satisfaction with life ($\beta = .33, p = .001$). In addition, increases in mindfulness were associated with reductions in experiential avoidance (AAQ; $\beta = -.57, p < .001$). Reductions in experiential avoidance (AAQ) significantly predicted increases in satisfaction with life over the course of the intervention ($\beta = -.47, p < .001$), with mindfulness entered into the model. Change in

mindfulness was no longer significant predictor of life satisfaction ($\beta = .06, p = .53$), when experiential avoidance (AAQ) was simultaneously entered into the model, indicating full mediation.

Mindfulness practice as predictor variable. The following mediation model (Model 12 in Table A11) was the only one tested with mindfulness practice as the predictor variable, due to the pattern of correlations discussed above (p. 74). The amount of average daily mindfulness practice over the course of the intervention was found to significantly predict change in positive affect (IDAS Well-Being) from pre-treatment to post-treatment ($\beta = .27, p = .045$). There was a trend for higher levels of mindfulness practice to predict reduced cognitive and affective avoidance (MEAQ Distraction/Suppression scale; $\beta = -.27, p = .06$).² Reduced experiential avoidance (MEAQ Distraction/Suppression) predicted increased positive affect (IDAS Well-Being; $\beta = -.42, p = .004$), while mindfulness was no longer a significant predictor once avoidance (MEAQ Distraction/Suppression) was entered into the regression model ($\beta = .17, p = .21$). The PRODCLIN test (as shown in Table A11) indicated a mediation effect.

² Power was lower for the analyses involving mindfulness practice because some participants did not complete practice logs and consequently the sample for these analyses was smaller ($n = 57$). The PRODCLIN test has higher power compared to the Baron and Kenny regression steps in smaller samples (Table A2). Accordingly, the PRODCLIN test was considered a more authoritative indicator of mediation than the Baron and Kenny steps for this analysis. Though Step 2 of Baron and Kenny's method had a significance of $p = .06$, mediation was considered supported because the PRODCLIN test was statistically significant.

CHAPTER IV

DISCUSSION

In the current investigation, 106 community participants completed questionnaires at pre-, mid- and post-MBSR, in order to examine the mechanisms of change in a mindfulness-based stress management intervention. Increased mindfulness over the course of the intervention was associated with decreased cognitive, affective and behavioral avoidance. In addition, increased mindfulness was associated with reduced negative cognitions and affect, increased positive affect, reduced disability, and increased satisfaction with life. Several mediation models were tested and, taken together, the results of the mediation analyses provide support for the central hypothesis that the beneficial effects of mindfulness on outcomes including negative cognitions, negative and positive affect, disability, and satisfaction with life appear to be mediated by decreased experiential avoidance resulting from the mindfulness intervention.

In addition, participants in the current investigation demonstrated significant changes from pre- to post-intervention in mindfulness, experiential avoidance, and outcome variables. Though the purpose of this study was not to investigate the main effects of the intervention *per se*, these findings are an important contextual consideration in interpreting the mediation results. At the pre-treatment time-point, scores on mindfulness, avoidance, negative and positive affect, and satisfaction with life were similar to those previously reported by community samples of non-meditators (see p. 68 for more detail). At the end of treatment, participants' scores on the mindfulness questionnaire were similar to those previously reported by experienced meditators (Baer et al., 2008). In addition, at the end of treatment, participants reported significantly less cognitive, affective, and behavioral avoidance, and less negative affect and disability than at the start of treatment, along with more positive affect and satisfaction with life at

the end of treatment in comparison to pre-treatment. These findings of significant change with (medium to large effect sizes) from pre- to post- treatment are consistent with previous randomized studies that have shown significant improvements in outcome measures after participation in MBSR (Hoffmann et al., 2010). Indeed, mean MBSR effect sizes have been found to be similar for MBSR studies with pre-post or between-group designs (Baer, 2003).

Mindfulness, Experiential Avoidance, and Negative Affect

In examining the mediation results in more detail, several important points emerge. As hypothesized, experiential avoidance was found to partially mediate the relation between mindfulness and decreased negative affect, and similar results were found in the model predicting negative cognition. For negative cognition and negative affect outcome variables, partial mediation and not full mediation was obtained. There are several potential reasons for this outcome.

Partial mediation of the relation between mindfulness and negative affect was found for all mediation models testing various measures of avoidance; however, partial mediation of a particularly small magnitude was found for the mediation model in which FFMQ mindfulness was the predictor, MEAQ Distraction/Suppression was the mediator, and IDAS Dysphoria was the outcome variable. This appears to be a measurement issue. The MEAQ subscales included in the current investigation (Distraction/Suppression and Behavioral Avoidance) were chosen prior to the completion of the measure, as the MEAQ was under development at the time that data collection for the current investigation got underway. The Distraction/Suppression subscale was chosen as an avoidance measure because it was expected *a priori* to be strongly linked to negative affect. However, as it turned out, the Distraction/Suppression subscale was the least strongly associated with negative affect of all the MEAQ subscales (mean $r = .20$ across student and patient samples; Gamez, in press). It may be that the content of the

Distraction/Suppression subscale is normative and thus does not strongly differentiate between non-problematic avoidance and clinically relevant avoidance – indeed, of all the MEAQ subscales, Distraction/Suppression has the lowest effect size difference between students and patients ($d = .36$). Subscales such as Distress Aversion (negative attitudes toward distress) and Repression/Denial (distancing from distress) showed greater differentiation between students and psychiatric patients and also were more highly correlated with negative affectivity (r 's = .33 to .41 in student and patient samples). In retrospect, with the full knowledge of the final properties of the MEAQ, it would have been best to include Distress Aversion and Repression/Denial in the assessment packet for the current investigation. At the time, the total exploratory MEAQ item pool consisted of 124 items and was considered too burdensome to participants to include in full. Instead, 66 exploratory items were included in our study (the final item pool of the MEAQ consists of 62 items). Participant burden was an especially important consideration given that participants were asked to complete the packet at three time-points; participants who found the questionnaire packet too onerous at pre-treatment would not have completed further assessments, which would have reduced the sample size. Future research on experiential avoidance in mindfulness, as well as in other therapies, would be well served by including the entire MEAQ measure.

In terms of predicting negative affect in the mediation models more generally, it may be that a stronger pattern of mediation would be found in a more distressed population. In their meta-analysis of mindfulness interventions, Hoffman, Sawyer, Witt and Oh (2010) found that mindfulness outcome studies in which participants were more distressed yielded larger effect sizes than studies in which participants were less distressed. It is likely that a more distressed population would be more likely to engage in experiential avoidance strategies as well, as Gamez (2010) found. A mindfulness

intervention might change this tendency, thus leading to a stronger mediation finding in a more distressed sample.

Alternatively, it may be that experiential avoidance partially mediates the relation between mindfulness and negative affect, while other variables act as additional mediators. One additional hypothesized mechanism of change, relaxation, was tested but no evidence was found that relaxation mediates the relation between mindfulness and negative affect, although relaxation did increase significantly from pre- to post-intervention. The potential role of relaxation and its relation to mindfulness should be further explored in future research such as a randomized controlled trial that compares mindfulness and relaxation interventions. It would be ideal to incorporate physiological measures of relaxation at regular intervals during the interventions, as well as measures of experiential avoidance and other potential behavioral mediators.

Other mechanisms that may mediate the effect of mindfulness on negative mood include changes in rumination (Jain et al., 2007) and the role of cognitive reactivity (Kyuken et al., 2010). Kyuken and colleagues (2010) found that when individuals with a history of depression, who had been treated successfully by medication, showed depressive thinking in response to a laboratory mood induction, these changes predicted worse mood outcomes; however, depressive thinking in response to mood induction was not related to outcomes in a group of comparable patients treated with MBCT, instead of medication. This suggests that, after mindfulness training, patients who have a historical vulnerability to depression are not as affected by their negative thoughts (cognitive defusion, in ACT terms). This may be another important mediator of the effect of mindfulness training on negative mood. These mechanisms were not tested in the current study.

Mindfulness, Experiential Avoidance, and Positive Affect

While negative affect has traditionally been a critical target of clinical interventions, more and more emphasis is being placed on the importance of positive affect. In the current investigation, experiential avoidance was found to mediate the relation between mindfulness and positive affect. More specifically, increased mindfulness was associated with increased positive affect over the course of the intervention, and the relation between mindfulness and positive affect was fully mediated by behavioral avoidance.

The finding of full mediation for behavioral avoidance is particularly interesting given the important link between behavior and positive affect in basic emotion theory. Behavioral avoidance inhibits approach behavior, which is tightly tied to positive affect through the biological substrate of the Behavioral Activation System (BAS; Depue and Iacono, 1989; Watson, 2000). While emotion researchers have known that, as Watson puts it, “it is easier to induce a state of elevated positive affect through *doing* than through *thinking*” (p. 102, emphasis in the original), this theoretical framework from basic science has not been explicitly harnessed in applied clinical research to create effective psychotherapy from the ground up. Nonetheless, the associations between reduced behavioral avoidance, increased behavioral activation, and increased positive affect which are understood in basic emotion science may be at work in effective psychotherapies, including MBSR. The finding that behavioral avoidance mediates the relation between mindfulness and positive affect thus exemplifies the capacity of mechanism research to draw a direct line between the discoveries of basic science and the active ingredients of effective psychotherapy.

This particular mechanism associated with increased positive affect may be at work across a variety of contemporary psychotherapies. Some clear examples can be found in psychotherapy for the treatment of depression, as it is well known that positive

affect is often low in depressed patients. Behavioral Activation therapy for the treatment of depression explicitly works to get participants moving toward valued goals in their lives, as does Acceptance and Commitment Therapy for the treatment of depression (Addis & Martell, 2004; Strosahl & Robinson, 2008). In addition, behavioral activation is a key component of mainstream cognitive-behavioral therapy for depression. Our findings suggest that cognitive-behavioral treatments and mindfulness-based interventions (including MBCT which targets the prevention of depression relapse) may have a common mechanism of change with respect to behavioral avoidance. Further empirical investigation of the mechanisms of change in these interventions is needed in order to confirm this common thread. The promise of mechanism research is that it is likely to highlight key common elements from our many approaches to psychotherapy, making it are easier for therapists to learn and disseminate effective interventions.

Mindfulness, Experiential Avoidance, and Disability

The next outcome examined was change in disability over the course of the mindfulness intervention. Reduced behavioral avoidance was found to fully mediate the relation between greater mindfulness and less disability. This makes sense given that functional impairment is a behavioral construct concerned with what one *does* on a daily basis – as hypothesized, this behavioral variable was found to be particularly connected to behavioral avoidance. This component of mindfulness sheds light on previous findings showing that mindfulness and acceptance-based interventions can lead to improved physical functioning among patients with medical illnesses, including cancer (Lengacher et al., 2009) and chronic pain (Vowles & McCracken, 2010).

