MINDFULNESS IN BIPOLAR DISORDER AND MAJOR DEPRESSIVE DISORDER

THE IMPACT OF MINDFULNESS-BASED COGNITIVE THERAPY ON BIPOLAR DISORDER AND MAJOR DEPRESSIVE DISORDER

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Abstract

Bipolar disorder is characterized by frequent episodes of depression and/or mania which results in tremendous amounts of disability. Rates of relapse are very high despite pharmacological treatments. Many studies have examined the effectiveness of conjunctive pharmacotherapy and some sort of psychosocial interventions in this patient population. Mindfulness-based cognitive therapy (MBCT) was primarily designed for patients with major depressive disorders as a method to prevent additional depressive recurrences. It has recently been implemented among bipolar patient groups as well. The central goals of this study were: to evaluate the impact of MBCT to reduce depressive symptoms in a group of bipolar and unipolar patients with current depressive symptoms, assess factors that might be mechanisms of action associated with depression reduction in MBCT and compare the result of the intervention between the bipolar and unipolar patient groups. In this study, sixteen adult patients diagnosed with depression or bipolar disorder with current mild to moderate depressive symptoms participated in an 8-week MBCT group program within the same class settings. Depressive symptoms along with levels of mindfulness, self-compassion, rumination, sleep, anxiety and quality of life were assessed at pre-MBCT, post-MBCT and 3-month follow-up. Using repeated measures analysis of variance, changes in these variables were examined from pre to post-MBCT and from post-intervention to 3- month follow-up. We found similar significant changes across both patient groups in depression, rumination, and self-compassion, as well as the observe, act-aware and non-react subscales of mindfulness following MBCT. Only bipolar patients showed significant improvements in the non-judgement quality of mindfulness at post-intervention. In regards to mechanisms of action, significant correlations between reductions in rumination and depression levels were detected across both patient groups. Due to our small sample size mediation analyses could not be employed to further evaluate mechanisms of action. All improvements were

maintained at 3-month follow-up. Future studies need to incorporate designs with a larger sample size which would allow further evaluation and confirmation of potential mechanisms of change in MBCT with bipolar and unipolar depressed patients.

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List of all Abbreviations and Symbols

ANOVA: Analysis of Variance
BAI: Beck Anxiety Inventory
BD: Bipolar Disorder
BDI-II: Beck Depression Inventory
BPAD: Bipolar Affective Disorder
CBT: Cognitive Behavioural Therapy
CT: Cognitive Therapy
EQ: Experiences Questionnaire
FFMQ: Five Factor Mindfulness Questionnaire
FFT: Family Focused Treatment
GAF: Global Assessment of Functioning
IPSRT: Interpersonal and Social Rhythm Therapy
M: Mean
mADM: Maintenance Anti-Depressant Medication
MADRS: Montgomery-Asberg Depression Rating Scale
MANOVA: Multivariate Analysis of Variance
MBCT: Mindfulness Based Cognitive Therapy
MBSR: Mindfulness Based Stress Reduction
MDD: Major Depressive Disorder
ms: milli-seconds
PSQI: Pittsburgh Sleep Quality Inventory
RM-ANOVA: Repeated Measure-Analysis of Variance
RRS-RSQ: Rumination Response Style-Response Style Questionnaire
SCS: Self-Compassion Scale
SD: Standard Deviation
TAU: Treatment as Usual
TMQ: Toronto Mindfulness Questionnaire
WHOQOL-BREF: World Health Organization Quality of Life-Brief Version
YMRS: Young Mania Rating Scale

Declaration of Academic Achievement

Throughout my two years of involvement in this research, I gained the opportunity to grow, to learn and to become better. I owe this to those whose beliefs in me made me believe in myself harder and become stronger. The opportunity that I was given to study, explore and understand the field of my passion is priceless to me. The challenges that were presented along the way only arose my inquisitive nature even more and amplified my thirst for learning. My Master's experience contributed greatly to my academic as well as professional growth. I sincerely appreciate the assistance of all who granted me this opportunity.

Introduction

Bipolar Disorder (BD) is a condition characterized by repetitive episodes of depression and or mania (American Psychiatric Association, 2000). It is estimated as the sixth leading cause of disability worldwide (Murray and Lopez, 1996). Rates of recurrence are high in BD patients despite medication interventions (as high as 60% in 2 years) (Gitlin et al., 1995; Perlis et al., 2006). Even with pharmacotherapy, BD patients continue to experience residual mood symptoms in between episodes preventing full remission (Judd et al., 2008). Recurrence rates of depression and the amount of time spent in depressive phases could be as much as three times higher than the mania recurrence rates or the total time spent in manic episodes (Judd et al., 2002; Perlis et al., 2006). Residual symptoms of depression are accurate predictors of recurrent mood episodes (Perlis et al., 2006). Pharmacotherapy is the primary treatment of choice for this population of patients (Williams et al., 2007). Nevertheless, despite following strict medical regimes, 73% of patients relapse within 5 years (Gitlin et al., 1995). Therefore, due to the shortcomings of pharmacological treatments, many studies have incorporated psychosocial interventions as adjuncts to medications to improve disease outcomes (Miklowitz et al., 2009). These interventions include Interpersonal and Social Rhythm Therapy (IPSRT), Family Focused Treatment (FFT), and Cognitive Behavioural Therapy (CBT). IPSRT focuses on improving interpersonal relationship and increasing the consistency of social rhythms (Frank et al., 2000). FFT includes psychoeducation for families, boosting communication among family members, helping families recognize signs of relapse and training for group problem solving (Miklowitz et al., 2008). CBT focuses on cognitive restructuring, activity scheduling, techniques for relapse prevention and mood monitoring. CBT's role in reducing relapse rates and symptom severity has been replicated many times (Scott et al., 2001; Lam et al., 2003; Lam et al., 2005). However, all

