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Mindfulness-Based Cognitive Therapy for the Prevention of Perinatal Depression:  
The Roles of Participant At-home Practice and Therapist Adherence in Participant  
Outcomes

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## Abstract

### Mindfulness-Based Cognitive Therapy for the Prevention of Perinatal Depression: The Roles of Participant At-home Practice and Therapist Adherence in Participant Outcomes

By Amanda P. Brown

Mindfulness Based Cognitive Therapy (MBCT) has garnered empirical support as an effective preventive intervention for depressive relapse, but the mechanisms of change are unclear. In the context of the open trial phase of a study designed to develop and provide preliminary data for the effectiveness of MBCT for Perinatal Depression (MBCT-PD), we examined the extent to which participant at-home practice and therapist adherence were associated with decreased or stable depression and anxiety symptoms, decreased levels of experiential avoidance, and increased levels of self-reported mindfulness. In a sample of 41 perinatal women, quantity of at-home practice was significantly associated with decreased depression symptoms and increased mindfulness scores at post-intervention, but was not significantly associated with post-intervention anxiety symptoms or experiential avoidance. Quantity of both formal and informal mindfulness practice was significantly related to post-intervention mindfulness scores. Engagement only in formal mindfulness practice was significantly related to post-intervention depressive symptoms. In terms of therapist adherence, adherence targeted toward participant practice was associated with participants' at-home practice behavior, suggesting that therapist emphasis on at-home practice may be important in increasing quantity of participant practice. The sole significant predictor of at-home practice that we identified was number of prior depressive episodes, such that women with two or more major depressive episodes (MDEs) practiced significantly more than women with only one MDE. Findings highlight the value of participant engagement with at-home practices in the maintenance of wellness following MBCT, as well as which participant characteristics may predict better compliance with at-home practice.

*Keywords:* MBCT, perinatal depression, at-home practice, adherence, homework

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## **Introduction**

Maternal depression during pregnancy is a pervasive problem, which significantly increases risk both for subsequent development of depression in the postpartum and for various negative child outcomes (Goodman et al., 2011; Leigh & Milgrom, 2008). There is a need for effective prevention mechanisms for perinatal depression, as well as identification of subgroups of women who may respond more positively to specific interventions (Goodman & Dimidjian, 2011). Despite knowledge that having a history of depression is a clear, measurable risk factor for developing prenatal depression, little evidence exists for effective preventive interventions. This robust predictor makes prevention efforts viable. Mindfulness-Based Cognitive Therapy (MBCT), which has garnered strong support for its effectiveness in preventing depressive relapse in adults, has immense potential for the prevention of perinatal depression. This preventive intervention has been adapted specifically for depression during the perinatal period (MBCT for Perinatal Depression; MBCT-PD) and a pilot randomized clinical trial is presently being conducted to evaluate its effectiveness. This paper aims to identify potential mechanisms underlying MBCT-PD that may operate to prevent depressive relapse and decrease levels of depression and anxiety symptoms, experiential avoidance, and increase levels of mindfulness. Specifically, the roles of participant time spent in mindfulness practices and therapist adherence to MBCT-PD will be examined with the data from the open trial phase of the study.

## **Prevalence and Risk of Perinatal Depression**

Within the general population, rates of prenatal or postnatal depression are equally prevalent in the population, ranging from 12 - 15% (Evans, Heron, Francomb,

Oke, & Golding, 2001; O'Hara & Swain, 1996). Depression during pregnancy is strongly associated with prior history of depressive episodes (Coyne, Pepper, & Flynn, 1999; Marcus, Flynn, Blow, & Barry, 2003). Women with a history of depression are twice as likely as women with no history to experience minor and major depression during the perinatal period (Banti et al., 2011). In a sample of pregnant women with any prior history of depression, 42.6% reported clinically significant depressive symptomatology on the Center for Epidemiologic Studies Depression Scale (CES-D) (Marcus et al., 2003). Rates of depression meeting diagnostic criteria for major depressive episodes (MDE) in this group are also high, with approximately 30% experiencing relapse or recurrence during pregnancy (Goodman & Tully, 2009).

### **Consequences for Perinatally Depressed Women**

Researchers have identified a host of negative correlates associated with perinatal depression including lower social support and more severe negative life events (Sequin, Potvin, St. Denis, & Loiselle, 1995), low socioeconomic status (Bennett, Einarson, Taddio, Koren, & Einarson, 2004; Holzman et al., 2006), unmarried or unpartnered status (Podolska, Majkowicz, Sipak-Szmigiel, & Ronin-Walknowska, 2009; Podolska & Sipak-Szmigiel, 2010), substance use and substance use in someone close, and history of abuse (Holzman et al., 2006). Perinatal depression also has significant consequences for couples, with relationship adjustment suffering over time as a result of increased depressive symptoms (Whisman, Davila, & Goodman, 2011). Depressive symptoms during the prenatal period also significantly heighten women's risk for subsequent development of depression in the postpartum (O'Hara & Swain, 1996). Perhaps one of the greatest concerns with respect to perinatal depression is the risk of negative consequences



for offspring. Children of depressed mothers are at heightened risk for a host of negative outcomes, higher levels of psychopathology, internalizing, externalizing, and lower levels of positive affect and behavior (Goodman et al., 2011).

Of pregnant women meeting diagnostic criteria for depression, only 23% receive any mental health care during pregnancy (Kelly, Zatzick, & Anders, 2001) and approximately 50% of women with postpartum depression do not receive any form of mental health evaluation or treatment (U.S. Department Health and Human Services [U.S. DHHS], 2000). The high rates of unrecognized and untreated perinatal depression coupled with the significant risk of depressive recurrence in women with a history of depression makes this population an important and identifiable target group for preventive interventions. Given the prevalence of untreated perinatal depression and its deleterious consequences, it is vitally important to improve efforts toward preventive strategies.

### **Current Preventive Strategies for Prenatal Depression**

Research on the prevention of prenatal depression has been largely neglected, with the majority of investigators instead targeting the postpartum period for prevention and treatment (Leigh & Milgrom, 2008). Given that prenatal depression is one of the strongest predictors for depression in the postpartum (O'Hara & Swain, 1996), it is arguably even more important for researchers to target the prevention of prenatal depression than the prevention of postpartum depression. Limited empirical data support the use of interpersonal therapy (IPT) (Zlotnick, Miller, Pearlstein, Howard, & Sweeney, 2006) and cognitive-behavioral therapy (CBT) (Le, Perry, & Stuart, 2011) for effectively preventing prenatal depression. Although each of these randomized controlled trial

(RCT) studies make important contributions to understanding the prevention of prenatal depression in low-income, predominantly Latina populations, their results cannot be generalized to other populations of women. Based on a continually growing body of strong evidence for the negative and diverse consequences of prenatal depression, it is essential that researchers invest further in developing and testing the effectiveness of preventive interventions for this critical problem. MBCT, an effective approach for the prevention of recurrent depression (see following section), is a promising new intervention to explore in the context of perinatal depression. Given the need for effective preventive interventions for prenatal depression and knowledge that depression during pregnancy is often a recurrence of depression that had occurred prior to pregnancy, MBCT was considered to be a promising option for preventing prenatal depression. Thus, MBCT was adapted for use with pregnant women. In the study reported here, we explored the roles of participant time spent in at-home practice and therapist adherence in relation to the recurrence of depressive relapse and other outcomes among MBCT-PD participants.

### **Support for MBCT and Rationale for Adaptation for the Prevention of Perinatal Depression**

MBCT is a prophylactic intervention program taught in groups of up to 12 participants that meet for eight weekly sessions, which combines elements of Beck's cognitive therapy (Beck, 1979), frequently labeled as cognitive behavioral therapy (CBT), with mindfulness training. Mindfulness has been defined as "paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally" (Kabat-Zinn, 1994, p. 4). MBCT participants are instructed to complete various daily homework

exercises on their own that are intended to cultivate a mindful cognitive processing mode. The aim of MBCT is to foster this mode, which the authors call “metacognitive awareness,” “metacognitive insight,” or “a cognitive set in which negative thoughts and feelings are seen as passing events in the mind rather than as inherent aspects of self or as necessarily valid reflections of reality” (Teasdale et al., 2002, p. 285). MBCT explicitly targets the underlying cognitive and affective vulnerabilities of individuals with histories of depression. This approach is essentially a delimited use of mindfulness in that it focuses most heavily on negative thoughts and feelings, in contrast to the entire range of one's internal and external experience.

MBCT was specifically designed to prevent relapse in adults with a history of recurrent major depression. Through the use of mindfulness and CBT techniques, MBCT is directed toward the cognitive and affective mechanisms that trigger and maintain depression. Guided by the theory that individuals with a history of depression are vulnerable to automatic patterns of high reactivity to dysphoric mood states (Teasdale, 1999a, 1999b), MBCT trains individuals in mindfulness techniques specifically intended to disrupt these habitual responses. Consistent with a large body of literature linking rumination and onset of depression, basic research has demonstrated that as compared to individuals without histories of depression, previously depressed individuals show increased reactivity to depressogenic thoughts when dysphoric mood is experimentally induced (Scher, Ingram, & Segal, 2005). Furthermore, the degree of reactivity to dysphoric mood predicts depressive relapse in individuals with a prior history of depression (Segal et al., 2006).

MBCT has been rigorously tested in several RCTs (e.g., Bondolfi et al., 2010; Teasdale & Ma, 2004; Teasdale et al., 2002; Teasdale et al., 2000). A recent meta-analytic review evaluated six RCT studies of MBCT, combining data from a total of 593 individuals with recurrent MDD in remission (Piet & Hougaard, 2011). MBCT participants relapsed significantly less (38%) than control participants (58%), for an overall mean risk ratio of 0.66. Two of the studies reviewed by Piet and Hougaard (2011) compared MBCT to maintenance antidepressant medication (m-ADM); the data from these studies (i.e., Kuyken et al., 2008; Segal et al., 2010) show that MBCT is at least as effective for preventing depressive relapse as m-ADM, without adding any extra financial cost.

In the third of three studies presented in an article by Teasdale et al. (2002), MBCT was compared to treatment-as-usual (TAU) in an RCT design with participants who had a history of recurrent major depression. In the TAU condition, participants sought help from their doctor or other sources as they normally would. Following treatment, metacognitive awareness in participants as measured by the Measure of Awareness and Coping in Autobiographical Memory (MACAM) was significantly greater in the MBCT group as compared to the TAU group. Furthermore, as compared to TAU, MBCT significantly reduced relapse in major depression for participants with three or more previous episodes of depression. In the second study reported in the article, Teasdale et al. employed a similar RCT design comparing CBT alone (*not* MBCT) to antidepressant medication, in which lower levels of metacognitive awareness predicted earlier relapse. CBT significantly increased metacognitive awareness as measured by the MACAM, as well as significantly reduced relapse as compared to ADM. Although these

studies were only able to perform partial meditational analyses due to the timing of assessments, their results suggest that increased mindfulness, or metacognitive awareness is the mechanism that seems to lead to reductions in relapse rates in both CBT and MBCT. MBCT, however, operates without attempting to change the *content* of beliefs in negative thought patterns or in the underlying assumptions of those thought patterns.

In addition to the strong evidence for MBCT as an effective preventive strategy for depressive relapse, several studies have provided evidence for the effects of MBCT on current symptomatic depression, generalized anxiety disorder, and overgeneral autobiographical memory (Piet & Hougaard, 2011). Advancements in understanding *how* MBCT works, however, have been less successful, although several mechanisms of action have been suggested in the literature: increased meta-awareness, decreased rumination and cognitive reactivity, and increased self-compassion (Piet & Hougaard, 2011).