According to the current study, behavioral avoidance functions as a mediator of the relation between both (1) mindfulness and positive affect and (2) mindfulness and disability. This kind of common pathway of mediation may explain how mindfulness is helpful to individuals with a wide variety of problems, from depression to cancer. In the

research literature, scientists have tested psychotherapy protocols on homogeneous groups of patients with single diagnoses whenever possible, in order to achieve clarity on which treatments work for specific problems. However, outside of research protocols, it is common for one individual to suffer from multiple problems or diagnoses. In behavioral medicine, in particular, medical and psychiatric issues often come together, as the stress of serious medical illness can lead to marked distress and can bring to light underlying psychological vulnerabilities; moreover, some medical conditions are thought to affect mood through biological pathways. It is useful to have interventions that treat both distress and functioning through common pathways, as this study suggests is the case for MBSR.

It may be surprising that an intervention such as MBSR, which emphasizes sitting in meditation, would be associated with reduced behavioral avoidance -- indeed, at times, sitting meditation might itself function as a form of avoidance of important life activities. However, mindfulness teachers emphasize the importance of participating in life's activities while using the open, observing stance cultivated in mindfulness practice. For example, in the mindfulness component of Dialectical Behavior Therapy, Linehan clearly elucidates participation in life as a component of mindfulness (1993b).

Mindfulness, Experiential Avoidance, and Satisfaction with Life

Satisfaction with life was the final outcome tested via mediation model. While no mediation effect was found for the experiential avoidance strategy of cognitive and affective distraction/suppression, once again behavioral avoidance was found to play a strong mediating role. In addition, experiential avoidance as measured by the AAQ was found to fully mediate the relation between mindfulness and life satisfaction. These findings regarding life satisfaction are important because mindfulness- and acceptance-based interventions tend to focus less directly on reducing negative affect and cognitions

as their primary goal, in favor of a more global goal of increasing life satisfaction as a whole.

Role of Mindfulness Practice

In the previously discussed mediation models, mindfulness was assessed using the Five Facet Mindfulness Questionnaire. Time spent in meditation was also examined as a measure of mindfulness training. In the current investigation, the amount of time spent in mindfulness practice over the course of the intervention was most strongly associated with the outcome of increased positive affect. Consistent with findings described above for effects of mindfulness as measured by the FFMQ, the relation between amount of mindfulness practice and positive affect was mediated by experiential avoidance (MEAQ Distraction/ Suppression, specifically). No other mediation analyses with mindfulness practice as the predictor variable were tested, due to nonsignificant Pearson correlations between the relevant variables. Notably, these analyses may have been limited by low power ($n = 57$), as a substantial portion of participants did not submit sufficient practice logs to have their data included in the analyses. In addition, participants who handed in fewer logs later retrospectively reported that they had completed less practice than participants who handed in more logs. This makes clarity of analysis and interpretation difficult, as missing data and amount of practice are somewhat confounded. Accordingly, the analyses involving daily mindfulness practice should be interpreted with greater caution. While previous research has found that, homework does, in general, enhance psychotherapy outcomes (Kazantzis, Deane, and Ronan, 2000), and some previous research has shown that more mindfulness practice is associated with greater reductions in negative mood (Carmody & Baer, 2008; Jha et al., 2010; Kristeller & Hallet, 1999; Rosenzweig et al., 2010; Speca et al., 2000), findings to date have been contradictory (Vettese et al., 2009).

Further research is needed, with careful attention to methodological considerations aimed at reducing missing data (particularly for those who are practicing less and may be reluctant or not involved enough to report it to instructors or researchers) before definitive conclusions can be drawn regarding the effect of mindfulness homework practice. These issues are important to address because mindfulness training offers an unusual opportunity to measure time spent engaging in the skill being taught by the intervention and, consequently, to engage in dose-response research, an important aspect of the empirical study of mechanisms of change.

Limitations

The results of the current study must be understood in light of certain limitations. The sample for the current study was largely Caucasian. While this sample was representative of the local population, it is not representative of the diversity of the nation as a whole. In addition, the majority of participants were female and highly educated, which also limits the generalizability of the findings. While previous studies have demonstrated that mindfulness interventions have had a positive impact on diverse groups (e.g., Roth & Robbins, 2004), the current findings would be strengthened by replication in a more diverse sample. In future, it would also be useful to replicate the current methodology with a sample consisting of participants with a specific, relatively homogenous medical condition, as well as greater distress and disability.

One significant limitation of the current study was that there was not a control group. Participants in the current investigation showed changes from pre-intervention to post-intervention on the relevant measures. However, in the current study, the changes from pre- to post- intervention cannot be decisively attributed to the intervention due to the lack of a comparison group. A future study in which an RCT is combined with mechanism research would be an important contribution to the literature.

In the current investigation, further mediation analyses were planned, but not conducted, in which changes in the mindfulness and experiential avoidance from pre-treatment to mid-treatment would have been used to predict changes in the outcome variables from mid-treatment to post-treatment. These types of analyses, in which hypothesized mediators change prior to changes in outcome variables, are important in establishing a time-line of mediation. However, these mediation analyses were not carried out because correlations between pre- to mid-treatment predictor and mediator variables and mid- to post-treatment outcome variables were not significant.

In the current study, it may be that the mid-point assessment was too early (participants completed the assessment packet after the third class). Based on clinical experience, it may be that in the first few weeks of MBSR many participants are grappling to understand the mindfulness paradigm and do not yet have a handle on the fundamentally different approach to one's experience taught in the program; thus, it may be too early to assess change in predictor and mediating variables. Researchers have not yet identified empirically-based guidelines for the length of mindfulness interventions (though Carody & Baer, 2009, attempted to investigate this question). Further research is necessary, across a broad range of intervention studies in clinical psychology, to identify the ideal time-points for assessing mechanisms of change in order to show changes in mediator variables prior to changes in outcome variables.

The current study explored the relations between mindfulness, experiential avoidance, and treatment outcomes predicted by a particular theoretical model. However, other theoretical models should be explored so that competing explanations of how mindfulness works can be tested. In the current study, analyses with relaxation as an alternate mediator were carried out in order to begin the process of testing alternative explanations for the effect of mindfulness. As Kazdin and Nock (2003) point out, the

argument in favor of a proposed mediator is strengthened if other plausible mediators based on competing theoretical models are ruled out.

Strengths

The current investigation of experiential avoidance as a mechanism of action in MBSR has several important strengths. Most importantly, this investigation addresses the need for empirically-based investigation of how behavioral treatments work, as called for by the NIMH (National Institutes of Mental Health, 2003) and leaders in the field of clinical psychology such as Kazdin (Kazdin & Nock, 2003).

Kazdin and Nock (2003) describe multiple criteria that are necessary to demonstrate mediation conclusively (as outlined on p. 39). As they note, no one study can meet all of these criteria -- programmatic research is always necessary. The current study met the criterion of *strong association*, as mindfulness and the outcome measures were all significantly associated with experiential avoidance. This investigation also provided evidence for the *specificity* of experiential avoidance as a mediator of the effect of mindfulness, as no evidence was found for relaxation as an alternative mediator. Further investigation is needed, however, with the understanding that multiple mediators are common in social science research. In terms of the criterion of *gradient*, the dose of experiential avoidance was not manipulated in the current investigation; however, the amount of mindfulness practiced was assessed in order to investigate dose-response effects. Despite power limitations, we found that more mindfulness practice was associated with a greater increase in positive affect, and that this relation was mediated by decreased experiential avoidance (MEAQ Distraction/Suppression). This finding offers reason to hope that further dose-response relations could be found with more highly powered analyses. Finally, this study attempted to investigate the important question of *sequence of change* (i.e., do changes in the mediator precede changes in outcome?); the addition of a mid-point evaluation to the more standard protocol of pre-

and post- assessments is an important methodological strength of the current investigation. Future investigations would benefit by adding additional points of assessment in order to clarify whether sequence of change effects can be detected later in the intervention.

Finally, Kazdin and Nock (2003) specify that mediation research should meet the criteria of *plausibility and coherence*. Proposed mediators, they argue, should be drawn from a plausible theoretical framework and relevant empirical literature. We have described the relevance of experiential avoidance to emotion science and the action tendencies related to positive and negative affect. We have summarized the role of experiential avoidance in the theoretical understanding of emotional disorders, as well as ongoing empirical research in that area. The relevance of experiential avoidance to behavioral medicine interventions was also described. In addition to describing the connection between experiential avoidance and various emotional disorders and medical conditions, we described its hypothesized role in multiple behavioral treatments, including cognitive-behavioral therapy, mindfulness-based interventions like MBSR and MBCT, and so-called third wave behavioral treatments such as ACT and DBT. This body of evidence provides theoretical underpinnings on multiple levels of analysis for the role of experiential avoidance in therapeutic change, thus meeting the important criterion of plausibility and coherence in mechanism research.

While mechanism research is important, it is difficult to execute without the proper tools. The current investigation utilizes new measurement tools (e.g., Multidimensional Experiential Avoidance Questionnaire) and statistical techniques (e.g., PRODCLIN) to offer evidence for the role of decreased experiential avoidance as a mechanism of change linked to multiple outcomes in MBSR. The availability of the MEAQ (Gamez, in press), a new measure developed using state-of-the-art methodology, was particularly important, as it allowed for the assessment of facets of experiential

avoidance, such as behavioral avoidance. The relations of these facets to distinct outcomes enrich the findings of the current study. In addition, the use of the Acceptance and Action Questionnaire allows the current study to add to the growing body of mediation literature using the AAQ, particularly with regard to ACT interventions (e.g., Bohlmeijer, Fleddrus, Rokx, & Pieterse, 2011; Gregg et al., 2007; Varra, Hayes, Roget, & Fisher, 2008), thus offering empirical support for common mechanisms across markedly different acceptance-based interventions. The use of multiple measures of EA yielded richer findings than if available measures were combined in some fashion, such as factor analysis. In addition, the use of multiple outcome measures, including the separate analyses for changes in negative and positive affect, functioning, and satisfaction with life, provides a fuller picture of the multifaceted outcomes associated with experiential avoidance.

Conclusions and Implications

Over the past several years, mindfulness and acceptance based interventions have multiplied and new questions have been raised about how psychotherapy works. The current findings clearly have relevance to MBSR as a specific treatment protocol, and speak more broadly to how mindfulness can be helpful in psychotherapy. However, the implications may resonate further. There is theoretical support and growing empirical evidence for the notion that experiential avoidance as a mechanism could be at work in acceptance-based interventions more broadly. Furthermore, cognitive-behavioral treatments that would not appear on the surface to share common mediators with mindfulness, such as behavioral activation or exposure, may in fact turn out to be related in terms of mechanisms of effect. Programmatic mechanism research is needed in order to elucidate potential common active ingredients at work in diverse approaches to psychotherapy.

Mechanism research is also relevant to the new emphasis on studying treatments for heterogeneous groups (e.g., McEvoy & Nathan, 2007), rather than the single-diagnosis research participants that have been a staple of intervention research in the past. Here, the goal is to examine how common mechanisms of change work in parallel in the treatment of individuals with a variety of psychological conditions and major stressors, including serious medical illness. The current study contributes to this work by offering evidence that the same mechanisms of effect may help a variety of outcomes in a heterogeneous group of multi-problem patients. Ultimately, this kind of mechanism research may help us to move from our current profusion of problem-specific empirically supported treatment protocols to a more streamlined approach to psychotherapy, in which we treat the whole person using empirically-tested principles of psychotherapeutic change.

In summary, mechanism research has great potential to link psychotherapy to basic research, build theoretical models that bridge psychotherapeutic modalities, and improve clinical efficacy. In order to reach this potential, the efforts of many scientists are needed. The current investigation aims to contribute to that effort.

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APPENDIX A

TABLES

Table A1: Constructs and Measures for the Current Investigation

| Variables | Construct | Measure | Subscale(s) |
|---------------------|-----------------------------------|---|---|
| Predictor Variables | Mindful Awareness | Five Facet Mindfulness Questionnaire (FFMQ) | Observing, Describing and Acting with Awareness |
| | Mindfulness Practice | Time spent in mindfulness practice | |
| Mediator Variables | Cognitive Avoidance | White Bear Suppression Inventory (WBSI) | Thought Suppression |
| | Cognitive and Emotional Avoidance | Multidimensional Experiential Avoidance Questionnaire (MEAQ) | Distraction/Suppression |
| | Behavioral Avoidance | Multidimensional Experiential Avoidance Questionnaire (MEAQ) | Behavioral Avoidance |
| | Experiential Avoidance | Acceptance and Action Questionnaire (AAQ) | |
| | Perceived Relaxation | Self-report items in practice log | |
| Outcome Variables | Negative Cognitions | Automatic Thought Questionnaire (ATQ) | |
| | Negative Affect | Inventory of Depression and Anxiety Symptoms (IDAS) | Dysphoria |
| | Positive Affect | Inventory of Depression and Anxiety Symptoms (IDAS) | Well-Being |
| | Functional Impairment/Disability | World Health Organization Disability Assessment Schedule II (WHODAS II) | |
| | Satisfaction with Life | Satisfaction with Life Scale (SWLS) | |

Table A2: Empirical Estimates of Sample Size Needed for .8 Power in Mediation Analyses

| Test | Magnitude of Regression Coefficients | | | | |
|-------------------------|--|---|--|---|--|
| | Smaller α /Smaller β $\alpha = .26, \beta = .26$ | Smaller α /Medium β $\alpha = .26, \beta = .39$ | Medium α /Medium β $\alpha = .39, \beta = .39$ | Medium α /Large β $\alpha = .39, \beta = .59$ | Large α /Large β $\alpha = .59, \beta = .59$ |
| B & K ($\tau' = .14$) | 224 | 179 | 118 | 88 | 53 |
| B & K ($\tau' = .39$) | 158 | 124 | 75 | 59 | 38 |
| Sobel Test | 196 | 144 | 90 | 66 | 42 |
| PRODCLIN Test | 161 | 125 | 74 | 57 | 35 |

Note. B & K = Baron and Kenny mediation steps. τ' = the direct effect of X on Y controlling for M; α = the effect of X on M; β = the effect of M on Y controlling for X. Adapted from Fritz and MacKinnon's (2007) empirical investigation in which the parameters of α and β were set at smaller, medium, and large effect sizes. "Smaller" effect sizes are between small and medium in magnitude. The size of τ' only has an effect on power for the Baron and Kenny test; therefore, the values of τ' are not shown for other tests. Sample sizes in bold reflect expected effect sizes for the current investigation based on pilot data.

Table A3: Demographic Information ($N = 106$)

| Demographic Information | M (SD) |
|-----------------------------------|---------------|
| Age (years) | 45.90 (11.43) |
| Demographic Information | % |
| Gender | |
| Female | 84.90% |
| Male | 15.10% |
| Ethnicity | |
| Caucasian | 96.20% |
| African American or Black | 0% |
| Asian | .90% |
| Latino/Hispanic | .90% |
| American Indian or Alaskan Native | 0% |
| More than One Race | .90% |
| Other | .90% |
| Education | |
| High School | 5.70% |
| Some College | 17.0% |
| Completed College | 24.50% |
| Some Post Graduate | 7.50% |
| Post Graduate Degree | 44.30% |
| Work Status | |
| Working Full Time | 69.80% |
| Working Part Time | 12.30% |
| Homemaker | 4.70% |
| Student | 6.80% |
| Disabled | 1.90% |

Table A3 -- Continued

| | |
|-------------------------|--------|
| Retired | 4.70% |
| Demographic Information | % |
| Household Income | |
| Less than \$20,000 | 1.90% |
| \$20,001 to \$30,000 | 3.80% |
| \$30,001 to \$40,000 | 5.70% |
| \$40,001 to \$50,000 | 15.10% |
| \$50,001 to \$60,000 | 13.20% |
| \$60,001 to \$70,000 | 16.00% |
| \$70,001 to \$80,000 | 3.80% |
| Greater than \$80,001 | 26.40% |

Table A4: Means, Standard Deviations, and Internal Consistencies of Measures

| Measures | Pre-Treatment | | | Mid-Treatment | | | Post-Treatment | | |
|---------------------|---------------|-------|-------|---------------|-------|-------|----------------|-------|-------|
| | α | Mean | S.D. | α | Mean | S.D. | α | Mean | S.D. |
| FFMQ | .92 | 72.86 | 13.26 | .88 | 80.20 | 10.73 | .89 | 85.82 | 9.92 |
| WBSI | .82 | 23.68 | 5.94 | .85 | 21.88 | 5.74 | .89 | 17.35 | 6.26 |
| MEAQ-DS | .93 | 24.13 | 8.77 | .93 | 22.61 | 7.81 | .95 | 18.40 | 7.60 |
| MEAQ-BA | .91 | 34.92 | 11.13 | .92 | 31.04 | 10.23 | .95 | 27.91 | 11.93 |
| AAQ | .88 | 74.82 | 14.76 | .88 | 67.90 | 13.88 | .90 | 61.85 | 15.23 |
| ATQ | .90 | 18.11 | 6.97 | .88 | 15.13 | 5.30 | .86 | 12.98 | 4.58 |
| IDAS- Dysphoria | .91 | 23.37 | 7.99 | .90 | 20.84 | 7.12 | .87 | 17.92 | 5.90 |
| IDAS- Well Being | .93 | 22.58 | 6.89 | .92 | 25.18 | 6.44 | .93 | 26.93 | 6.76 |
| WHO DAS II | .90 | 18.70 | 14.89 | .87 | 13.72 | 12.03 | .88 | 9.91 | 10.51 |
| SWLS | .91 | 21.03 | 7.30 | .88 | 22.75 | 7.19 | .92 | 24.36 | 7.25 |

Note. FFMQ = Five Facet Mindfulness Questionnaire (FFMQ score is based on summation of scores from subscales Observing, Describing, and Acting with Awareness), WBSI = White Bear Suppression Inventory (Thought Suppression subscale), MEAQ = Multidimensional Experiential Avoidance Questionnaire (DS = Distraction/Suppression; BA = Behavioral Avoidance), AAQ = Acceptance and Action Questionnaire, ATQ = Automatic Thought Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms, WHO DAS II = World Health Organization Disability Assessment Schedule II, SWLS = Satisfaction with Life Scale.

Table A5: Effect Sizes for Pre-Post Effects

| Variables | Construct | Measure | <i>d</i> | Effect Size |
|--------------------|-----------------------------------|-----------------|----------|--------------|
| Predictor Variable | Mindfulness | FFMQ | 1.26 | Large |
| Mediator Variables | Cognitive Avoidance | WBSI | .97 | Large |
| | Cognitive and Affective Avoidance | MEAQ-DS | .64 | Medium-large |
| | Behavioral Avoidance | MEAQ-BA | .83 | Large |
| | Experiential Avoidance | AAQ | 1.06 | Large |
| | Perceived Relaxation | Practice Log | .36 | Small-medium |
| Outcome Variables | Negative Cognitions | ATQ | .83 | Large |
| | Negative Affect | IDAS Dysphoria | .88 | Large |
| | Positive Affect | IDAS Well-Being | .70 | Medium-large |
| | Disability | WHO DAS II | .72 | Medium-large |
| | Life Satisfaction | SWLS | .66 | Medium-large |

Note. By convention, *d* values of .2 are considered small, *d* values of .5 are considered medium, and *d* values of .8 are considered large effect sizes. FFMQ = Five Facet Mindfulness Questionnaire, WBSI = White Bear Suppression Inventory, MEAQ = Multidimensional Experiential Avoidance Questionnaire (DS = Distraction/Avoidance subscale; BA = Behavioral Avoidance subscale), AAQ = Acceptance and Action Questionnaire, ATQ = Automatic Thought Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms, WHO DAS II = World Health Organization Disability Assessment Scale II, SWLS = Satisfaction with Life Scale.

Table A6: Correlations Between Raw Scores at Pre-Treatment

| | FFMQ | WBSI | MEAQ- DS | MEAQ- BA | AAQ | ATQ | IDAS Dys | IDAS Well | WHO DAS | SWLS |
|-----------------|------|--------|-------------|-------------|--------|--------|-------------|--------------|------------|--------|
| FFMQ | -- | -.38** | -.37** | -.47** | -.52** | -.41** | -.43** | .51** | -.39** | .22* |
| WBSI | | -- | .65** | .46** | .58** | .44** | .44** | -.45** | .42** | -.28** |
| MEAQ-DS | | | -- | .60** | .59** | .26* | .35** | -.27* | .38** | -.16 |
| MEAQ-BA | | | | -- | .59** | .44** | .51** | -.43** | .54** | -.44** |
| AAQ | | | | | -- | .56** | .61** | -.58** | .55** | -.42** |
| ATQ | | | | | | -- | .82** | -.62** | .55** | -.55** |
| IDAS Dysphoria | | | | | | | -- | -.65** | .61** | -.52** |
| IDAS Well-Being | | | | | | | | -- | -.54** | .57** |
| WHO DAS | | | | | | | | | -- | -.57** |
| SWLS | | | | | | | | | | -- |

Note. $N = 106$. * $p < .05$; ** $p < .01$. FFMQ = Five Facet Mindfulness Questionnaire, WBSI = White Bear Suppression Inventory, MEAQ = Multidimensional Experiential Avoidance Questionnaire (DS = Distraction/Avoidance subscale; BA = Behavioral Avoidance subscale), AAQ = Acceptance and Action Questionnaire, ATQ = Automatic Thought Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms, WHO DAS = World Health Organization Disability Assessment Scale II, SWLS = Satisfaction with Life Scale.