The theoretical foundations and empirical evidence from the MBCT literature provide strong rationale for the application of this intervention to pregnant women at risk for developing perinatal depression. In addition to being a viable preventive intervention for recurrent depression, MBCT was adapted from Mindfulness-Based Stress Reduction, which has a strong evidence base demonstrating its effectiveness in alleviating stress and anxiety (Astin, 1997; Kabat-Zinn, Massion, Kristeller, & Peterson, 1992). MBCT therefore has the potential to help pregnant women better cope with the high levels of anxiety and stress that are associated with depression during pregnancy (Goodman & Tully, 2009). Furthermore, women at risk for perinatal depression may be more likely to perceive a lack of social support (Dennis, Janssen, & Singer, 2004; Goodman & Tully,

2009; Leigh & Milgrom, 2008; O'Mahen, Flynn, & Nolen-Hoeksema, 2010) and poorer social functioning (O'Mahen, Flynn, & Nolen-Hoeksema, 2010), which could be improved by participation in a group of peers led by a supportive therapist. Given the empirical support for MBCT in the prevention of depression recurrence, adaptation of this intervention to expectant mothers with history of depression has promising implications for preventing the future development of depressive episodes and associated consequences for these women, their partners, and their babies. The mechanisms underlying MBCT, however, have yet to be understood; uncovering these mechanisms has the potential to help enhance the effectiveness of the intervention, with the ultimate benefit being lower rates of perinatal depression among women at risk.

### **Impact of Participant At-home Practice on Outcomes**

One understanding of how MBCT works is as a function of participant at-home practice in between sessions. Although research has demonstrated the effectiveness of mindfulness-based interventions (MBIs) like MBCT in reducing pathology and increasing well-being (Baer, 2003; Collard, Avny, & Boniwell, 2008; Roemer, Orsillo, & Salters-Pedneault, 2008), little has been published on the role of time spent in mindfulness practices, thus leaving unanswered the question of whether at-home practice contributes to the effectiveness of MBCT.

To begin exploring this question, it may be informative to look to the substantial body of research in CBT, which shares with MBIs the assignment of at-home practices to clients. Evidence from the CBT literature supports a clear link between homework assignments and positive outcomes. A meta-analytic review of homework effects in CBT, synthesizing the results from 46 studies, yielded an effect size of  $d = 0.48$  when holding

the type of therapy constant (Kazantzis, Whittington, & Dattilio, 2010). Kazantzis et al. (2010) interpreted these findings to suggest that compared to 38% of clients who would improve with non-homework therapy, 62% of clients undergoing therapy with homework would experience improvements in outcomes (p. 151). Two studies that were not included in the meta-analysis have also reported significant effects of homework compliance on client outcomes (Burns & Nolen-Hoeksema, 1992; Fennell & Teasdale, 1987). Given these data from the CBT literature, we expect that the at-home practice element of MBCT may play a similar mediating role.

In the MBI literature, the published research related to the role of at-home practice in participant outcomes relies mostly on non-experimental designs with novice meditators, as well as on studies of experienced meditators. Despite some mixed findings, likely due in large part to methodological limitations (Vettese, Toneatto, Stea, Nguyen, & Wang, 2009), most studies in this growing body of literature have found support for a positive association between quantity of at-home practice and a variety of positive participant outcomes. Among these, several studies have compared experienced meditators with novice or non-meditators, suggesting that individuals with many hours of lifetime practice show greater attention regulation, higher levels of body awareness, more adaptive emotion regulation strategies (Hölzel et al., 2011), and distinct patterns of activity in brain networks thought to be related to mind wandering and sustained attention (Hasenkamp, Wilson-Mendenhall, Duncan, & Barsalou, 2012). Studies of experienced meditators often sample participants with a remarkable range of lifetime meditation experience and have the advantage of improved power to detect associations with outcomes of interest. In contrast, samples with more restricted ranges of meditation

experience may lack the power to detect meaningful associations with outcomes of interest. It is unclear, however, whether the benefits seen in experienced meditators are direct effects of meditation practice or whether experienced meditators have distinct characteristics to begin with.

Researchers have also attempted to elucidate the role of at-home practice with samples of novice meditators, often using random assignment. In one novice sample, Shapiro and colleagues used daily practice data from self-report diaries to show that more time spent in informal mindfulness and mindful movement practices (i.e., mean number of minutes spent in daily practices over a 7-week treatment period) predicted less stress and higher levels of forgiveness post-intervention (Shapiro, Oman, Thoresen, Plante, & Flinders, 2008). Speca and colleagues (2000) found that number of minutes spent in meditation predicted mood improvement over the course of a 7-week RCT of MBSR for cancer outpatients. In a controlled trial of mindfulness training for U.S. Marines, Jha et al. (2010) found that for individuals with higher levels of at-home practice time, working memory capacity increased, positive affect increased, and negative affect decreased. The same research group reported associations between practice time and increased levels of self-reported mindfulness following the mindfulness training (Stanley, Schaldach, Kiyonaga, & Jha, 2011). Similar benefits have been found in adolescent samples. Adolescents in foster care demonstrated improvements in hopefulness and decreased anxiety that were associated with greater frequency of at-home compassion meditation practice during the second half of a six-week intervention (Reddy et al., 2013). In another controlled trial of mindfulness training with adolescents, researchers



found a significant positive association between time spent in practice outside the classroom and improvements in well-being and mindfulness (Huppert & Johnson, 2010).

In addition to predicting psychosocial measures of well-being, at-home practice has also been found to be associated with physiological indicators of a well-being. In a sample of female schoolteachers, duration of practice (measured in total minutes summed over the program) was significantly associated with physiological measures of reactivity during the Trier social stress test (Kemeny et al., 2012). Similarly, Pace and colleagues reported positive practice-effects in a randomized controlled study of compassion meditation with undergraduate college students, including improved immune responses to a standardized laboratory psychosocial stress task (Pace et al., 2009). A follow-up study with significant improvement to the design provided further support for the role of at-home practice in improving physiological and behavioral stress responses (Pace et al., 2010). Lastly, a recent study from the same research group demonstrated that in a sample of adolescents in foster care, increased practice time was associated with decreased inflammatory markers from baseline to post-intervention (Pace et al., 2013). Overall, there is a substantial and growing body of evidence from a diverse array of studies providing support for positive “dose effects” of at-home practice in novices as well as adepts.

In addition to studies in populations with various levels of meditation experience, clinical intervention studies have examined the role of mindfulness practices, generally finding support for the relationship between practice time and beneficial outcomes. In a study of Mindfulness-Based Stress Reduction (MBSR) with adults with a wide range of physical health problems and major life stressors, average minutes-per-day spent in

formal<sup>1</sup> practices was associated with increases in self-reported mindfulness and well-being (Carmody & Baer, 2008). Self-reported mindfulness was measured by the Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Associations were found between time spent in formal at-home practice and four of the five facets. These authors also found a negative association between average time spent in formal mindfulness practices and psychological symptoms and perceived stress at post-intervention. Furthermore, they found that self-reported increases in mindfulness mediated the relationship between time spent in formal at-home practice and improvements in psychological functioning. Similarly, Kristeller and Hallett (1999) reported a significant association between time spent in mindfulness exercises and reduced depressive symptoms and binge eating behavior in a sample of women with binge eating disorder. Lastly, in a sample of adults with lifetime mood disorders, Ramel and colleagues (2004) found that total time spent in meditation practice (in hours) over 8-weeks of MBSR was negatively associated with rumination scores at post-intervention follow-up. Thus, initial findings from the clinical intervention literature suggest a positive relationship between time spent in mindfulness practices and various measures of well-being, across a variety of disorders.

In contrast, one study examining at-home practice as a predictor of participant outcomes has yielded non-significant results. Practice data was collapsed from baseline through 12-month follow-up in an MBCT RCT study that reported that “relapsers” did not differ significantly from non-relapsers in amount of practice time (Bondolfi et al., 2010). Results from this study demonstrated that although formal sitting meditation

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<sup>1</sup> Practices are considered “formal” when the practitioner is doing nothing additional to the practice itself.

decreased over time, participants maintained their practice of informal mindfulness exercises in daily life. Fourteen months after beginning the MBCT course, participants in the study were asked to retrospectively report on their at-home practice frequency, starting from the very beginning of the study through the 14-month follow-up time point. Participants rated their frequency of at-home practice on a 4-point Likert scale from 1 = never to 4 = almost every day (scores of 1-2 were considered “low” and scores of 3-4 were considered “high”). This study, however, was considerably limited in its ability to reliably examine practice effects due to retrospective reporting of practice time. The low likelihood of accurate retrospective reports of practice frequency over the course of 14 months coupled with the lack of detail elicited in practice reports could explain the null effects of practice on relapse rates. In reviewing 24 other studies that have examined associations between at-home practice quantity and clinical outcomes, Vettese et al. (2009) concluded that the null effects reported by 12 of these studies were largely reflective of a general lack of sound methodology.

As Del Re and colleagues (2013) recommend, the findings to-date suggest that researchers need to attend to operational definitions of the construct of at-home mindfulness practice and ideally, would benefit from taking into account duration, frequency, type, and depth of specific *individual* practices (e.g. formal sitting, body scan). Without such detailed data collection over time, even prospective measurement tools are likely to overlook important information about practice behavior. The current study attempted to address some of these methodological issues in its consideration of mindfulness practice as a construct. While operationalizing or measuring quality of at-home practice was beyond the scope of the present study, we took into account measures

of duration, frequency, and category of practice in order to capture quantity of at-home practice. Furthermore, to our knowledge, only one other study has examined the predictors of participant at-home practice (Stanley et al., 2011). Given the growing evidence that time spent in mindfulness practices is associated with a host of positive outcomes, we attempted to identify predictors of at-home practice quantity, in the hopes of better understanding which factors might correspond to at-home practice compliance in pregnant women. In a sample of U.S. Marines, Stanley et al. (2011) addressed this question by conducting exploratory analyses of the associations between practice time and demographic characteristics, personality variables, deployment history, and attitudes about the mindfulness training course. In our sample of pregnant women with a history of depression, we examined demographic characteristics (e.g., number of children), as well as psychological indicators (e.g., history of depression) that could potentially be associated with women completing mindfulness practices outside of class.

### **Therapist Adherence and Participant Outcomes**

Although there is a significant body of literature supporting the association between client outcomes and certain therapeutic factors, such as therapist alliance (Martin, Garske, & Davis, 2000), the potential role of other therapeutic mechanisms remains unclear. A second mechanism that may be essential to the success of MBCT is therapist adherence to the intervention. Therapist adherence has been defined as “the degree to which therapists are delivering the theory-specified techniques or methods of the intervention” (Webb, DeRubeis, & Barber, 2010). Following this definition, we use the term *global therapist adherence* to describe general adherence to all intervention techniques.

In manualized therapy research, interest has grown with respect to the role of therapist adherence. In the first published meta-analytic review of therapist adherence and treatment outcome findings (based on 36 studies), Webb et al. (2010) reported a nonsignificant trend in which the highest positive associations between therapist adherence and outcomes were found in the subset of studies that targeted Major Depressive Disorder. These results suggest that depression may be more responsive to global therapist adherence than other disorders. Although research in global therapist adherence has not consistently demonstrated positive associations with client outcomes, the restriction of range in reported adherence ratings may be one factor that minimizes researchers' ability to detect a significant effect (Webb et al., 2010). This limitation may be particularly true for treatment development and RCT studies, where particular care is paid to accurate, skillful delivery of interventions, thus constraining observable variability in therapist adherence.

In a study of outpatient CBT for depression, DeRubeis and Feeley (1990) conducted a factor analysis, separating therapist adherence into two factors. When assessed early in treatment, the factor that represented concrete CBT methods, including setting an agenda and reviewing homework, predicted subsequent symptom reduction (DeRubeis & Feeley, 1990; Feeley, DeRubeis, & Gelfand, 1999). Similarly, Shaw and colleagues found that the therapist component most associated with reductions in depressive symptomatology was the therapist's ability to structure the treatment, which consisted of homework review and assignment, agenda, and pacing (1999). The association between these concrete elements of treatment and reductions in depressive symptoms may be mediated by clients' acquisition and independent use of coping skills

taught in therapy. Strunk et al. (2007) found that patients' use of the material taught in CBT for depression predicted risk for relapse following successful treatment.