Table A7: Correlations Between Raw Scores at Mid-Treatment

| | FFMQ | WBSI | MEAQ- DS | MEAQ- BA | AAQ | ATQ | IDAS Dys | IDAS Well | WHO DAS | SWLS |
|-----------------|------|--------|-------------|-------------|--------|--------|-------------|--------------|------------|--------|
| FFMQ | -- | -.33** | -.35** | -.43** | -.58** | -.30** | -.28* | .45** | -.32** | .16 |
| WBSI | | -- | .66** | .51** | .53** | .30** | .19 | -.42** | .27* | -.28* |
| MEAQ-DS | | | -- | .68** | .66** | .11 | .07 | -.27* | .32** | -.15 |
| MEAQ-BA | | | | -- | .67** | .25* | .26* | -.37** | .39** | -.30* |
| AAQ | | | | | -- | .43** | .39** | -.52** | .47** | -.36** |
| ATQ | | | | | | -- | .77** | -.63** | .52** | -.60** |
| IDAS Dysphoria | | | | | | | -- | -.66** | .57** | -.42** |
| IDAS Well-Being | | | | | | | | -- | -.47** | .53** |
| WHO DAS | | | | | | | | | -- | -.40** |
| SWLS | | | | | | | | | | -- |

Note. $N = 74$. * $p < .05$; ** $p < .01$. FFMQ = Five Facet Mindfulness Questionnaire, WBSI = White Bear Suppression Inventory, MEAQ = Multidimensional Experiential Avoidance Questionnaire (DS = Distraction/Avoidance subscale; BA = Behavioral Avoidance subscale), AAQ = Acceptance and Action Questionnaire, ATQ = Automatic Thought Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms, WHO DAS = World Health Organization Disability Assessment Scale II, SWLS = Satisfaction with Life Scale.

Table A8: Correlations Between Raw Scores at Post-Treatment

| | FFMQ | WBSI | MEAQ-DS | MEAQ-BA | AAQ | ATQ | IDAS Dys | IDAS Well | WHO DAS | SWLS |
|-----------------|------|--------|---------|---------|--------|--------|----------|-----------|---------|--------|
| FFMQ | -- | -.43** | -.46** | -.55** | -.66** | -.49** | -.56** | .57** | -.34** | .37** |
| WBSI | | -- | .52** | .53** | .68** | .52** | .44** | -.38** | .49** | -.43** |
| MEAQ-DS | | | -- | .73** | .65** | .20 | .27* | -.41** | .43** | -.24* |
| MEAQ-BA | | | | -- | .77** | .38** | .49** | -.53** | .67** | -.40** |
| AAQ | | | | | -- | .59** | .61** | -.64** | .57** | -.54** |
| ATQ | | | | | | -- | .77** | -.58** | .41** | -.55** |
| IDAS Dysphoria | | | | | | | -- | -.65** | .54** | -.49** |
| IDAS Well-Being | | | | | | | | -- | -.50** | .55** |
| WHO DAS | | | | | | | | | -- | -.53** |
| SWLS | | | | | | | | | | -- |

Note. $N = 106$. * $p < .05$; ** $p < .01$. FFMQ = Five Facet Mindfulness Questionnaire, WBSI = White Bear Suppression Inventory, MEAQ = Multidimensional Experiential Avoidance Questionnaire (DS = Distraction/Avoidance subscale; BA = Behavioral Avoidance subscale), AAQ = Acceptance and Action Questionnaire, ATQ = Automatic Thought Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms, WHO DAS = World Health Organization Disability Assessment Scale II, SWLS = Satisfaction with Life Scale.

Table A9: Correlations Between Residualized Change Scores: Change from Pre- to Post-Treatment

| | FFMQ | Mind Prac | WBSI | MEAQ- DS | MEAQ- BA | AAQ | ATQ | IDAS Dys | IDAS Well | WHO DAS | SWLS |
|----------------------|------|--------------|--------|-------------|-------------|--------|--------|-------------|--------------|------------|--------|
| FFMQ | -- | .24 | -.45** | -.51** | -.43** | -.57** | -.45** | -.54** | .48* | -.34** | .33** |
| Mindfulness Practice | | -- | .14 | -.27† | -.24 | -.20 | -.10 | -.05 | .28* | .07 | .00 |
| WBSI | | | -- | .41** | .38** | .60** | .45** | .40** | -.30** | .41** | -.44** |
| MEAQ-DS | | | | -- | .63** | .60** | .25* | .51** | -.45** | .29* | -.26* |
| MEAQ-BA | | | | | -- | .61** | .42** | .57** | -.52** | .52** | -.39** |
| AAQ | | | | | | -- | .44** | .51** | -.50** | .44** | -.50** |
| ATQ | | | | | | | -- | .57** | -.45** | .36** | -.38** |
| IDAS Dysphoria | | | | | | | | -- | -.60** | .45** | -.36* |
| IDAS Well-Being | | | | | | | | | -- | -.48** | .38** |
| WHO DAS | | | | | | | | | | -- | -.41** |
| SWLS | | | | | | | | | | | -- |

Note. $N = 106$. † $p = .06$; * $p < .05$; ** $p < .01$. FFMQ = Five Facet Mindfulness Questionnaire, WBSI = White Bear Suppression Inventory, MEAQ = Multidimensional Experiential Avoidance Questionnaire (DS = Distraction/Avoidance subscale; BA = Behavioral Avoidance subscale), AAQ = Acceptance and Action Questionnaire, ATQ = Automatic Thought Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms, WHO DAS = World Health Organization Disability Assessment Scale II, SWLS = Satisfaction with Life Scale.

Table A10: Correlations Between Residualized Change Scores: Change in Predictor Variables and Mediator Variables from Pre- to Mid-Treatment and Change in Outcome Variables from Mid- to Post-Treatment

| | FFMQ | WBSI | MEAQ- DS | MEAQ- BA | AAQ | ATQ | IDAS Dys | IDAS Well | WHO DAS | SWLS |
|------------------------|------|------|-------------|-------------|-------|------|---------------------|----------------------|--------------------|-------------|
| FFMQ | -- | -.09 | -.25 | -.12 | -.29* | -.09 | -.18 | .18 | .03 | .13 |
| WBSI | | -- | .46** | .32** | .44** | .03 | .00 | .00 | .15 | .04 |
| MEAQ-DS | | | -- | .56** | .57** | -.04 | .01 | -.06 | -.04 | .14 |
| MEAQ-BA | | | | -- | .47** | -.13 | -.09 | -.01 | .17 | .05 |
| AAQ | | | | | -- | -.08 | -.03 | .09 | .05 | .04 |
| ATQ | | | | | | -- | .63** | -.49** | .25* | -.43** |
| IDAS Dysphoria | | | | | | | -- | -.52** | .30** | .42** |
| IDAS Well-Being | | | | | | | | -- | .48** | .33** |
| WHO DAS | | | | | | | | | -- | -.25* |
| SWLS | | | | | | | | | | -- |

Note. $N = 74$. * $p < .05$; ** $p < .01$. All measures in bold font reflect change from mid- to post-treatment; measures not in bold reflect changes from pre- to mid- treatment. FFMQ = Five Facet Mindfulness Questionnaire, WBSI = White Bear Suppression Inventory, MEAQ = Multidimensional Experiential Avoidance Questionnaire (DS = Distraction/Avoidance subscale; BA = Behavioral Avoidance subscale), AAQ = Acceptance and Action Questionnaire, ATQ = Automatic Thought Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms, WHO DAS = World Health Organization Disability Assessment Scale II, SWLS = Satisfaction with Life Scale.

Table A11: Results of PRODCLIN Test of Mediation for All Mediation Models

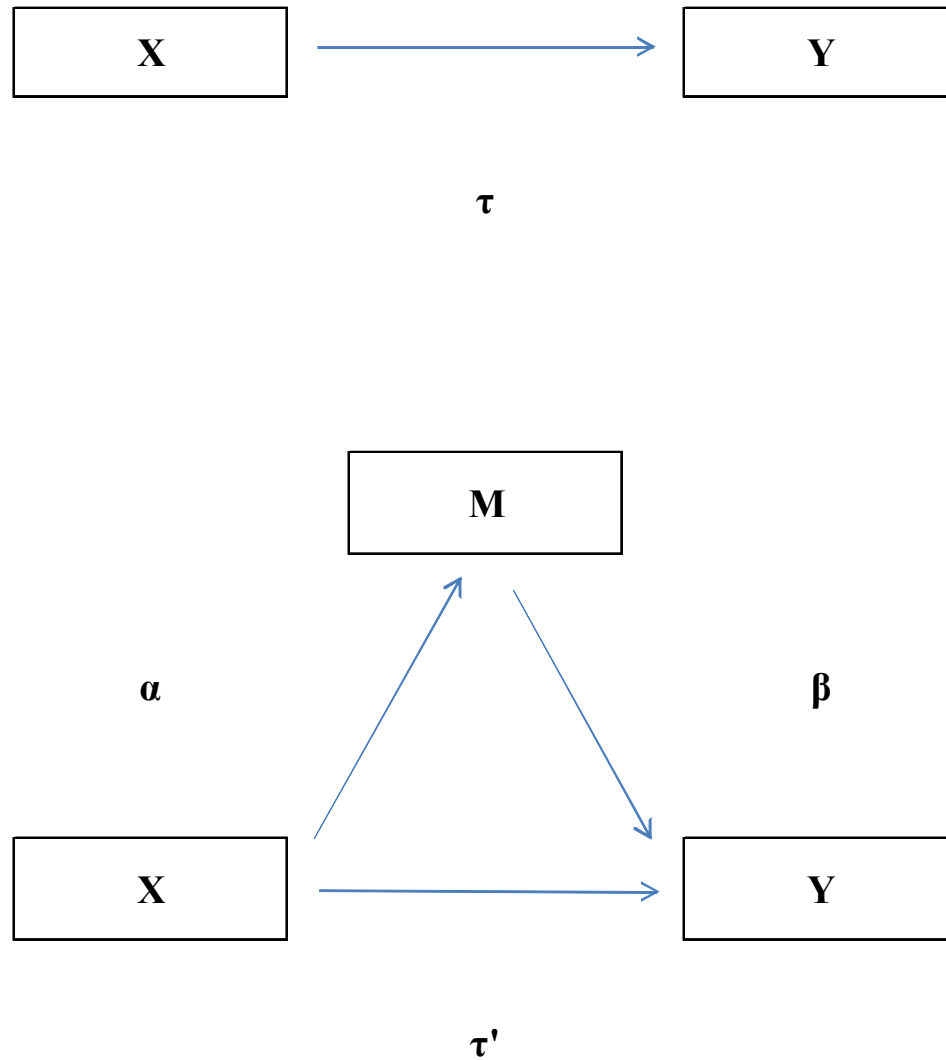
| Model | Predictor Variable | Mediator Variable | Outcome Variable | Lower Confidence Limit | Upper Confidence Limit | Significance |
|-------|------------------------------|-------------------------------|-------------------------------------|------------------------|------------------------|--------------|
| 1 | Mindfulness (Δ FFMQ) | Avoidance (Δ WBSI) | Negative Cognitions (Δ ATQ) | -.0870 | -.0145 | * |
| 2 | Mindfulness (Δ FFMQ) | Avoidance (Δ MEAQ-DS) | Negative Affect (Δ IDAS) | -.1462 | -.0097 | * |
| 3 | Mindfulness (Δ FFMQ) | Avoidance (Δ MEAQ-BA) | Negative Affect (Δ IDAS) | -.1654 | -.0305 | * |
| 4 | Mindfulness (Δ FFMQ) | Avoidance (Δ AAQ) | Negative Affect (Δ IDAS) | -.1779 | -.0366 | * |
| 5 | Mindfulness (Δ FFMQ) | Avoidance (Δ MEAQ-DS) | Positive Affect (Δ IDAS) | .0247 | .2100 | * |
| 6 | Mindfulness (Δ FFMQ) | Avoidance (Δ MEAQ-BA) | Positive Affect (Δ IDAS) | .0412 | .2204 | * |
| 7 | Mindfulness (Δ FFMQ) | Avoidance (Δ AAQ) | Positive Affect (Δ IDAS) | .0552 | .2316 | * |
| 8 | Mindfulness (Δ FFMQ) | Avoidance (Δ MEAQ-BA) | Disability (Δ WHODAS) | -.2964 | -.0625 | * |
| 9 | Mindfulness (Δ FFMQ) | Avoidance (Δ MEAQ-DS) | Satisfaction (Δ SWLS) | -.0300 | .1480 | |
| 10 | Mindfulness (Δ FFMQ) | Avoidance (Δ MEAQ-BA) | Satisfaction (Δ SWLS) | .0196 | .1842 | * |
| 11 | Mindfulness (Δ FFMQ) | Avoidance (Δ AAQ) | Satisfaction (Δ SWLS) | -.2542 | -.0857 | * |
| 12 | Mindfulness (Practice) | Avoidance (Δ MEAQ-DS) | Positive Affect (Δ IDAS) | .0006 | .1238 | * |

Note. Δ = residual change from pre- to post-treatment; FFMQ = Five Facet Mindfulness Questionnaire, WBSI = White Bear Suppression Inventory, MEAQ-DS = Multidimensional Experiential Avoidance Questionnaire-Distraction/Suppression, MEAQ-BA = Multidimensional Experiential Avoidance Questionnaire-Behavioral Avoidance, AAQ = Acceptance and Action Questionnaire, ATQ = Automatic Thought Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms, WHODAS = World Health Organization Disability Assessment Schedule II, SWLS = Satisfaction with Life Scale; * = the PRODCLIN test of mediation is significant as the 95% confidence interval does not include zero.

APPENDIX B

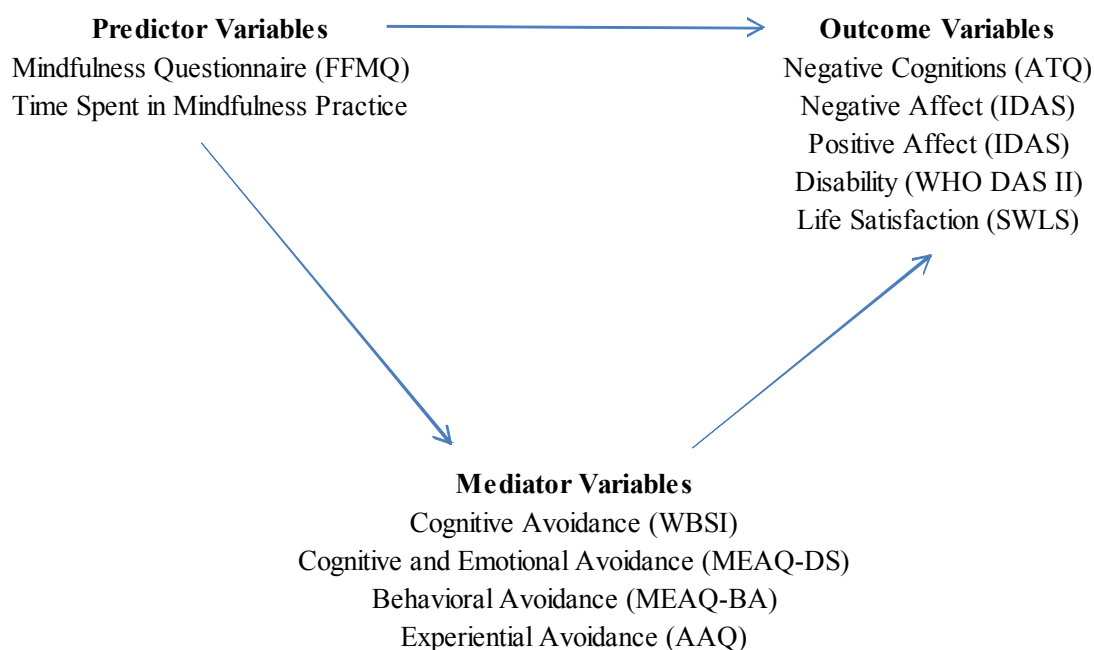
FIGURES

Figure B1: Path Diagram for Statistical Mediation



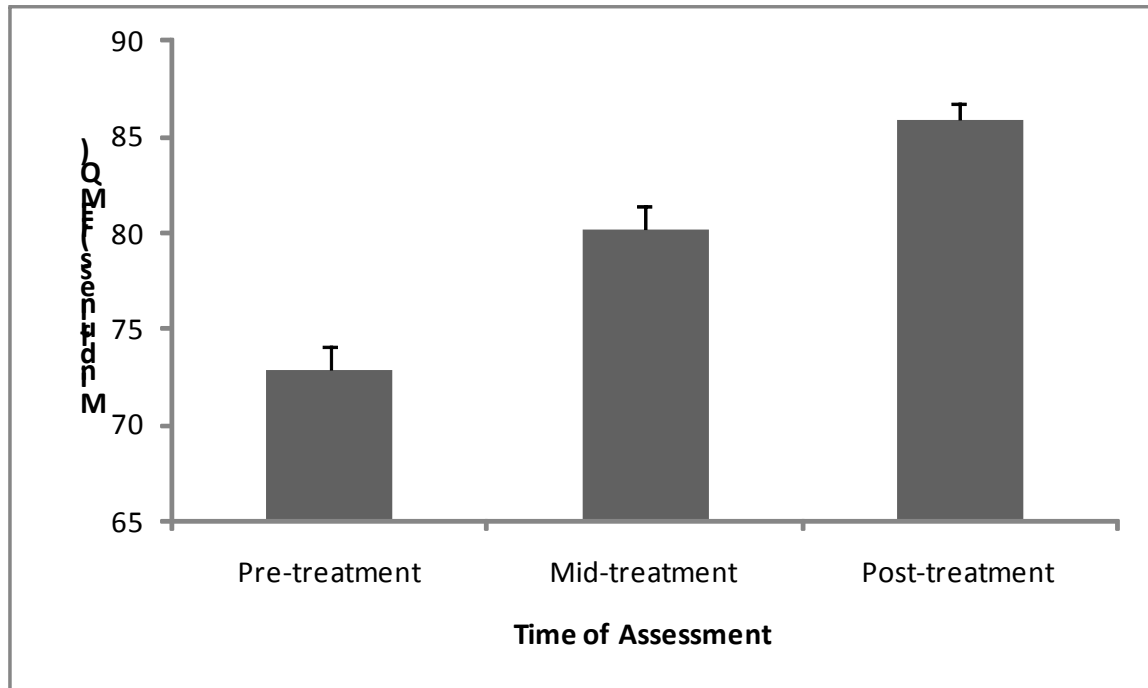
Note. The model on the top of the figure represents the direct effect of the independent variable (X) on the dependent variable (Y). The model on the bottom of the figure depicts the indirect effect of the independent variable on the dependent variable through the mediator (M) variable.

Figure B2: Mediation Diagram Showing all Predictor, Mediator, and Outcome Variables used in the Mediation Analyses



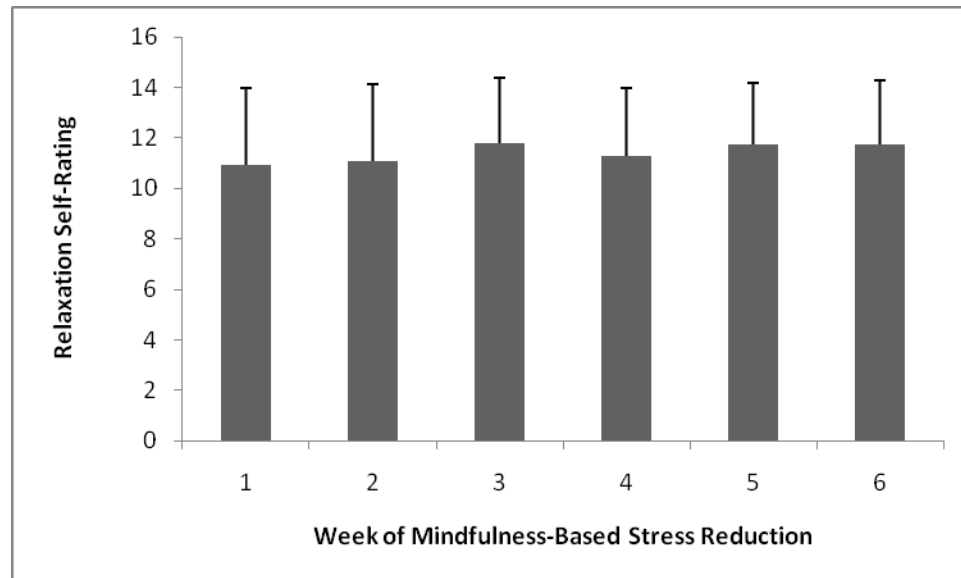
Note. FFMQ = Five Facet Mindfulness Questionnaire (Observing, Describing and Acting with Awareness subscales), ATQ = Automatic Thought Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms (Dysphoria and Well Being subscales), WHO DAS II = World Health Organization Disability Assessment Schedule, SWLS = Satisfaction with Life Scale, WBSI = White Bear Suppression Inventory (Thought Suppression subscale), MEAQ = Multidimensional Experiential Avoidance Questionnaire (Distraction/Suppression and Behavioral Avoidance subscales), AAQ = Acceptance and Action Questionnaire.