Thus the examination of two separate adherence factors, as is planned in the proposed study, could help to clarify the relationship between therapist adherence and client outcomes. Based on findings from the therapist adherence and fidelity literature that have provided support for the effectiveness of concrete adherence factors (e.g. homework-focused as opposed to global adherence), there is preliminary evidence for a hypothesized association between therapist adherence targeted toward at-home practice and positive client outcomes in MBCT.

### **Hypotheses**

We made two primary predictions. First, we hypothesized that greater quantity of participant at-home practice (both *frequency* and *duration*) would be associated with fewer depressive relapses, decreased or stable depression and anxiety symptoms, and decreased levels of experiential avoidance at post-intervention. We also predicted that greater quantity of at-home practice would be associated with increased levels of self-reported mindfulness at post-intervention. With respect to *category* of practice (i.e., formal, informal, perinatal-focused, or CBT-focused), we examined in an exploratory manner the associations between practice category and depressive relapse, depression and anxiety symptoms, experiential avoidance, and mindfulness. Next, we hypothesized that increases in mindfulness would mediate the relationship between quantity of at-home practice and positive outcomes (i.e., prevention of depressive relapse, stable or decreased depression and anxiety symptoms, and decreased experiential avoidance). Lastly, we aimed to identify the predictors of at-home practice among participants in MBCT-PD

(e.g., depression history, comorbid anxiety, perceived stress). We examined the extent to which these characteristics predicted quantity of participant practice over the course of the intervention.

Second, we tested the prediction that therapist adherence targeted toward participant practice (i.e., practice-targeted adherence) would be more strongly associated with fewer depressive relapses, decreased or stable depression and anxiety symptoms, decreased levels of experiential avoidance, and increased levels of mindfulness at post-intervention than global therapist adherence. We also expected to find a positive relationship between practice-targeted adherence and quantity of participant at-home practice. Lastly, we hypothesized that if support for this relationship was found, at-home practice would mediate the relationship between practice-targeted adherence and positive outcomes (i.e., prevention of depressive relapse, stable or decreased depression and anxiety symptoms, increased mindfulness, and decreased experiential avoidance).

### **Method**

The methods described here correspond specifically to the open trial phase of a larger study designed to evaluate MBCT-PD. The open trial was the second of three phases, following the conceptualization and development phase and preceding the randomized clinical trial (RCT) phase, for which data collection will conclude in May, 2013.

### **Participants**

**MBCT-PD participants.** Pregnant women up to 32 weeks gestation and ages 21 or older, meeting criteria for prior depression and currently in recovery or remission as indicated by the Diagnostic and Statistical Manual of Mental Disorders, 4<sup>th</sup> edition

(DSM-IV-TR) with baseline scores of  $\leq 12$  on the Edinburgh Postpartum Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987) and  $\leq 9$  on the Hamilton Rating Scale for Depression (HAM-D; Hamilton, 1960) (see measures below) were eligible. The following conditions were criteria for exclusion: schizophrenia or schizoaffective disorder, bipolar disorder, or current psychosis; organic mental disorder or pervasive developmental delay; current panic, obsessive-compulsive, or eating disorder; current substance abuse or dependence; antisocial, borderline, or schizotypal personality disorder; imminent suicide or homicide risk; any medical conditions that would preclude participation, including high risk pregnancy; discontinuation of antidepressant medication within the preceding 8 weeks.

A total of 49 participants were recruited and enrolled from Kaiser Permanente (KP) obstetric clinics from two different regions of the United States (27 from Denver, Colorado; 22 from Atlanta, Georgia). Recruitment brochures and flyers were distributed to women at their initial prenatal care appointment, along with a brief form where they indicated if they were willing to be contacted for additional information about the study. For women who gave the study permission to contact them, research staff telephoned to describe the study and make initial eligibility assessments of potential participants. Women who were eligible and interested completed an intake appointment. Of the 49 women who enrolled in the open trial phase of the study, eight participants (16%) failed to complete because of miscarriage ( $n=2$ , 25%) or participant-initiated withdrawal (e.g., due to medical problems;  $n=6$ , 75%). See Figure 1 for a description of participant flow from recruitment to enrollment. Table 1 provides a description of the demographic



characteristics of the final sample of 41. Overall, the sample was of high socio-economic status.

As participants enrolled, they were assigned to a cohort with other participants until there were enough women to constitute a group for MBCT-PD delivery. Over the course of the open trial, a total of ten cohorts were recruited (five at each site) with the first cohort beginning classes in February of 2009 and the last cohort beginning classes in April of 2010. Cohort sizes ranged from 3 to 6 women.

**MBCT-PD Therapists.** Across both sites, four females served as the MBCT-PD clinicians. Two were experienced licensed clinical psychologists, each of whom conducted the sessions with a masters level co-therapist. All of the therapists attended Zindel Segal's weeklong MBCT training workshop.

## **Measures**

**Demographic information.** Using a form created for this study, participants provided descriptive information about basic demographic variables, including but not limited to ethnicity, education level, occupation, relationship status, yearly income, and previous treatment history.

**Psychiatric history.** A semi-structured psychiatric interview, *The Structured Clinical Interview for DSM-IV Axis I Disorders – Patient Version* (SCID-I/P; First, Spitzer, Gibbon, & Williams, 1994), was the primary instrument for intake assessment and included the required adaptations for perinatal assessments (Gorman et al., 2004). For exclusionary purposes, *The Structured Clinical Interview for DSM-IV Axis II Disorders – Patient Version* was used to assess the previously mentioned personality disorders.

**Depression.** The *Edinburgh Postpartum Depression Scale* (EPDS; Cox et al., 1987) is the most widely used self-report measure of antenatal and postpartum depression symptoms, and was used to assess baseline symptom severity for purposes of inclusion. Participants also completed the EPDS on a weekly basis during the program and until the post-intervention time point, after the last session had ended. The EPDS consists of 10 items, each scored on a scale from 0-3. Possible scores range from 0 to 30, with higher scores indicating greater levels of depressive symptoms. The EPDS has been shown to have adequate sensitivity, specificity, and sensitivity to change in depression severity over time. In our sample, the EPDS had good internal consistency at baseline ( $\alpha = .88$ ) and at post-intervention ( $\alpha = .84$ ). The *Hamilton Rating Scale for Depression* (HAM-D; Hamilton, 1960), the most widely used clinician-rated depression measure, was also used to assess baseline symptoms of depression and was administered again at post-intervention. The HAM-D is typically used in intervention trials for depression in the general population, including prior MBCT trials (Teasdale et al., 2002; Williams, 1988). Remission status was indicated based on the HAM-D cut-off score of 9. The *Longitudinal Interval Follow-up Evaluation* (LIFE; Keller et al., 1987) was administered to all participants to ascertain subsequent diagnostic status, again according to DSM-IV-TR diagnostic criteria (APA, 2000). The LIFE provides a retrospective assessment of relapse and recurrence based on a semi-structured interview. Based on these interviews, a sum score was computed by counting the number of relapses that occurred between the first MBCT-PD class and follow-up at 6-months postpartum. This sum score was then re-coded into a dichotomous variable to reflect whether or not any relapse had occurred in that time frame.

**Anxiety.** To assess state anxiety symptoms, we administered the *State-Trait Anxiety Inventory* (STAI; Spielberger, Gorsuch, & Lushene, 1970) at baseline and at post-intervention. The first twenty items were reverse coded when appropriate and summed to make up the *A-State scale*. Items of this self-report measure are scored on a 4-point scale (i.e., “almost never,” “sometimes,” “often,” “almost always”). The range of scores on the STAI is 20 to 80, with higher scores indicating greater anxiety. Concurrent validity and internal consistency have been documented for the STAI (Spielberger, Reheiser, Ritterband, Sydeman, & Unger, 1995), which is widely preferred as the measure to use in order to establish baseline anxiety levels in pregnant women (Ayers, 2001). In our sample, the STAI had good internal consistency, with Cronbach alpha coefficients of .93 at baseline and at .95 at the post-intervention time point.

**Mindfulness.** The *Five Factor Mindfulness Questionnaire* (FFMQ) (Baer et al., 2006) is a 39-item self-report measure that assesses five facets of mindfulness: *observing* (noticing or attending to stimuli, both internal and external), *describing* (labeling these stimuli with words), *acting with awareness* (bringing mindfulness to one’s actions; not acting absent-mindedly), *non-judging of inner experience* (accepting one’s own sensations, thoughts, and emotions without evaluation) and *non-reactivity to inner experience* (being able to let thoughts and emotions arise without becoming “swept away” by them). Items are rated on a Likert scale from 1 (“never or very rarely true” to 5 (“very often or always true”). Individual facet scores can range from 7 to 40. Scores on the overall measure can range from 39 to 195. The items corresponding to each of the five facets were summed and re-coded, yielding individual facet scores. Higher scores indicate either greater levels of the individual mindfulness facets (e.g., non-reactivity to

internal experience) or greater levels of mindfulness (i.e., in the case of the overall measure score). This measure has acceptable psychometric properties and has demonstrated incremental validity for three of the five facets (Baer et al., 2008). According to Baer et al. (2008), the FFMQ has adequate-to-good internal consistency, with alpha coefficients for all facets ranging from .72 to .92. In our sample, each of the five facet subscales had good internal consistency both at baseline ( $\alpha$  ranging from .86 to .93) and at post-intervention ( $\alpha$  ranging from .80 to .94).

**Experiential avoidance.** The *Acceptance and Action Questionnaire* (AAQ; Hayes et al., 2004) is a 9-item self-report instrument designed to measure experiential avoidance or the attempt to avoid or control, rather than accept, internal experience. Items are scored on a 7-point Likert scale ranging from “never true” to “always true.” Total scores can range from 9 to 63. According to Hayes et al. (2004), the AAQ has acceptable internal consistency ( $\alpha = .70$ ). In our sample, the AAQ had acceptable internal consistency at post-intervention ( $\alpha = .74$ ) and slightly below what is typically considered acceptable at baseline ( $\alpha = .68$ ).

**Perceived stress.** The *Perceived Stress Scale* (PSS; Cohen, Kamarck, & Mermelstein, 1983) is a 14-item self-report inventory used to measure the degree to which women considered experiences to be stressful during the preceding month, has good test-retest reliability, and adequate validity and internal consistency. Items are scored on a 5-point Likert scale from 0 (“never”) to 4 (“very often”). Total scores can range from 0 to 56. The PSS was administered to all participants and was tested as a potential predictor of at-home practice quantity. The PSS was completed at baseline and

at post-intervention. In our sample, the PSS had good internal consistency at baseline ( $\alpha = .85$ ) and at post-intervention ( $\alpha = .88$ ).

**At-home practice.** Quantity of at-home practice was recorded by *The Weekly Record and Follow-Up Record*, a project specific measure designed to assess the extent to which participants practiced key skills taught in the intervention. This measure included a space for every day of the week and each possible practice assigned. This form was collected weekly during the 8-week program, beginning with the week following Session 1 (i.e., practice records were collected at Session 2-8). Participants were asked to practice at least six days per week, for a minimum of 42 total days, and to record the number of times (i.e., frequency) and the number of minutes (i.e., duration) of every practice they completed (e.g., sitting meditation; mindfulness with baby). At-home practice was categorized based on type of practice (i.e., formal, informal, perinatal-focused, CBT-focused; see Table 2) and considered separately based on frequency (i.e., number of occasions) and duration (i.e., number of minutes). Although women reported on duration for all practice categories, the records were insufficiently detailed to allow us to abstract duration data for the informal practices. For example, rather than reporting the number of minutes of bringing awareness to noticing “automatic pilot,” many women instead reported the number of minutes that they were “on automatic pilot” (e.g., “all day”; “4-5 hours). The Weekly Record and Follow-Up Record self-report form underwent significant modifications early in the open trial, such that the most participants in the first four cohorts did not have sufficient data to calculate some of the at-home practice variables of interest (e.g., perinatal-focused practices; formal practice duration).

Table 3 describes the at-home practice variables that were computed based on these record forms.

**Therapist adherence.** The *MBCT-PD Adherence Scale* (MBCT-PD-AS) is a 13-item scale that was used to rate the degree to which therapists delivered the techniques or methods of the intervention with fidelity according to the basic principles of the intervention manual. The MBCT-PD-AS was adapted from the original MBCT Adherence Scale (MBCT-AS; Segal, Teasdale, Williams, & Gemar, 2002) and modified to fit the MBCT-PD protocol under consultation from Segal. MBCT-PD-AS items are scored on a three-point-scale (i.e., 0-2), where “0” indicates no evidence for an item, “1” indicates slight evidence of the behavior relating to the item, and “2” indicates definite evidence of the behavior by the therapist. As has been done in the therapist fidelity literature (Svartberg, 1989), mean global adherence scores were calculated for each session by averaging the ratings for all 13 items.

Consistent with the original MBCT-AS, the threshold for adequate adherence to the MBCT-PD protocol is defined as a mean score of greater than 1; ratings below 1 would indicate a need for additional training and supervision of the clinician (Segal et al., 2002). Four items that specifically emphasize or relate to individual at-home practice (e.g., “To what extent does the therapist review homework that was assigned to the group?”) were considered separately as a subscale measuring this concrete, structured factor of the intervention (i.e., *practice-targeted adherence*). Like the global adherence scores, practice-targeted adherence was calculated by computing means of the scores on the four practice items. Out of the 20 sessions that were rated, one of the videotapes was cut short for the later portion of the session, rendering ratings on the practice-targeted

items impossible. Thus, one single session was excluded for the purposes of computing practice-targeted adherence scores. Sum scores for the two primary adherence variables were not used because they would necessarily exclude the two sessions for which certain items were un-ratable (e.g., if video was incomplete).

## **Procedures**

**Session samples.** MBCT-PD group sessions were video-recorded. Following Shaw et al., (1999) and Webb et al. (2012), both of whom examined the relationship between therapist adherence and client outcomes, we sampled the same sessions across all cohorts. In line with a recent study by Webb and colleagues (2012), two sessions were chosen, with one representing the “early” and one representing the “late” phases of the intervention: Session 2 (“early”) and Session 6 (“late”). Webb et al. rated Session 3 and Session 15 out of 24 total sessions (in a 16-week protocol); because MBCT-PD consisted of only 8 weekly sessions, we modified the session numbers to accommodate the shorter length of this intervention. Furthermore, as each session is thematically distinct, we chose two sessions that would represent a reasonable sampling of the intervention. Session 2, “Working with Barriers,” identifies obstacles to mindfulness practice and emphasizes an increased focus on the body, both as a mindfulness practice in itself and as a way to enhance awareness of emotions and cognitions (e.g., body scan; “walking down the street” exercise). Session 6, “How Can I Best Take Care of Myself,” focuses on identifying individual relapse warning signs and developing behavioral activation strategies to prevent relapse (e.g., identifying activities that improve or deteriorate mood).

When assessed early in treatment, therapist adherence to concrete methods of CBT predicted later symptom reduction (DeRubeis & Feeley, 1990; Feeley et al., 1999).

In a study examining therapist adherence, competence, and alliance, Session 2 was chosen to represent early therapy sessions, as early-session therapist ratings have been shown to be predictive of client outcomes (Barber et al., 2006). Selection of an early session, such as Session 2, allows for greater subsequent variability in symptom change over the course of treatment (Webb et al., 2012) and ensures that session ratings will be less confounded with outcomes (Frances, Sweeney, & Clarkin, 1985). Based on these studies, we selected Session 2 to represent the therapeutic techniques used in the early phase of the intervention.

Measuring therapist behavior as early as possible with Session 2 was the primary basis to test the hypotheses related to therapist adherence because we were interested in how therapist behavior predicts subsequent client behavior. For the purposes of the larger study, ratings from both sessions will be used to ensure that the intervention was delivered with adherence (i.e., a fidelity check). In the present study, the addition of the “late” session was supplementary, allowing us to determine whether late adherence: 1) adds any predictive value and 2) is associated with early adherence. In two separate studies of CBT for depression, therapists were found to deliver at least as much concrete therapeutic technique at Session 2 as in later, randomly selected sessions (DeRubeis & Feeley, 1990; Feeley et al., 1999). In the present study, session 6 was selected to sample the “late” phase of the 8-session intervention for two major reasons. First, as described above, Session 6 provided a good representation of the more CBT-focused elements of the course, and second, provided us with more time to collect subsequent at-home practice data than would a later session. Thus, twenty total sessions were selected for adherence ratings, with each of the ten cohorts being represented by two sessions (i.e.,



Session 2 and Session 6). Video recordings were unavailable for two of the twenty total sessions (i.e., Colorado Cohort 1 Session 6; Colorado Cohort 5 Session 2) and were replaced by the next sequentially available sessions (i.e., Colorado Cohort 1 Session 7; Colorado Cohort 5 Session 3).

**Raters and rating procedure.** Raters were one graduate student (the author of this thesis) and one master's level volunteer who were blind to intervention outcome. Raters were trained by an advanced graduate student and worked closely with the developers of MBCT-PD. In the process of training, all raters read Segal, Williams, and Teasdale's (2002) *Mindfulness-based cognitive therapy for depression: A new approach to preventing relapse*, reviewed manuals for the MBCT-AS and MBCT-PD-AS, rated a minimum of five MBCT-PD practice sessions, and established reliability with previously trained raters. Raters were then randomly assigned to sessions, watched each of the assigned sessions in their entirety, and rated therapist adherence on the MBCT-PD-AS. In order to calculate inter-rater reliability, a random 25% of the sessions were rated by both raters, without raters being aware of which sessions were selected for this purpose. During the training phase, any discrepancies or questions about the scale were discussed and resolved with the developers of MBCT-PD and the MBCT-PD-AS. To prevent rater drift during the rating phase, raters had several cross-site meetings via Skype® to review the criteria for the items of the scale.

Inter-rater reliability was determined by calculating intraclass correlation coefficients (ICCs), treating the raters as random effects (Shrout & Fleiss, 1979). The reliability for global therapist adherence (i.e., the mean overall MBCT-PD-AS score) was high,  $ICC(2, 2) = 0.82$ ; the reliability for the practice-targeted adherence subscale was

also high,  $ICC(2, 2) = 0.88$ . When ratings for all sessions were calculated for the two adherence variables (i.e., global adherence and practice-targeted adherence), the final scores were matched with each individual participant according to cohort number and site. Thus, participants from the same site and cohort share the same therapist adherence scores.

## Results

### Preliminary and Descriptive Analyses

First, data were checked for entry-errors, missing data, and outliers. Frequency distributions were examined for all variables used in analyses to identify potential problems with skew and kurtosis. Descriptive statistics were generated for the primary independent variables (see Table 3 and 4) and for the dependent variables (measured both at baseline and at post-intervention; see Table 5).

Descriptive analyses revealed that of the 41 women who completed the study, 40 (97.6%) provided data on some or all of their at-home practice behavior. On average, women completed at least one at-home practice 33 ( $SD = 10.97$ ) out of the 42 assigned days (79% of the days), and practiced for an average of 475 total minutes ( $SD = 479.44$ ) over the course of the 8 weeks. The frequency of informal practice, however, increased in the last four weeks of the program ( $M = 16.23$ ,  $SD = 5.99$ ) relative to the first three weeks ( $M = 8.91$ ,  $SD = 5.45$ ),  $t(24) = -3.61$ ,  $p < .01$ , paired. Conversely, the frequency of formal practice decreased in the last four weeks of the program ( $M = 3.15$ ,  $SD = 2.07$ ) relative to the first three weeks ( $M = 4.46$ ,  $SD = 2.54$ ),  $t(18) = 2.61$ ,  $p < .05$ , paired. Only 22-32% of the sample provided data on perinatal-focused or CBT-focused practice behavior. The remaining 78-68% of participants were missing these data, either because they used the

earliest version of the Homework Record Form (42%) or they did not complete any questions on CBT- or perinatal-focused practices in the revised version of the Homework Record Form. Therefore, we did not include these two variables in hypothesis testing.

With regard to the therapist adherence variables, descriptive analyses revealed that “early” mean practice-targeted adherence had a bimodal distribution (i.e., scores of either 1.5 or 1.75), and was therefore recoded into a dichotomous variable. All four therapist adherence variables (“early” and “late,” and practice-targeted and global) had limited range; none of the scores were lower than 1.23 on a potential scale of 0-2.

Post-intervention HAM-D scores were missing for 22 (54%) of the 41 participants. Of these 22 participants, 91% were in the first three cohorts. In order to determine whether the post-intervention HAM-D scores were missing at random in relation to participant characteristics, a series of independent-samples *t*-tests were conducted to compare the group of participants who had missing HAM-D data at post-intervention with those who had complete HAM-D data on the primary independent and dependent variables. Before controlling for family-wise error, only one out of 21 *t*-tests was statistically significant, indicating a mean difference between the missing HAM-D group ( $M = 5.27, SD = 3.47$ ) and the non-missing HAM-D group ( $M = 8.44, SD = 4.59$ ) in baseline HAM-D scores,  $t(29) = -2.16, p = .04$ , two-tailed, such that the non-missing group had higher baseline clinician-reported depressive symptoms. This finding indicates that all subsequent interpretations based on HAM-D analyses are applicable only to participants with lower baseline clinician-rated depressive symptoms. On one other comparison, the number of total practice days reported, the difference was not statistically significant,  $t(38) = -1.88, p = .07$ , two-tailed, but the difference between the

missing HAM-D group ( $M = 29.71$ ,  $SD = 10.13$ ) and the non-missing HAM-D group ( $M = 36.05$ ,  $SD = 11.16$ ) had a medium effect ( $d = -.60$ ). Of the 23 participants who reported on the frequency of their formal practices, 7 (30%) were missing the HAM-D at post-intervention. Therefore, the HAM-D was examined for hypothesis testing.

Next, we examined direct bivariate associations between the predictor variables and the outcome variables (see Tables 6 and 7). Although most patterns of associations will be later described in hypothesis testing, it is first important to note that “early” practice-targeted adherence was associated with several baseline variables. “Early” practice-targeted adherence was positively associated with the following baseline scores: AAQ,  $p = .04$ , PSS,  $p = .07$ , and HAM-D,  $p = .06$ . Although the relationships with the PSS and the HAM-D were not statistically significant, all three associations indicated medium effect sizes, suggesting a positive relationship between “early” practice-targeted adherence and baseline levels of experiential avoidance, perceived stress, and depression symptoms. “Early” practice-targeted adherence was also negatively associated with the Describe subscale at baseline,  $r(33) = -.41$ ,  $p = .03$ , indicating a medium effect size. Secondly, frequency of any type of practice was negatively associated with perceived stress (PSS scores) at post-intervention,  $r(36) = -.33$ ,  $p = .048$ , but after controlling for number of classes attended, the association became marginally significant,  $r(33) = -.24$ ,  $p = .17$ , indicating a small effect size.

Next, the following variables were considered as potential confounds to be controlled in hypothesis testing: study site, cohort, number of classes attended, age, and ethnicity. Of these potential confounding variables, only age was found to be consistently associated with the outcome variables, specifically the following post-intervention

variables: EPDS score ( $r(37) = .41, p = .01$ ), FFMQ total score ( $r(35) = -.37, p = .03$ ), Aware subscale score ( $r(35) = -.41, p = .01$ ), and marginally associated with AAQ score ( $r(36) = .32, p = .06$ ). Age was also significantly associated with the following pre-intervention variables: FFMQ total score ( $r(32) = -.58, p = .00$ ), Describe subscale score ( $r(32) = -.50, p = .00$ ), Aware subscale score ( $r(32) = -.56, p = .00$ ), Non-judge subscale score ( $r(32) = -.39, p = .03$ ), and Non-react subscale score ( $r(32) = -.37, p = .04$ ). Therefore, age was used as a statistical control in all analyses.