Figure B3: Mindfulness Scores at Pre-Treatment, Mid-Treatment, and Post-Treatment



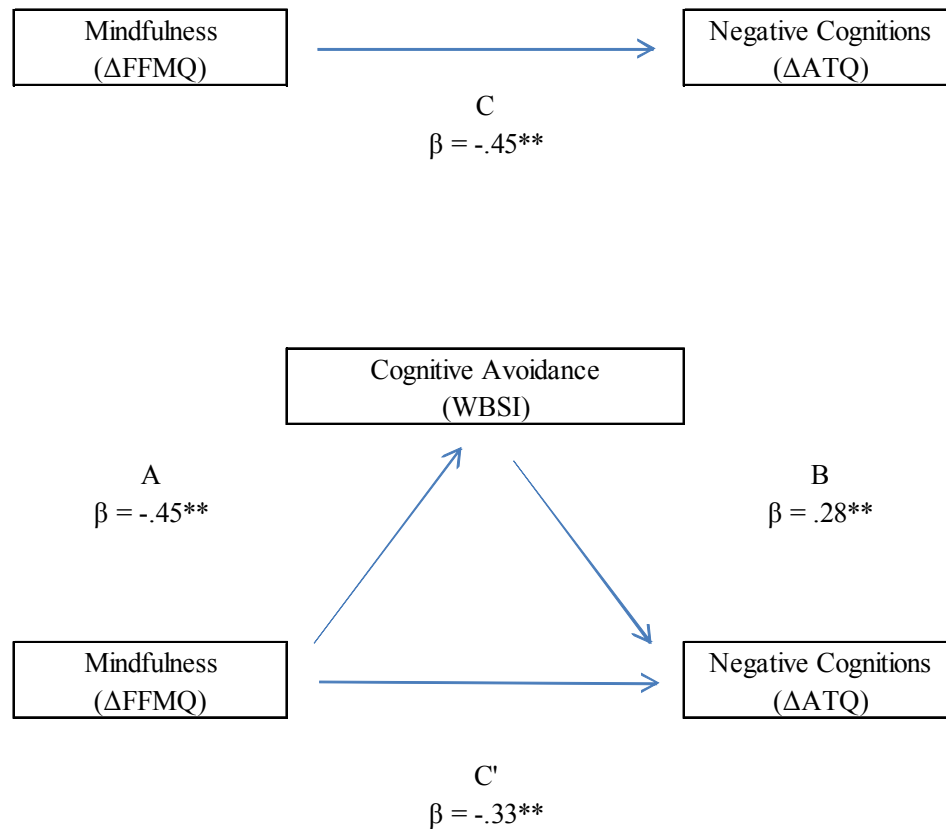
Note. $N = 106$ for pre- and post-treatment; $n = 74$ for mid-treatment. FFMQ = Five Facet Mindfulness Questionnaire. Planned comparisons indicate that mindfulness at each time-point significantly differed from mindfulness at each other time-point, all p 's < .011.

Figure B4: Relaxation Self-Ratings From Weekly Practice Logs



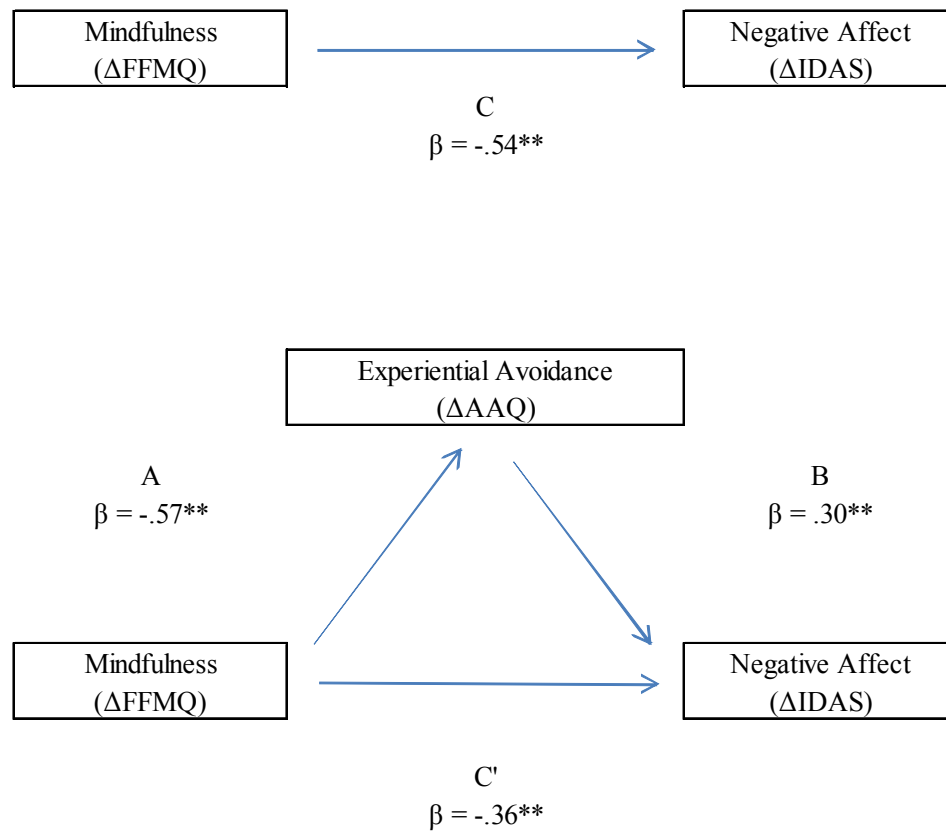
Note. $N = 66$. Though the Mindfulness-Based Stress Reduction program was 8 weeks long, six weeks of class data are shown. This is because participants did not complete homework for their first class; in addition, markedly fewer participants handed in practice logs at the last class and therefore data collected from the last class was not considered sufficiently complete to be included.

Figure B5: Results of the Hypothesized Mediation Model with Mindfulness as Predictor, Cognitive Avoidance as Mediator, and Negative Cognitions as Outcome Variable.



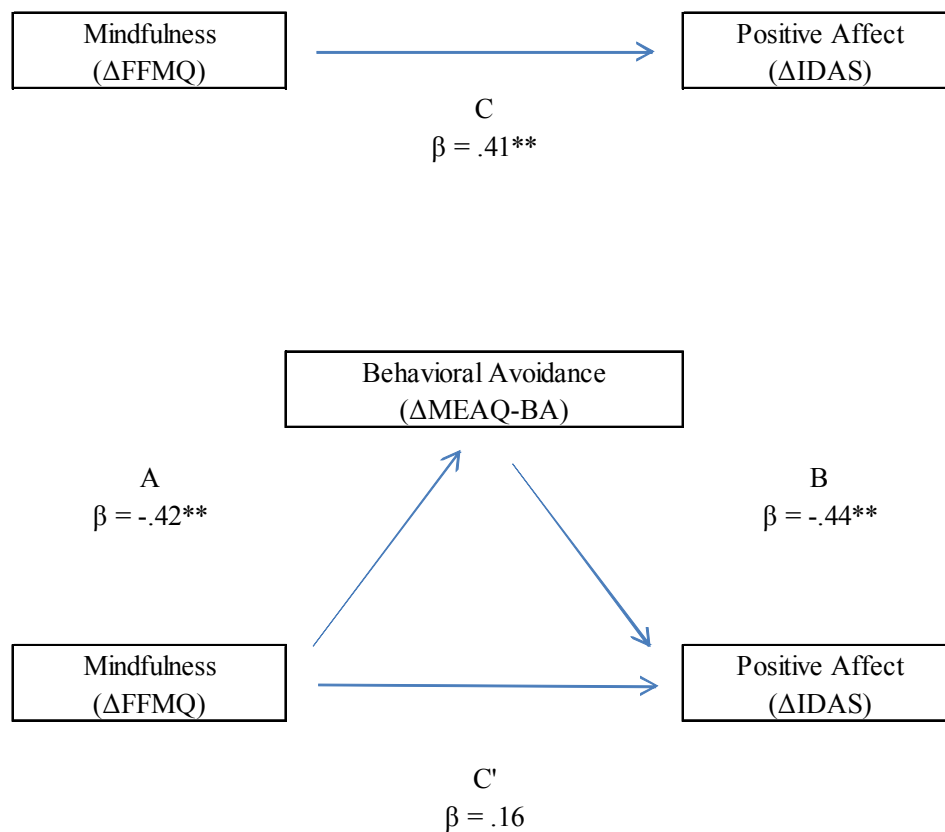
Note. $N = 106$. Δ = residual change from pre-treatment to post-treatment; FFMQ = Five Facet Mindfulness Questionnaire, WBSI = White Bear Suppression Inventory, ATQ = Automatic Thought Questionnaire. * $p < .05$; ** $p < .01$.

Figure B6: Results of the Hypothesized Mediation Model with Mindfulness as the Predictor, Experiential Avoidance as Mediator, and Negative Affect as Outcome Variable



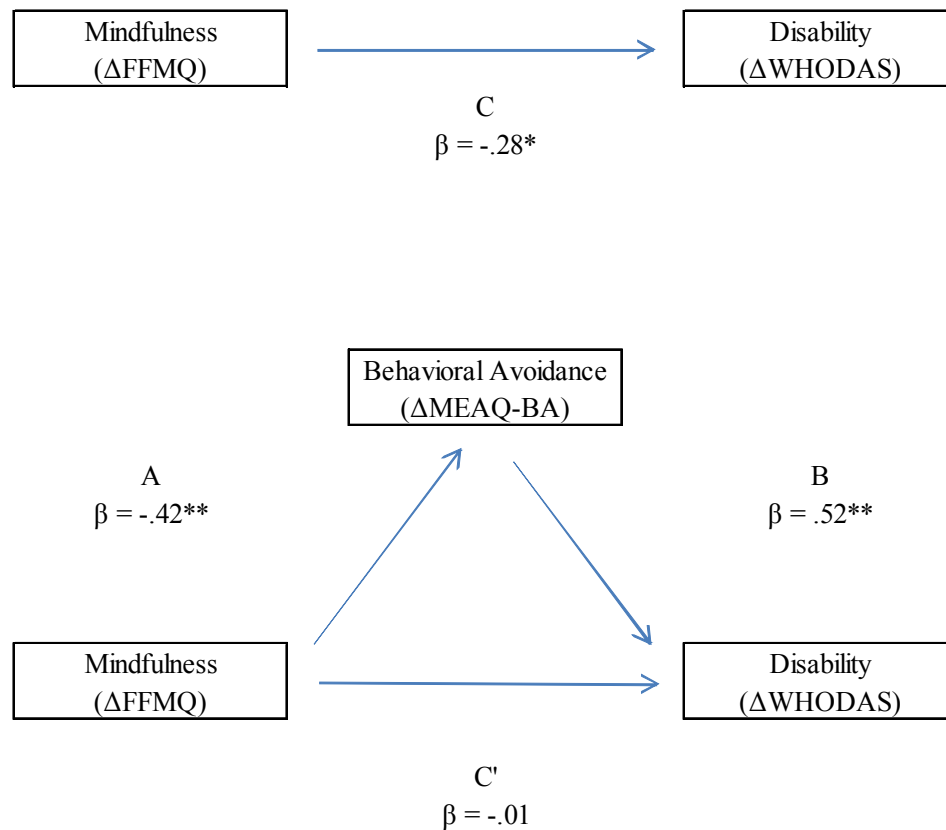
Note. $N = 106$. Δ = residual change from pre-treatment to post-treatment; FFMQ = Five Facet Mindfulness Questionnaire, AAQ = Acceptance and Action Questionnaire, IDAS = Inventory of Depression and Anxiety Symptoms (Dysphoria subscale). * $p < .05$; ** $p < .01$.