None of the at-home practice variables differed significantly based on site, cohort, age, or ethnicity. Number of classes attended was positively associated with frequency of any type of practice ( $r_s(40) = .33, p = .04$ ), but not with any of the other at-home practice variables. Given this association, we controlled for class attendance in all hypothesis testing where frequency of any type of practice was a predictor variable. We then tested number of classes attended as a stand-alone predictor with all outcome variables. Regression analyses revealed that class attendance significantly predicted post-intervention EPDS scores,  $\beta = -.36, t(29) = -2.20, p = .04$ , indicating a negative relationship between class attendance and post-intervention EPDS scores. Class attendance significantly predicted additional variance in post-intervention EPDS scores over and above pre-intervention scores and age,  $\Delta R^2 = .12, \Delta F(1,29) = 4.86, p = .02$ , indicating a medium effect size. However, class attendance did not significantly predict any of the other outcome variables at post-intervention ( $\beta$ 's ranged from  $-.36$  to  $.30, p$ 's ranged from  $.11$  to  $.97$ ).

We next conducted analyses to explore the impact of potential confounds on therapist adherence. As therapist adherence scores were assigned to group sessions rather

than to individual participants, we only examined the following potential confounds: study site and cohort. To explore the potential impact of site on mean practice-targeted therapist adherence, a Chi-square test for independence was conducted. No significant association was revealed between site and practice-targeted adherence,  $\chi^2(1, n = 19) = 1.15, p = .56$ . To explore the potential impact of site on global therapist adherence, a one-way analysis of variance was conducted. The main effect for site,  $F(1, 19) = .08, p = .79$ , was not statistically significant. None of the therapist adherence variables differed significantly by cohort.

### **Hypothesis Testing**

**At-home practice and depression.** We first tested the hypothesis that greater levels of at-home practice would be associated with stable or decreased depression symptoms (EPDS and HAM-D scores). Results of Pearson product moment correlations revealed that frequency of formal practice was associated with self-reported depressive symptoms (EPDS) in the predicted direction, indicating a medium effect,  $r(19) = -.35, p = .12$ , but did not reach significance. Consistent with our hypotheses, multiple linear regression analyses revealed that the duration of time spent in formal practices significantly predicted clinician-rated depressive symptoms (HAM-D scores) at post-intervention after controlling for pre-intervention symptoms,  $\beta = -.55, \Delta R^2 = .30, p < .01$ , indicating a large effect size. Similarly, frequency of formal practices significantly predicted clinician-rated depressive symptoms (HAM-D scores) at post-intervention after controlling for pre-intervention symptoms,  $\beta = -.56, \Delta R^2 = .25, p < .05$ , indicating a large effect size. We also found a trend toward the frequency of any type of at-home practice predicting lower HAM-D post-intervention scores after controlling for pre-intervention

scores and for number of classes attended,  $\beta = -.42$ ,  $\Delta R^2 = .16$ ,  $p = .06$ , indicating a medium effect size.

Direct logistic regression was used to test whether higher levels of at-home practice predicted the likelihood of depressive relapse occurring between the first MBCT-PD class and follow-up at 6-months postpartum. Four models were tested, each with a separate practice quantity variable as the independent variable (i.e., frequency of any type of practice, duration of formal practice, frequency of formal practice, and frequency of informal practice). Contrary to our hypotheses, none of the models were statistically significant, indicating that they were not able to distinguish between participants who relapsed and those who did not (odds ratios ranged from 1.06 to .77).

**At-home practice and anxiety symptoms.** Next, we tested the hypothesis that greater levels of at-home practice would be associated with decreased post-intervention anxiety symptoms (STAI scores). Contrary to our hypotheses, regression analyses revealed that none of the practice quantity variables significantly predicted post-intervention STAI scores after controlling for pre-intervention scores ( $\beta$ 's ranged from -.15 to -.35,  $p$ 's  $> .05$ ). Consistent with our predictions, bivariate associations revealed that frequency of formal practice was negatively associated with post-intervention STAI scores,  $r(17) = -.33$ ,  $p = .20$  with a medium effect size, although not statistically significant.

**At-home practice and experiential avoidance.** We then tested the hypothesis that greater levels of at-home practice would be associated with decreased experiential avoidance (AAQ scores) at post-intervention. Contrary to our hypotheses, none of the at-home practice quantity variables were significantly associated with AAQ scores and did

not significantly predict AAQ scores at post-intervention ( $\beta$ 's ranged from  $-.19$  to  $.15$ ,  $p > .05$ ).

**At-home practice and mindfulness.** Next, we tested the hypothesis that greater levels of at-home practice (i.e., frequency of any type of practice, frequency of formal practice, frequency of informal practice, and duration of formal practice) would be associated with increased levels of mindfulness (FFMQ scores) at post-intervention. Consistent with our hypotheses, regression analyses revealed that frequency of any type of at-home practice significantly predicted post-intervention FFMQ total scores,  $\beta = .41$ ,  $t(24) = 2.21$ ,  $p = .045$ , indicating a positive relationship between frequency of any type of at-home practice and post-intervention FFMQ total scores. Frequency of any at-home practice significantly predicted additional variance in post-intervention FFMQ total scores over and above pre-intervention scores, age, and number of classes attended,  $\Delta R^2 = .14$ ,  $\Delta F(1,24) = 4.87$ ,  $p = .045$ , indicating a medium effect size.

Furthermore, frequency of any type of at-home practice significantly predicted post-intervention Observe scores,  $\beta = .35$ ,  $t(24) = 2.44$ ,  $p = .02$ , indicating a positive relationship between frequency of any type of at-home practice and post-intervention Observe scores. Frequency of any at-home practice significantly predicted additional variance in post-intervention Observe scores over and above pre-intervention scores, age, and number of classes attended,  $\Delta R^2 = .11$ ,  $\Delta F(1,24) = 5.98$ ,  $p < .001$ , indicating a medium effect size.

Also consistent with our hypotheses, frequency of any type of at-home practice significantly predicted post-intervention Non-react scores,  $\beta = .60$ ,  $t(24) = 3.74$ ,  $p = .001$ , indicating a positive relationship between frequency of any type of at-home practice and



post-intervention Non-react scores. Frequency of any at-home practice significantly predicted additional variance in post-intervention Non-react scores over and above pre-intervention scores, age, and number of classes attended,  $\Delta R^2 = .30$ ,  $\Delta F(1,24) = 13.98$ ,  $p = .002$ , indicating a large effect size.

Both duration (i.e., total minutes) and frequency of formal practices significantly predicted post-intervention Observe subscale scores,  $\beta = .50$ ,  $\Delta R^2 = .20$ ,  $p < .05$ ;  $\beta = .52$ ,  $\Delta R^2 = .23$ ,  $p < .05$ . Frequency of informal practices also significantly predicted Observe subscale scores,  $\beta = .36$ ,  $\Delta R^2 = .18$ ,  $p < .05$ . Furthermore, we found a trend toward frequency of formal practice predicting higher scores on the Non-react subscale at post-intervention,  $\beta = .40$ ,  $\Delta R^2 = .16$ ,  $p < .1$ . None of the at-home practice quantity variables predicted scores on the Describe, Aware, or Non-judge subscales.

### **Mindfulness mediating the relationship between at-home practice and depression.**

Based on our findings that quantity of at-home practice was consistently associated with increases in mindfulness (as measured by the Observe and Non-react subscales) and decreases in clinician-rated depressive symptoms (HAM-D), we were able to test our next hypothesis, that increases in mindfulness mediate the relationship between quantity of at-home practice and improvements in depressive symptoms. To examine this question, we conducted three mediation analyses using the steps outlined by Preacher and Hayes (2004). In each case, the outcome variable was post-intervention HAM-D score. Following the precedents set by Carmody and Baer (2008), the proposed mediating variable was the degree of change in mindfulness from pre- to post-intervention, which was computed by calculating the difference between pre- and post-intervention scores

(post minus pre) and then summing the difference scores across the mindfulness facets. We calculated this difference score and tested mediation for the sum of the difference scores for the Observe and Non-react facets and not for the facets that were not significantly associated with at-home practice quantity (i.e., Aware, Non-judge, and Non-react). The predictor variables for the three mediation analyses were: 1) duration of formal practices, 2) frequency of formal practices, and 3) total days of any type of practice. We also re-ran the mediation analyses with the proposed mediating variable being either the difference score for the Observe facet or the Non-react facet (for six total mediation models), as an alternative to the precedent set by Carmody and Baer (2008). Contrary to our hypotheses, analyses did not support mediation in any of the nine proposed models.

**Predictors of at-home practice.** Our next aim was to identify predictors of at-home practice quantity. First, we found that number of prior depressive episodes was positively associated with frequency of any type of practice,  $r_s(40) = .36, p = .02$ , indicating a medium effect size. Furthermore, practice frequency differed significantly based on number of prior depressive episodes, such that women with at least two prior MDEs practiced more total days,  $M = 36.30, SD = 9.18$ , than women with only one prior MDE,  $M = 27.37, SD = 11.16$ ;  $F(1,40) = 8.12, p < .01, d = .87$ , indicating a large effect size. Consistent with the association between prior depressive episodes and practice frequency, baseline HAM-D scores were positively associated with frequency of formal practices,  $r(21) = .58, p = .01$ , indicating a large effect size, and baseline EPDS scores were positively but marginally associated with duration of formal practices,  $r(18) = .43, p = .08$ , indicating a medium effect size. Number of children was negatively associated

with frequency of informal practice,  $r(30) = -.31, p = .10$ , with a medium effect, although not statistically significant. Lastly, two participants met for previous history of GAD and three met for full or subthreshold GAD symptoms at baseline. Therefore, we were unable to test comorbid and previous GAD as predictors of at-home practice. Similarly, all but two women in the sample were co-habiting, so we were unable to test associations between presence of partner in the home and at-home practice quantity. None of the at-home practice variables were significantly associated with baseline levels of perceived stress (PSS scores) or with any other demographic characteristics.

**Therapist adherence and depression.** We hypothesized that practice-targeted therapist adherence (mean practice-targeted adherence scores) would be more strongly (negatively) associated with depressive symptoms (EPDS and HAM-D scores) at post-intervention than global therapist adherence. Multivariate regression analyses revealed that neither of the “early” therapist adherence variables significantly predicted EPDS or HAM-D scores at post-intervention ( $\beta$ 's ranged from  $-.01$  to  $.14, p$ 's  $> .05$ ). Consistent with our hypotheses, however, when “late” practice-targeted adherence was added to the hierarchical regression model, the overall model explained a significant portion of the variance in post-intervention HAM-D scores after controlling for pre-intervention scores,  $R^2 = .65, \Delta F(4,11) = 5.03, p = .02$ , indicating a large effect size. In the regression model predicting EPDS scores, the addition of “late” practice-targeted adherence did not explain additional variance in post-intervention EPDS scores.

Next, direct logistic regression was performed to assess whether higher levels of practice-targeted adherence predicted the likelihood of depressive relapse occurring between the first MBCT-PD class and follow-up at 6-months postpartum. In the first

model, “early” mean global therapist adherence was the independent variable; in the second model, “early” practice-targeted therapist-adherence was the independent variable. Contrary to our hypotheses, neither model was statistically significant, indicating that they were not able to distinguish between participants who relapsed and those who did not. The addition of “late” global therapist adherence or practice-targeted adherence did not add any predictive value to the logistic regression models.