Figure B7: Results of the Hypothesized Mediation Model with Mindfulness as Predictor, Behavioral Avoidance as Mediator, and Positive Affect as Outcome Variable.



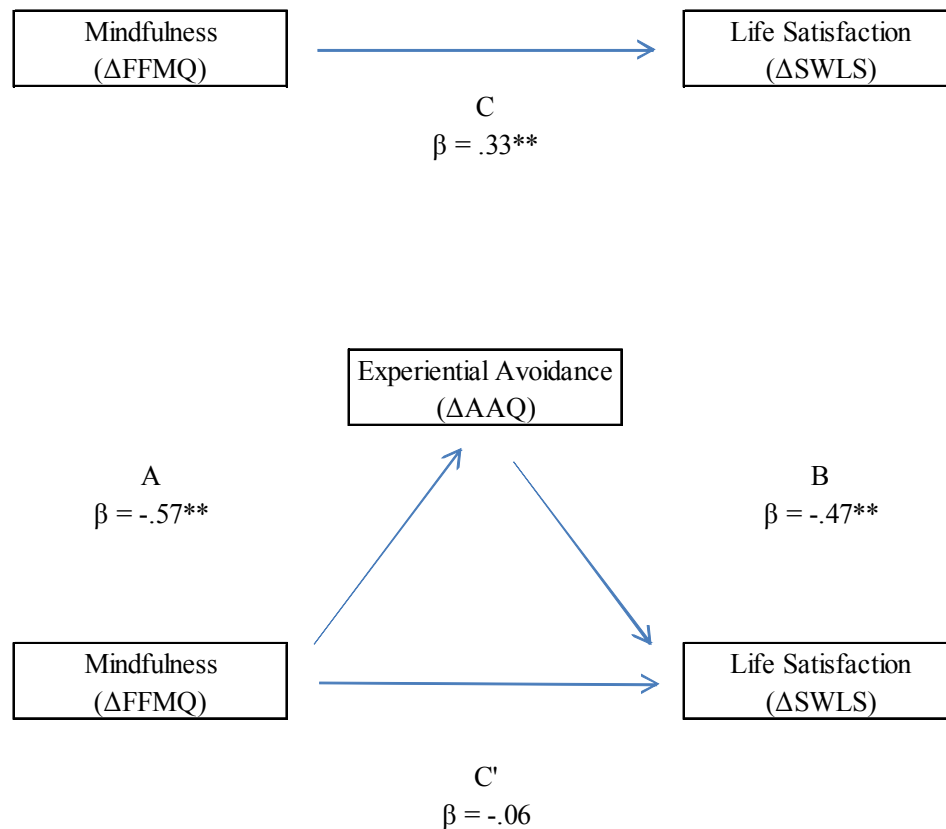
Note. $N = 74$. Δ = residual change from pre-treatment to post-treatment; FFMQ = Five Facet Mindfulness Questionnaire, MEAQ-BA = Multidimensional Experiential Avoidance Questionnaire (Behavioral Avoidance subscale), IDAS = Inventory of Depression and Anxiety Symptoms (Well-Being subscale). * $p < .05$; ** $p < .01$.

Figure B8: Results of the Hypothesized Mediation Model with Mindfulness as Predictor, Behavioral Avoidance as Mediator, and Disability as Outcome Variable.



Note. $N = 74$. Δ = residual change from pre-treatment to post-treatment; FFMQ = Five Facet Mindfulness Questionnaire, MEAQ-B = Multidimensional Experiential Avoidance Questionnaire (Behavioral Avoidance subscale), WHODAS = World Health Organization Disability Assessment Schedule II. $*p < .05$; $**p < .01$.

Figure B9: Results of the Hypothesized Mediation Model with Mindfulness as Predictor, Experiential Avoidance as Mediator, and Life Satisfaction as Outcome Variable.



Note. $N = 106$. Δ = residual change from pre-treatment to post-treatment; FFMQ = Five Facet Mindfulness Questionnaire, AAQ = Acceptance and Action Questionnaire; SWLS = Satisfaction with Life Scale. * $p < .05$; ** $p < .01$.

APPENDIX C

MEASURES

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 what has been true for you for the past two weeks.

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

Factor 1: Nonreactivity to Inner Experience

1. I perceive my feelings and emotions without having to react to them.
2. I watch my feelings without getting lost in them.
3. In difficult situations, I can pause without immediately reacting.
4. Usually when I have distressing thoughts or images, I am able just to notice them without reacting.
5. Usually when I have distressing thoughts or images, I feel calm soon after.
6. Usually when I have distressing thoughts or images, I “step back” and am aware of the thought or image without getting taken over by it.
7. Usually when I have distressing thoughts or images, I just notice them and let them go.

Factor 2: Observing/ Noticing/ Attending to Sensations/

Perceptions/ Thoughts/ Feelings

1. When I’m walking, I deliberately notice the sensation of my body moving.
2. When I take a shower or a bath, I stay alert to the sensations of water on my body.

3. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.
4. I pay attention to sensations, such as the wind in my hair or sun on my face.
5. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
6. I notice the smells and aromas of things.
7. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.
8. I pay attention to how my emotions affect my thoughts and behavior.

Factor 3: Acting with Awareness/ Automatic pilot/

Concentration/ Nondistracted

1. I find it difficult to stay focused on what's happening in the present.
2. It seems I am "running on automatic" without much awareness of what I'm doing.
3. I rush through activities without being really attentive to them.
4. I do jobs or tasks automatically, without being aware of what I'm doing.
5. I find myself doing things without paying attention.
6. When I do things, my mind wanders off and I'm easily distracted.
7. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.
8. I am easily distracted.

Factor 4: Describing/ Labeling with Words

1. I'm good at finding words to describe my feelings.
2. I can easily put my beliefs, opinions, and expectations into words.
3. It's hard for me to find the words to describe what I'm thinking.
4. I have trouble thinking of the right words to express how I feel about things.

5. When I have a sensation in my body, it's hard for me to describe it because I can't find the right words.
6. Even when I'm feeling terribly upset, I can find a way to put it into words.
7. My natural tendency is to put my experiences into words.
8. I can usually describe how I feel at the moment in considerable detail.

Factor 5: Nonjudging of Experience

1. I criticize myself for having irrational or inappropriate emotions.
2. I tell myself that I shouldn't be feeling the way I'm feeling.
3. I believe that some of my thoughts are abnormal or bad and I shouldn't think that way.
4. I make judgments about whether my thoughts are good or bad.
5. I tell myself I shouldn't be thinking the way I'm thinking.
6. I think some of my emotions are bad or inappropriate and I shouldn't feel them.
7. I disapprove of myself when I have irrational ideas.
8. Usually when I have distressing thoughts or images, I judge myself as good or bad, depending on what the thought/image is about.

White Bear Suppression Inventory (WBSI):

Thought Suppression Subscale

Please indicate how much you agree or disagree with each of the following statements as it describes your experience over the past two weeks.

| 1 | 2 | 3 | 4 | 5 |
|-------------------|---------------------|----------------------------|------------------|----------------|
| Strongly disagree | Moderately disagree | Neither agree nor disagree | Moderately agree | Strongly agree |

1. There are some things I prefer not to think about.
2. I always try to put problems out of mind.
3. Sometimes I stay busy just to keep thoughts from intruding on my mind.
4. There are things that I try not to think about.
5. Sometimes I really wish I could stop thinking.
6. I often do things to distract myself from my thoughts.
7. I have thoughts that I try to avoid.

Multidimensional Experiential Avoidance Questionnaire

(MEAQ)

Please indicate the extent to which you agree or disagree with each of the following statements as it applies to you over the past two weeks.

| | | | | | | |
|-------|----------------|--------|-----------|------------|------------------|--------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Never | Very Seldom | Seldom | Sometimes | Frequently | Almost always | Always |

Distraction/Suppression Subscale

1. When something upsetting comes up, I try very hard to stop thinking about it.
2. I usually try to distract myself when I feel something painful.
3. When negative thoughts come up, I try to fill my head with something else.
4. When upsetting memories come up, I try to focus on other things.
5. When unpleasant memories come to me, I try to put them out of my mind.
6. When a negative thought comes up, I immediately try to think of something else
7. I work hard to keep out upsetting feelings.

Behavioral Avoidance Subscale

1. I won't do something if I think it will make me uncomfortable.
2. I avoid activities if there is even a small possibility of getting hurt.
3. I rarely do something if there is a chance that it will upset me.
4. If I am in a slightly uncomfortable situation, I try to leave right away.
5. I prefer to stick to what I am comfortable with, rather than try new activities.
6. If I have any doubts about doing something, I just won't do it.
7. If I am starting to feel trapped, I leave the situation immediately.

8. I work hard to avoid situations that might bring up unpleasant thoughts and feelings in me.
9. I go out of my way to avoid uncomfortable situations.
10. I avoid situations if there is a chance that I'll feel nervous.
11. I'm quick to leave any situation that makes me feel uneasy.

Acceptance and Action Questionnaire (AAQ)

Internal Avoidance Items

1. I try hard to avoid feeling anxious or jittery.
2. I need to control my feelings in order to handle my life well.
3. I can't stand feeling sad or guilty.
4. If an unpleasant memory comes into my head, I try to get rid of it.
5. I try to avoid thoughts and feelings that cause difficulty in my daily life.
6. I try hard to control the physical reactions that I experience in my body (heart racing, sweating).
7. When I feel uneasy, I do whatever I can to get rid of those feelings.
8. I try hard not to have bad feelings.