**Therapist Adherence and Anxiety Symptoms.** To test the hypothesis that practice-targeted adherence would be more strongly associated with decreased post-intervention anxiety symptoms (STAI scores), regression analyses were performed. Contrary to our hypotheses, neither of the “early” therapist adherence variables significantly predicted STAI scores at post-intervention ( $\beta$ 's ranged from .06 to .13,  $p$ 's > .05). The addition of “late” global therapist adherence or practice-targeted therapist adherence did not add any significant predictive value to the regression models.

**Therapist adherence and experiential avoidance.** We hypothesized that practice-targeted therapist adherence would be more strongly (negatively) associated with experiential avoidance (AAQ scores) at post-intervention than global therapist adherence. Contrary to our hypotheses, regression analyses revealed that neither of the “early” therapist adherence variables significantly predicted post-intervention AAQ scores ( $\beta$ 's ranged from -.09 to .00,  $p$ 's > .05). The addition of “late” global therapist adherence or “late” practice-targeted therapist adherence did not add any significant predictive value to the regression models.

**Therapist adherence and mindfulness scores.** We hypothesized that practice-targeted therapist adherence would be more strongly associated with levels mindfulness

(FFMQ total and subscale scores) at post-intervention than global therapist adherence. Contrary to our hypothesis, regression analyses revealed that practice-targeted therapist adherence at the “early” session did not significantly predict FFMQ total scores at post-intervention,  $\beta = .12$ ,  $\Delta R^2 = .01$ ,  $p = .56$ , nor any of the FFMQ subscales. The addition of practice-targeted therapist adherence at the “late” session did not add any significant predictive value to the regression models. Furthermore, global therapist adherence at the “early” session significantly predicted FFMQ total scores at post-intervention after controlling for pre-intervention scores, but in the unexpected direction,  $\beta = -.43$ ,  $\Delta R^2 = .17$ ,  $p < .05$ . We also found a trend in the unexpected direction toward “early” global therapist adherence predicting lower scores on the Non-judge subscale at post-intervention,  $\beta = -.29$ ,  $\Delta R^2 = .08$ ,  $p < .1$ . “Early” global therapist adherence did not approach significance in predicting any of the other FFMQ subscales,  $\beta$ 's ranged from  $-.19$  to  $-.30$ ,  $p$ 's  $> .1$ . The addition of global therapist adherence at the “late” session did not add any significant predictive value to the regression models.

**Therapist adherence and at-home practice.** We hypothesized that greater levels of practice-targeted adherence would be positively associated with quantity of at-home practice. Contrary to our hypotheses, regression analyses revealed that “early” practice-targeted adherence did not significantly predict any of the at-home practice variables,  $\beta$ 's ranged from  $.03$  to  $.39$ ,  $p$ 's  $> .05$ . However, “early” practice-targeted adherence marginally predicted frequency of formal practice,  $\beta = .39$ ,  $t(19) = 1.87$ ,  $p = .07$ , indicating a positive relationship between “early” practice-targeted adherence and frequency of formal practice,  $\Delta R^2 = .16$ ,  $\Delta F(1,19) = 3.49$ ,  $p = .08$ , that did not reach statistical significance but indicated a medium effect size.

Next, we tested the supplementary question regarding whether adding “late” practice-targeted adherence into the model would explain a significant portion of variance in at-home practice behavior. Hierarchical regression analyses revealed that when “late” practice-targeted adherence was added to the model, the overall model explained a marginal portion of the variance in the frequency of any type of at-home practice,  $R^2 = .21$ ,  $\Delta F(3,31) = 2.72$ ,  $p = .06$ , indicating a medium effect size. After controlling for number of classes attended and “early” practice-targeted adherence, “late” practice-targeted adherence significantly predicted additional variance in frequency of any at-home practice,  $\beta = .38$ ,  $t(24) = 2.25$ ,  $p = .03$ , such that higher levels of “late” practice-targeted adherence were associated with greater frequency of any type of at-home practice,  $\Delta R^2 = .13$ ,  $\Delta F(1,31) = 5.05$ ,  $p = .03$ , again indicating a medium effect size. Similarly, when added into the model predicting frequency of informal practice, “late” practice-targeted adherence explained a marginal additional portion of the variance,  $\beta = .41$ ,  $t(23) = 2.03$ ,  $p = .054$ , indicating a positive relationship between frequency of informal practice and “late” practice-targeted adherence. Although the overall model did not explain a significant portion of variance in informal practice ( $p = .15$ ), “late” practice-targeted adherence predicted a marginal additional portion of the variance in informal practice frequency over and above “early” practice-targeted adherence,  $\Delta R^2 = .15$ ,  $\Delta F(1,23) = 4.11$ ,  $p = .054$ , indicating a medium effect size.

#### **At-home practice as a mediator between therapist adherence and outcomes.**

Given that we failed to support our hypothesized associations between therapist adherence and outcomes, and in the case of mindfulness, associations were in the unexpected direction, we did not proceed with mediation analyses.

**“Early” versus “late” therapist adherence.** Lastly, we tested our supplementary question regarding whether “late” adherence is associated with “early” adherence. To explore the impact of timing of session (i.e., “early” versus “late”) on mean practice-targeted therapist adherence, we ran a paired samples t-test. The practice-targeted adherence scores at the “early” session ( $M = 1.67, SD = 0.13$ ) were not significantly different from practice-targeted adherence scores at the “late” session ( $M = 1.83, SD = 0.18; t(8) = -2.00, p = .08$ , paired). To explore the impact of timing of session on global therapist adherence, we ran a paired samples t-test. The global adherence scores at the “early” session ( $M = 1.38, SD = 0.11$ ) were significantly lower than global adherence scores at the “late” session ( $M = 1.59, SD = 0.20; t(9) = -2.97, p = .02$ , paired).

### Discussion

In a sample of perinatal women with a history of depression, we investigated the role of two potential mechanisms of change in MBCT-PD: at-home practice and therapist adherence. Specifically, we aimed to determine the extent to which at-home practice quantity and therapist adherence predicted depression outcomes, anxiety symptoms, experiential avoidance, and levels of mindfulness at the end of the intervention. Our findings support the value of at-home practice in the delivery of MBCT-PD, specifically in promoting improvements in depressive symptoms and increased levels of mindfulness. We did not find support for a significant role of at-home practice in predicting post-intervention levels of anxiety or experiential avoidance. With respect to therapist adherence (both global and practice-targeted), our findings did not support our hypotheses that adherence may play a role in predicting participant outcomes. Our

findings do provide, however, preliminary support for practice-targeted adherence as a potentially important predictor of participant time spent in at-home practice.

### **At-home Practice**

The first aim of this study was to determine whether quantity of participant at-home practice (both *frequency* and *duration*) would be associated with fewer depressive relapses, decreased or stable depression and anxiety symptoms, and decreased levels of experiential avoidance at the end of MBCT-PD. Consistent with findings from Bondolfi et al. (2010), we did not find support for at-home practice as a predictor of depressive relapse. Decreased depressive symptoms at post-intervention, however, were consistently associated with greater frequency and greater duration of formal but not informal practice, corroborating findings from Carmody and Baer (2008). Due to the fact that participants included in these analyses had significantly higher baseline depressive symptoms than participants for whom post-intervention depressive symptom data was missing, we interpreted the findings only with respect to individuals entering MBCT with higher clinician-rated depressive symptoms. Thus, engagement in formal at-home mindfulness practices may be instrumental in maintaining wellness over the course of MBCT-PD for individuals with higher baseline depressive symptomatology.

Consistent with findings from two other studies (Carmody & Baer, 2008; Stanley et al., 2011), we found that both frequency and duration of formal practice were associated with increased levels of self-reported mindfulness at post-intervention. Frequency of any type of practice, which took into account both formal and informal practices, also predicted post-intervention mindfulness scores. In our sample, only the Observe and the Non-react facets of the FFMQ were consistently associated with at-home practice



variables. These results contrasted somewhat with findings from two previous studies, one of which reported significant associations between formal practices and all but the Describe facet (Carmody & Baer, 2008), and the other of which reported no significant associations with any of the individual facets (Stanley et al., 2011). Lastly, we found a negative association between frequency of formal practice and post-intervention anxiety symptoms, which, although not statistically significant, indicated a medium effect size, therefore suggesting that limited power may have interfered with our ability to detect a meaningful relationship between formal practice and anxiety symptoms. Our findings did not support a relationship between quantity of at-home practice and experiential avoidance.

After finding significant relationships between quantity of at-home practice (i.e., frequency and duration of formal practice, and total number of days of any type of practice) and clinician-rated depressive symptoms, we tested whether increases in mindfulness mediated this relationship. In contrast to findings from Carmody and Baer (2008) based on similar mediation analyses with a sample of 121 participants, our results did not support any models of mediation. One reason for this may be that our study was not sufficiently powered to detect mediation.

We next aimed to identify the predictors of at-home practice in our sample. First, we found that those women who had experienced at least two major depressive episodes during their lifetime practiced significantly more than women who had only experienced one prior major depressive episode. Additionally, initial depressive symptom levels were positively associated with frequency of formal practices, indicating that women experiencing higher levels of depressive symptoms reported completion of more formal

at-home practice. Taken together, these findings suggest that women who have experienced recurrent depressive episodes or enter MBCT with elevated depressive symptoms may be more motivated to participate in regular at-home practice.

We also found a non-significant trend with a medium effect size for women with fewer children reporting a higher frequency of informal practices over the course of the program. This finding is not surprising, given that roughly 60% of the women in our sample were pregnant with their first child. It is likely that participants who were also caring for other children had significantly less time to themselves for at-home practice than the first-time mothers. Although there is evidence to suggest that comorbid anxiety may complicate the course of depression treatment and prevention (Singer, Dobson, & Dozois, 2008), we were unable to test associations between comorbid anxiety and at-home practice due to the low base rate of comorbid anxiety in our sample.

Overall, MBCT-PD participants practiced at comparable or higher levels to participants in other studies when considering average total days of practice (Carmody & Baer, 2008), average total duration of formal practice (Stanley et al., 2011), and average daily duration of formal practice (Shapiro et al., 2008). Nonetheless, there was a great degree of variability in the quantity and type of at-home practice that participants reported engaging in, suggesting that most participants did not strictly follow the substantial at-home practice assignments (i.e., a minimum of two practices daily, 6 days per week). These findings are consistent with a recent review (Vettese et al., 2009), which examined 24 studies that explored the role of at-home practice and participant outcomes. Vettese and colleagues (2009) reported that although daily practice behavior

generally fell within the range that was assigned, large variations in quantity of daily practice was evident between and within studies.

In contrast to findings from Reddy and colleagues (2013), overall frequency of at-home practice in our sample remained the same over the course of the program.

Interestingly, however, we found that women reported a decrease in formal practice and an increase in informal practice in the last four weeks of the program. Due to the lack of available data on perinatal- and CBT-focused practices, we were unfortunately unable to determine the extent to which women were engaged in these specific practices, and furthermore, the potential extent to which these practices may have contributed to the maintenance of their well-being. Lastly, with respect to measuring quantity of at-home practice, we are cautious to interpret results from duration analyses as stand-alone findings given, 1) the reduced number of participants for whom duration data was available, 2) the enormous variation in total number of minutes reported for formal practices, and 3) the fact that regular, consistent practice (as measured by occasions, or frequency) may be a better indicator of the cultivation of mindfulness skills, rather than intermittent episodes of practice (Del Re et al., 2013). In addition, as other researchers have reported (Carmody & Baer, 2008), the women in this study appeared to have difficulty supplying accurate estimates of the time they spent in informal practice, such that we decided this data was not meaningful and therefore was unusable. We suggest that future studies design better methods for monitoring informal as well as all other categories and individual types of practice.