Behavioral Avoidance Items

1. I can do things that are important to me even if I am feeling unhappy.
2. I can move toward important goals, even if I don't feel good about myself.
3. I try to achieve my goals, even if I am uncertain that I can.
4. I work toward things I value, even though at times I feel uncomfortable or uncertain.
5. I take action on a problem, even when I fear I may get it wrong.
6. I can set a course in my life and stick to it, even if I have doubts.
7. If I feel uncertain, I can still make a choice and take action.
8. If I promised to do something, I'll do it, even if later I don't feel like it.
9. In order to achieve my goals, I will not avoid people or places that upset me.
10. Having some worries will not prevent me from living a full life.
11. My thoughts and feelings do not get in the way of how I want to live my life.
12. I don't avoid situations that make me feel jittery.

Automatic Thought Questionnaire (ATQ)

Listed below are a variety of thoughts that pop into people's heads. Please read each thought and indicate how frequently, if at all, the thought occurred to you over the past two weeks.

| 1 | 2 | 3 | 4 | 5 |
|------------|-----------|------------------|-------|--------------|
| Not at all | Sometimes | Moderately often | Often | All the time |

1. I'm no good.
2. I'm so disappointed in myself.
3. What's wrong with me?
4. I'm worthless.
5. I feel so helpless.
6. Something has to change.
7. My future is bleak.
8. I can't finish anything.

Inventory of Depression and Anxiety Symptoms (IDAS)

Below is a list of feelings, sensations, problems, and experiences that people sometimes have. Read each item to determine how well it describes your recent feelings and experiences. Then select the option that best describes how much you have felt or experienced things this way during the past two weeks, including today. Use this scale when answering:

| | | | | |
|------------|--------------|------------|-------------|-----------|
| 1 | 2 | 3 | 4 | 5 |
| Not at all | A little bit | Moderately | Quite a bit | Extremely |

Dysphoria Subscale

1. I felt depressed.
2. I felt inadequate.
3. I felt fidgety, restless.
4. I blamed myself for things.
5. I felt discouraged about things.
6. I had little interest in my usual hobbies or activities.
7. I had trouble concentrating.
8. I had trouble making up my mind.
9. I talked more slowly than usual.
10. I found myself worrying all the time.

Well-Being Subscale

1. I was proud of myself.
2. I felt optimistic.
3. I felt that I had accomplished a lot.
4. I looked forward to things with enjoyment.

5. I felt hopeful about the future.
6. I felt that I had a lot to look forward to.
7. I felt like I had a lot of interesting things to do.
8. I felt like I had a lot of energy.

World Health Organization

Disability Assessment Schedule II (WHO DAS II)

This questionnaire asks about difficulties due to health conditions. Health conditions include diseases or illnesses, other health problems that may be short or long lasting, injuries, mental or emotional problems, and problems with alcohol or drugs.

Please circle only one response:

| | | | | | | |
|----|--|-----------|------|----------|-----|----------|
| 1. | How do you rate your overall health in the <u>past 30 days</u> ? | Very good | Good | Moderate | Bad | Very Bad |
|----|--|-----------|------|----------|-----|----------|

Think back over the last 30 days and answer these questions thinking about how much difficulty you had doing the following activities. For each question, please circle only one response.

In the last 30 days, how much difficulty did you have in:

| | | | | | | |
|----|--|------|------|----------|--------|----------------------|
| 2. | Standing for long periods such as 30 minutes? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 3. | Taking care of your household responsibilities? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 4. | Learning a new task, for example, learning how to get to a new place? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 5. | How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can? | None | Mild | Moderate | Severe | Extreme/ Can't Do |

| | | | | | | |
|-----|--|------|------|----------|--------|----------------------|
| 6. | How much have you been emotionally affected by your health problems? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 7. | Concentrating on doing something for ten minutes? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 8. | Walking a long distance such as a mile? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 9. | Washing your whole body? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 10. | Getting dressed? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 11. | Dealing with people you do not know? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 12. | Maintaining a friendship? | None | Mild | Moderate | Severe | Extreme/ Can't Do |
| 13. | Your day to day work? | None | Mild | Moderate | Severe | Extreme/ Can't Do |

| | | | | | | |
|-----|--|------------|--------|------------|----------|-----------|
| 14. | Overall, how much did these difficulties interfere with your life? | Not at all | Mildly | Moderately | Severely | Extremely |
|-----|--|------------|--------|------------|----------|-----------|

| | | |
|-----|--|---------------------------------|
| 15. | Overall, in the past 30 days, <u>how many days</u> were these difficulties present? | RECORD NUMBER OF DAYS: _____ |
| 16. | In the past 30 days, for how many days were you totally unable to carry out your usual activities or work because of any health condition? | RECORD NUMBER OF DAYS: _____ |
| 17. | In the past 30 days, not counting the days that you were totally unable, for how many days did you cut back or reduce your usual activities or work because of any health condition? | RECORD NUMBER OF DAYS: _____ |

Satisfaction with Life Scale (SWLS)

Below are five statements with which you may agree or disagree. Using the scale below, indicate your level of agreement with each item by placing the appropriate number on the line preceding that item. Please respond with reference to the past two weeks.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-------------------|----------|-------------------|----------------------------|----------------|-------|----------------|
| Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree |

1. In most ways my life is close to my ideal.
2. The conditions of my life are excellent.
3. I am satisfied with my life.
4. So far I have gotten the important things I want in my life.
5. If I could live my life over, I would change almost nothing

APPENDIX D
PRACTICE LOG

Mindfulness Practice Record Form

| | |
|--|--|
| <p>RESEARCH PARTICIPANTS: Please answer the following questions on each week's record form. This is your ID code.</p> <p>First two letters of the town in which you were born? ____ ____</p> <p>First two letters of mother's maiden name?..... ____ ____</p> <p>During what <u>month</u> were you born? _____</p> <p>How many <u>brothers</u> do you have? _____</p> | <p>If you are not a research participant:</p> <p>Please write your initials: _____.</p> |
|--|--|

Instructions: Record on the Practice Record Form each time you do the formal and informal practice this week. Make a note of how long you do formal practice and what you experience as you do the practice. As discussed in class, hopefully you will do the assigned practices each day; however, please fill out the form to accurately reflect your practices. Please bring the form to your next class.

| Day | Date | Type of Practice (e.g. yoga, sitting meditation, body scan, etc.) | Minutes of Formal Practice | What did you experience/observe? |
|-----|------|---|-------------------------------|---|
| 1 | | Formal: Informal: | | After your first formal practice of the week, please fill out the attached form. |
| 2 | | Formal: Informal: | | |
| 3 | | Formal: Informal: | | |
| 4 | | Formal: Informal: | | |
| 5 | | Formal: Informal: | | |
| 6 | | Formal: Informal: | | |
| 7 | | Formal: Informal: | | |

EXPERIENCE OF MINDFULNESS PRACTICE

Please complete this questionnaire immediately after completing your first formal practice session of the week. This questionnaire is to be completed once per week.

| | |
|--|--|
| <p>RESEARCH PARTICIPANTS: Please answer these questions to create your personal ID code.</p> <p>Today's Date: _____</p> <p>First two letters of the town in which you were born? ____ ____</p> <p><u>First two letters</u> of mother's maiden name?..... ____ ____</p> <p>During what month were you born? _____</p> <p>How many brothers do you have? _____</p> | <p>If you are not a research participant:</p> <p>Please write your initials: _____.</p> |
|--|--|

| | Not At All | A Little Bit | Moderately | Quite A Bit | Extremely |
|--|------------|--------------|------------|-------------|-----------|
| 1. I was aware of my thoughts and feelings without getting lost in them. | 1 | 2 | 3 | 4 | 5 |
| 2. My arms and legs felt warm. | 1 | 2 | 3 | 4 | 5 |
| 3. I tried to control my thoughts and feelings. | 1 | 2 | 3 | 4 | 5 |
| 4. I was able to focus on the experiences of the present moment. | 1 | 2 | 3 | 4 | 5 |
| 5. My arms and legs felt heavy. | 1 | 2 | 3 | 4 | 5 |
| 6. My mind wandered. | 1 | 2 | 3 | 4 | 5 |
| 7. I felt relaxed. | 1 | 2 | 3 | 4 | 5 |
| 8. I felt restless. | 1 | 2 | 3 | 4 | 5 |
| 9. I tried to put problems out of my mind. | 1 | 2 | 3 | 4 | 5 |
| 10. I observed unpleasant feelings without being drawn into them. | 1 | 2 | 3 | 4 | 5 |
| 11. I was alert and attentive. | 1 | 2 | 3 | 4 | 5 |
| 12. My muscles felt loose and limp. | 1 | 2 | 3 | 4 | 5 |
| 13. If I felt something emotionally intense, I tried to distract myself. | 1 | 2 | 3 | 4 | 5 |
| 14. I felt sleepy. | 1 | 2 | 3 | 4 | 5 |

APPENDIX E

SAMPLE MINDFULNESS EXERCISES

Exercise 1 – Basic Mindfulness Meditation Exercise

- Assume a comfortable posture lying on your back or sitting; keep the spine straight and let your shoulders drop.
- Close your eyes, if it feels comfortable.
- Bring your attention to your belly, feeling it rise or expand gently on the in-breath and fall or recede on the out-breath.
- Keep the focus on your breathing, “being with” each in-breath for its full duration and with each out-breath for its full duration, as if you were riding the waves of your own breathing.
- Every time you notice that your mind has wandered off the breath, notice what it was that took you away, and then gently bring your attention back to your belly and the feeling of the breath coming in and out.
- If your mind wanders away from your breath a thousand times, then your “job” is simply to bring it back to the breath every time, no matter what preoccupies it.
- Practice this exercise for 15 minutes at a convenient time every day. Over time, try extending the time that you practice until you can practice for thirty minutes or more.

Exercise 2 – Variations on Basic Mindfulness Exercise

- Once you can maintain some continuity of attention on the present-moment sensations of the breath, you can expand your awareness.
- Expand your field of awareness to include awareness of your body sensations.
- Try listening to the sounds around you. This means hearing what is here to be heard, moment by moment, without judging the sounds.
- Shift your awareness to the process of thinking itself. Just watch thoughts come into and leave the field of your attention. Note their content while, if possible,

not being drawn into thinking about them. Just maintain the “frame” through which you are observing the process of thought.

- Also observe feelings or moods as they come and go. If you get lost in all this, just go back to your breathing.

Exercise 3 – Mindfulness in Daily Life

- Tune in to your breathing at different times during the day, feeling the belly go through one or two risings and fallings.
- Become aware of your thoughts and feelings at these moments, just observing them without judging them or yourself.

(All exercises adapted from Kabat-Zinn, 1990.)