### **Therapist Adherence**

The second major aim of this study was to determine whether therapist adherence, either targeted specifically toward at-home practice or reflecting global fidelity to MBCT-PD techniques, would be associated with fewer depressive relapses, decreased or stable depression and anxiety symptoms, decreased levels of experiential avoidance, and increased levels of mindfulness at the end of the intervention. First, we did not find any support for therapist adherence as a predictor of depressive relapse. Furthermore, contrary to our predictions, neither practice-targeted nor global therapist adherence when measured “early” in MBCT-PD significantly predicted post-intervention depressive symptoms. When taking into account both “early” and “late” practice-targeted adherence, however, greater levels of practice-targeted adherence predicted fewer clinician-rated depressive symptoms at post-intervention. The sample size available for this analysis, however, was small enough that we interpret these findings with caution. If our findings are replicated, however, this may suggest that consistent therapist emphasis on at-home practice over the course of the 8-week intervention is important for maintaining or even decreasing depressive symptoms.

Our findings indicated that therapist adherence was unrelated to post-intervention anxiety symptoms and levels of experiential avoidance. Also contrary to our hypothesis, practice-targeted therapist adherence did not predict post-intervention mindfulness total scores, nor any of the facets of the FFMQ. Surprisingly, we found that global therapist adherence predicted mindfulness total scores, such that greater levels of global adherence were associated with lower mindfulness total scores at post-intervention. Although not statistically significant, the associations between global therapist adherence and the five

facets of mindfulness were all negative in direction. These results were unexpected and need to be replicated, but suggest that there may be an important relationship between global therapist adherence to MBCT-PD and participant self-reported levels of mindfulness at post-intervention that should be clarified in future studies. As we did not find evidence for a relationship between therapist adherence and positive outcomes, we did not have justification for any tests of our hypotheses regarding mediation.

We found evidence for a positive association between practice-targeted adherence and frequency of formal practice, such that when taking into account both “early” and “late” practice-targeted adherence, we were able to significantly predict frequency of any type of at-home practice. We also found that “late” practice-targeted adherence marginally predicted frequency of informal practice over and above “early” practice-targeted adherence. These results, although preliminary, are consistent with findings in the adherence literature suggesting that therapist attention to concrete therapy techniques may be essential for participants’ acquisition and independent use of coping skills that are taught in therapy and thought to prevent depressive relapse (Strunk et al., 2007).

Interestingly, “early” practice-targeted adherence was associated with higher baseline levels of experiential avoidance and lower levels of mindfulness on the Describe facet, and marginally associated with higher baseline levels of perceived stress and clinician-rated depressive symptoms. Although these results need to be replicated, it may be the case that MBCT therapists tended to emphasize at-home practice to a greater degree with cohorts of women that demonstrated greater baseline levels of overall distress. This strategy could potentially benefit those participants who enter the program

at imminent risk for depressive relapse by making a point to emphasize the importance of committing to regular at-home practice early on in the intervention.

Finally, analyses comparing “early” to “late” therapist adherence indicated that “late” therapist adherence was not correlated with “early” therapist adherence. Moreover, with the exception of predicting clinician-rated depressive symptoms at post-intervention, “late” therapist adherence (global or practice-targeted) did not add any predictive value to models attempting to account for variance in participant outcomes. These findings suggest that MBCT therapists are using somewhat different techniques and emphasizing different themes throughout the course of the intervention. This is a likely possibility in the current study, given that the content of Session 2 (“Working with Barriers”) was considerably different from the content of Session 6 (“How Can I Best Take Care of Myself”).

### **Implications**

Results of the present study suggest that at-home practice, especially in the form of formal meditative exercises (i.e., sitting meditation, body scans, and yoga), plays an important role in the effectiveness of MBCT-PD. Specifically, pregnant women who engaged in more at-home practices reported increased levels of mindfulness and decreased depressive symptoms over the course of the 8-week program. Women who had experienced more than one MDE in their lifetimes were more likely to invest time in at-home practice. These findings can be understood in the context of the key studies testing the efficacy of MBCT, which have consistently found that the preventive intervention is most effective for individuals who have experienced three or more depressive episodes (Piet & Hougaard, 2011; Teasdale & Ma, 2004; Teasdale et al., 2000). It may be that

having history and experience with recurrent depression serves as a pivotal impetus to become actively engaged in one's own preventive treatment. Furthermore, it is possible that MBCT may be more appropriate for women with more severe histories of depression. Especially when first beginning mindfulness practice, a great deal of effort is required to "stick with" the practice, attempting to engage over and over again with one's internal experiences in a radically different way. Furthermore, the effort (and time) needed to engage in regular formal practices is significant and goes beyond what is necessary to experiment with "mindfulness in daily life" types of exercises (e.g., bringing attention to the sensation of the baby growing inside whenever it moves).

Therefore, future research would benefit from including measures of motivation-to-change, ideally both in the form of self-report questionnaires and in more basic implicit motivation tasks. Also, as Stanley and colleagues (2011) found, at-home practice time was positively associated with participants' positive attitudes toward the mindfulness training course, as measured by 5-point Likert-scale responses to three basic questions (e.g., "I learned valuable skills in this course"; p. 570). In addition to assessing attitudes toward MBCT, obtaining baseline measures of personality variables could further elucidate the predictors of at-home practice. By taking this approach a priori, Stanley et al. (2011) found that participant baseline levels of self-reported propensity to seek and produce novelty, be engaged, and be flexible were significantly associated with time spent in at-home practice. Some personality characteristics, such as trait disinhibition and impulsivity, have been found to be negatively associated with trait levels of mindfulness (Lattimore, Fisher, & Malinowski, 2011). Other researchers have suggested that Axis II personality pathology may play a central role in determining the

successful course of depression treatment (Ilardi & Craighead, 1999; Strunk, Brotman, DeRubeis, & Hollon, 2010). Furthermore, normative personality dimensions (e.g., conscientiousness, openness to experience) as well as other domains, like executive functioning (planning), general level of distress, and optimism/hopelessness could all influence one's success in avoiding depressive relapse and increasing well-being. It is highly likely that these and other variables play a significant role in determining which individuals devote time to at-home practice and ultimately derive the most benefit from intervention programs such as MBCT. Thus, careful consideration of potential moderators in future studies may be essential to understanding MBCT's mechanisms.

In addition to time or *quantity* of at-home practice, the depth or *quality* of at-home practice is an important dimension of at-home practice that has often been overlooked. Future studies should attempt to measure quality of at-home practice over the course of therapy and into follow-up. These measurements could be taken via self-report (see Del Re et al., 2013 for the description of one such measure), or by surveying therapists for second-person ratings of client growth in mindfulness practices. Another possibility would be to incorporate the use of qualitative methods via examining and rating verbal reports from participants about their experiences before, during, and after engaging in mindfulness practices (Mason & Hargreaves, 2001). Gathering and rating data from exit interviews could be another potentially rich source of information regarding at-home practice quantity and quality. Exit interviews could also provide supplemental data about the meaning that different individuals take from their experiences in MBCT and the different ways they choose to apply what they have learned. Lastly, as Del Re et al. (2013) did with longitudinal multilevel modeling (MLM), future studies would benefit



from employing more advanced statistical methods to look at individual trajectories and clusters of practice quantity and quality over time.

Although our study did not provide sufficient evidence to make a case for the role of therapist adherence in predicting participant outcomes, we have presented some preliminary evidence that therapist attention to encouraging, reviewing, assigning, and leading participants in mindfulness practices is positively associated with participants' actual at-home practice behavior. Perhaps therapists' practice-targeted adherence early in the course of MBCT predicts participants' completion of early homework assignments, which subsequently predicts therapists' continuing to focus on at-home practice later in the intervention. Future studies could benefit from employing statistical techniques that could take into account the transactional nature of the therapist-client(s) relationship.

### **Limitations**

First, our study was limited by the lack of a control group, which would tell us whether or not reductions in depression and increases in mindfulness to begin with were due to at-home practice and participation in MBCT. Ideally this study would have been designed to experimentally test for at-home practice as an active ingredient in the intervention (i.e. a two MBCT-PD group design in addition to a control group, with one of the intervention groups including all active "ingredients" of the intervention with the exception of at-home practice homework assignments and therapist encouragement to practice outside of class). We hope, however, that by coding specifically for practice-targeted adherence and examining participant time spent in at-home practice that this study will have contributed in some way to understanding the potential roles of at-home practice and therapist adherence as mechanisms of action in MBCT-PD.

A second limitation of the proposed study is its primary reliance on self-report measures, which are subject to demand characteristics and other biases. Furthermore, self-reports may be measuring individual differences in *awareness* of certain mental states, rather than the first person, phenomenal experience of those states (Lambie & Marcel, 2002), which is especially important to consider in mindfulness research. HAM-D scores, depressive relapse scores, and therapist adherence, however, were all scored based on clinician/graduate student level judgment or standardized diagnostic criteria. Finally, our measure of therapist adherence had a limited number of response options (0-2), often requiring only one or two relevant utterances by the therapist to receive full credit for an item. The restriction of range on this scale may have significantly impaired our ability to make fine-grained distinctions in therapeutic techniques, specifically with respect to practice-targeted techniques. Additionally, this study is limited by the lack of a design to experimentally control for other potential confounds (e.g. use of medications, previous experience with mindfulness-like practices). We instead used statistical controls when possible and examined hypothesized predictor variables.

Lastly, throughout the mindfulness literature, researchers have called specifically for improvements in construct operationalization and measurement in order to effectively study mechanisms of action in MBIs. While the FFMQ is widely used in mindfulness research and has psychometric properties superior to other existing mindfulness measures, it has demonstrated only incremental validity for several of its facets. Furthermore, this mindfulness questionnaire cannot escape the biases of self-report, which is a particularly problematic issue in mindfulness assessment; the very nature of mindfulness and “mindlessness” suggests that self-reports of mindfulness may be heavily

biased. Thus, in future studies, the collection of physiological data along the lines of previous research (Kemeny et al., 2012; Pace et al., 2009; Pace et al., 2013) would be a helpful supplement to improve measurement accuracy of mindfulness as a construct.

### **Conclusion**

Among pregnant women with a history of depression, higher levels of at-home practice, particularly formal practice, predict reductions in depressive symptoms and increases in mindfulness. Our results suggest that quantity of at-home practice may be a mechanism by which MBCT effects change. Women with a history of recurrent depression engaged in greater amounts of at-home practice over the 8-week course than women who had only experienced one MDE, which may suggest that women with more severe depression histories have greater motivation to actively engage in the intervention. Therapist adherence targeted toward participant at-home practice appears to be associated with participants' actual practice behavior, suggesting that therapists' repeated efforts to emphasize the importance of consistent mindfulness practice is worthwhile. Future work expanding these analyses has the potential to help us better understand how participant engagement with mindfulness practices influences the maintenance of wellness over the course of MBCT, as well as which factors may predict better compliance with at-home practice.

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Appendix

Figure 1.

*Participant Flow*

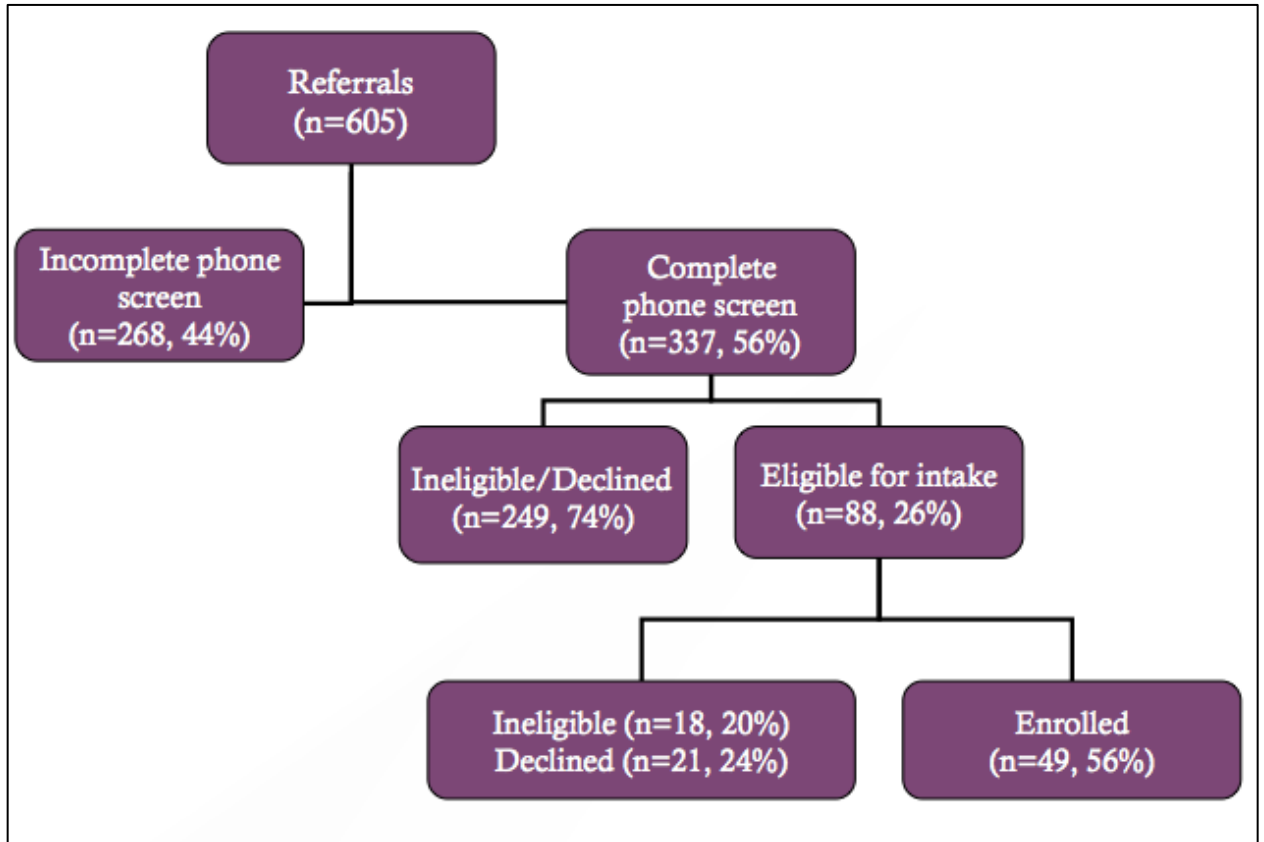


Table 1

*Demographic and Other Relevant Characteristics of MBCT-PD Open Trial Participants*

Variable	<i>n</i>	%	<i>M</i>	<i>SD</i>	Min	Max
Age			31.88	4.11	21	40
Relationship status						
Married	32	78.0				
Divorced and remarried	2	4.9				
Living with significant other	2	4.9				
Never been married	2	4.9				
Number of children			2	0.64	0	2
Education						
Graduate degree	21	52.5				
Partial graduate degree	5	12.5				
4-year college degree	5	12.5				
Partial college or 2-yr college degree	6	15.0				
Graduated from high school	3	7.5				
Ethnicity						
White	34	82.9				
African American	2	4.9				
Hispanic/Latina	2	4.9				
Asian	1	2.4				
Portuguese Native Indian	1	2.4				
Persian	1	2.4				

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Family income					
$\leq 39,000$	8	20.0			
40,000 – 59,999	8	20.0			
60,000 – 89,999	15	37.5			
$\geq 90,000$	9	22.5			
Primiparous	23	59.0			
History of MDEs					
One prior	17	41.5			
Two prior	14	34.1			
Three or more prior*	10	24.4			
Current GAD**	3	7.3			
Previous diagnosis of GAD	2	4.9			
Number of MBCT-PD classes attended			6.83	1.02	4      8

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*Unless otherwise specified, n = 41*

*MDE = Major Depressive Episode*

*\*Previous MDEs ranged from 3 to “too many to count” (i.e., > 11)*

*\*\*Meeting subthreshold or full criteria; Assessed at baseline*

Table 2  
*At-home Practice Categories*

	Formal	Informal	Perinatal- Focused	CBT- Focused
Body Scan	x			
Yoga	x			
Mindfulness of Breathing Meditation	x			
Loving Kindness Meditation	x			
Any Sitting Meditation	x			
3-Minute Breathing Space		x		
Mindfulness in Daily Life		x		
Notice Auto Pilot		x		
Being with Baby		x	x	
Connect with Baby			x	
Dear Mom Letter			x	
Unpleasant Events Calendar				x
Review Hand Outs				x
Activity and Mood Links				x
Write a Letter to Yourself				x
Share Action Plan				x
Connect with Support Person				x

Table 3

*Means, Standard Deviations, and Ranges of At-Home Practice Variables*

	<i>n</i>	<i>M</i>	<i>SD</i>	Min	Max
Total Days of any type of practice	40	32.73	10.97	3.00	47.00
Frequency of formal practices	23	21.96	15.56	1.00	58.00
Minutes of formal practices	18	474.50	479.44	15	1721.00
Frequency of informal practices	31	78.68	48.93	3.00	205.00
Minutes of perinatal practices	9	169.11	239.37	0	728.00
Frequency of perinatal practices	12	14.25	14.69	0	43.00
Frequency of CBT practices	13	10.46	9.80	0	34.00

Table 4

*Means, Standard Deviations, and Ranges of Therapist Adherence Variables*

	<i>n</i>	<i>M</i>	<i>SD</i>	Min	Max
“Early” Global adherence mean score	10	1.38	0.11	1.23	1.54
“Late” Global adherence mean score	10	1.59	0.20	1.23	1.92
“Early” Practice-targeted adherence mean score	9	1.67	0.13	1.50	1.75
“Late” Practice-targeted adherence mean score	10	1.80	0.20	1.50	2.00

Table 5  
*Descriptive Statistics for Dependent Variables*

	<i>n (%)</i>	Min	Max	<i>M</i>	<i>SD</i>
Relapse after the first session or at any point in the PP					
No relapse	32 (78%)				
Relapse	9 (22%)				
HAM-D Total pre	31	0	16	6.90	4.33
HAM-D Total post	19	1	15	6.95	3.39
EPDS Total pre	37	1	20	5.87	4.61
EPDS Total post	37	0	11	3.38	3.02
STAI Total pre	37	20	65	33.46	9.79
STAI Total post	31	21	58	32.36	9.34
FFMQ Total pre	32	101	181	133.84	21.46
FFMQ Total post	35	111	174	141.42	16.63
FFMQ – Observe scale pre	32	11	36	24.78	5.69
FFMQ – Observe scale post	35	15	37	27.51	5.59
FFMQ – Describe scale pre	32	15	40	30.28	6.17
FFMQ – Describe scale post	35	20	40	31.29	4.17
FFMQ – Aware scale pre	32	17	40	28.75	6.21
FFMQ – Aware scale post	35	15	40	28.60	5.44
FFMQ – Non-judge scale pre	32	20	39	29.31	5.81
FFMQ – Non-judge scale post	35	19	40	31.46	5.89
FFMQ – Non-react scale pre	32	11	33	20.72	5.24
FFMQ – Non-react scale post	35	13	29	22.57	4.02

Table 5 continued

*Descriptive Statistics for Dependent Variables*

AAQ Total pre	37	15	47	31.51	7.57
AAQ Total post	36	13	46	27.89	8.02
PSS Total pre	37	2	28	14.92	6.61
PSS Total post	36	3	30	13.14	5.46

*Note.* PP = postpartum; pre = intake score; post = score upon completion of MBCT-PD.

Table 6  
*Correlations Between Practice Variables and Pre-Post Outcome Variables*

	Relapse after first class or PP	HAM-D Total pre	HAM-D Total post	EPDS Total pre	EPDS Total post	STAI Total pre	STAI Total post	AAQ Total pre	AAQ Total post	PSS Total pre	PSS Total post
Total Days any practice	.18	.07	-.25	.05	-.06	.21	-.18	.26	.13	-.14	-.33*
Formal Duration	.04	.29	-.52	.43	-.32	.19	-.05	.12	.16	-.00	-.22
Formal Frequency	.07	.58**	-.31	.08	-.35	.33	-.33	.37	.03	.10	-.32
Informal Frequency	-.23	.04	-.35	.11	-.29	.24	-.24	.07	-.08	-.02	-.31

\*\*  $p < .01$  level (2-tailed). \*  $p < .05$  level (2-tailed).

*Note.* All correlations reported in first column (relapse) are Spearman's Rho correlations. All other correlations are Pearson product moment correlations; Frequency = # of total occasions; Duration = # of total minutes; PP = postpartum; pre = intake score; post = score upon completion of MBCT-PD



Table 6 continued  
*Correlations Between Practice Variables and Pre-Post Outcome Variables*

	FFMQ Total pre	FFMQ Total post	Observe scale pre	Observe scale post	Describe scale pre	Describe scale post	Aware scale pre	Aware scale post	Non- judge scale pre	Non- judge scale post	Non- react scale pre	Non- react scale post
Total Days any practice	-.17	.25	.16	.34*	-.28	-.10	-.12	.11	-.23	.02	-.15	.50**
Formal Duration	.09	.26	.42	.64**	-.16	-.21	.08	.27	.03	-.12	.06	.21
Formal Frequency	.02	.38	.36	.54**	-.21	-.13	.06	.32	-.13	.09	.06	.43*
Informal Frequency	.03	.27	.35	.52**	-.10	-.19	.10	.24	-.22	-.01	-.02	-.29

\*\*  $p < .01$  level (2-tailed). \*  $p < .05$  level (2-tailed).

*Note.* All correlations reported in first column (relapse) are Spearman's Rho correlations. All other correlations are Pearson product moment correlations; Frequency = # of total occasions; Duration = # of total minutes; PP = postpartum; pre = intake score; post = score upon completion of MBCT-PD

Table 7  
*Correlations Between Therapist Adherence Variables and Pre-Post Outcome Variables*

	MDE Relapse	HAM-D Total pre	HAM-D Total post	EPDS Total pre	EPDS Total post	STAI Total pre	STAI Total post	AAQ Total pre	AAQ Total post	PSS Total pre	PSS Total post
“Early” Global adherence	-.20	-.22	.22	-.03	.06	.07	.17	-.11	-.10	-.03	.16
“Late” Global adherence	-.20	.16	-.03	.22	-.02	.13	.10	.10	.13	-.04	.26
“Early” Practice-targeted adherence	.29	.38	.06	.28	.10	.09	.16	.37*	.17	.33	.27
“Late” Practice-targeted adherence	.27	.19	-.16	.21	.06	-.07	.05	-.09	-.05	.11	.09

\*\*  $p < .01$  level (2-tailed). \*  $p < .05$  level (2-tailed).

*Note.* All correlations reported in first column (relapse) are Spearman’s Rho correlations. All other correlations are Pearson product moment correlations; pre = intake score; post = score upon completion of MBCT-PD

Table 7 continued

*Correlations Between Therapist Adherence Variables and Pre-Post Outcome Variables*

	FFMQ Total pre	FFMQ Total post	Observe scale pre	Observe scale post	Describe scale pre	Describe scale post	Aware scale pre	Aware scale post	Non- judge scale pre	Non- judge scale post	Non- react scale pre	Non- react scale post
“Early” Global adherence	.06	-.25	-.10	-.23	.18	-.14	-.02	-.08	.14	-.16	-.01	-.23
“Late” Global adherence	-.04	-.30	.10	-.13	-.20	-.14	-.06	-.18	-.03	-.37*	.05	-.14
“Early” Practice-targeted adherence	-.23	-.10	.07	.07	-.41*	-.09	-.25	-.19	-.14	-.03	-.10	-.12
“Late” Practice-targeted adherence	.13	.10	.11	.26	.13	-.08	.17	.04	-.03	-.12	.11	.26

\*\*  $p < .01$  level (2-tailed). \*  $p < .05$  level (2-tailed).

*Note.* All correlations reported in first column (relapse) are Spearman’s Rho correlations. All other correlations are Pearson product moment correlations; pre = intake score; post = score upon completion of MBCT-PD