the aforementioned psychosocial interventions are lengthy and costly which makes them options that many patients will not explore (Miklowitz et al., 2009). Additionally, in spite of advances in such interventions, many patients continue to experience substantial mood symptoms following these interventions placing them at high risk for relapse and lowering sustained periods of remission among these patients (Perlis et al., 2006; Judd et al., 2008; Scott et al., 2006). Therefore there is a need for brief psychological interventions that may help improve mood symptoms and enhance inter-episode recovery in patients with BD.

Mindfulness Based Cognitive Therapy

Mindfulness-based cognitive therapy (MBCT) is an eight week group treatment program which combines practices from cognitive therapy and training in mindfulness as an attempt to teach patients non-judgemental observation skills (Miklowitz et al., 2009). It was primarily developed to prevent depressive relapse in patients with unipolar depression (Segal et al., 2002). MBCT develops skills to become more aware of thoughts, feelings and bodily sensations and view them as passing events rather than judging them (Williams et al., 2008). Several studies have implemented MBCT as a treatment option for patients with unipolar depression. Previous research indicates that participation in MBCT is associated with a fifty percent reduction in relapse rates in depressed patients with three or more prior depressive episodes (Teasdale et al., 2000; Teasdale and Ma, 2004). Bondolfi et al. (2010) also found that participation in MBCT is associated with increased time between depressive episodes for patients with recurrent depression. Studies also indicated that MBCT reduces residual depressive symptoms, rates of comorbidity with other psychiatric illnesses and enhances quality of life in partially or fully remitted patients with recurrent depression (Kuyken et al., 2008).

Mindfulness based cognitive therapy and bipolar disorder. Only recently, mindfulness interventions have also been suggested as an intervention for individuals with bipolar disorder

(Ball et al., 2007). Chadwick et al. (2011) listed a number of reasons as for why MBCT might be helpful for BD patients. First, rates of depressive relapse are high in individuals with bipolar disorder even among those treated with mood stabilizers (Keck et al., 1996; Gitlin et al., 1995) and as previously mentioned, MBCT participation has been linked with decreased rates of depressive relapse in unipolar patients (e.g. Teasdale et al., 2000). Second, stress and anxiety play a significant role in the course of BD and anxiety in particular is an important factor in predicting negative outcomes in BD (Boylan et al., 2004; Guardino and Miller, 2005). A study by Perich et al. (2012) found that bipolar individuals who participated in an MBCT program had significantly reduced anxiety symptoms following the intervention. Third, difficulty in regulation of thoughts/feelings (Ball et al., 2007) has been identified as a key feature of BD. To that end, Segal et al. (2002) refers to mindfulness as an intervention that promotes self-acceptance and improves regulation of negative thoughts/mood. Thus mindfulness might be a promising intervention for the reduction of depressive symptoms in bipolar patients.

Although there is a strong rationale for implementing MBCT among BD patients, there are only a few studies which have investigated the effect of MBCT for improving depressive symptoms in this category of patients. Weber et al. (2010) examined the efficacy of MBCT among 23 patients with BD (I, II, NOS) in a pre vs. post design study and found that increases in mindfulness skills were significantly correlated with decreases in depressive symptoms from pre to post intervention. However this study did not report any significant reductions in depressive symptoms after the intervention. Additionally, a randomized controlled trial by Perich et al. (2012) compared the efficacy of MBCT in addition to treatment as usual (TAU) to TAU only, in a group of patients with BD over a 12 months follow-up. This study found no significant differences between the two groups in terms of time to first recurrence of a mood episode or the total number of recurrences over the 12-month period. The MBCT group however, showed

significantly lower scores on state and trait anxiety. Thus, this study suggests MBCT as a potential useful tool in managing anxiety (in particular state anxiety) symptoms among bipolar patients.

In addition to alleviating effects of MBCT on anxiety symptoms within the context of bipolar disorder, MBCT has also been shown to be associated with several other positive outcomes. In a study done by Deckersbach et al. (2010), bipolar I or II individuals at post-MBCT and at a 3- month follow-up exhibited increased mindfulness skills, reduced residual depressive symptoms, lowered attentional difficulties, improved emotion regulation abilities, psychological well-being, psychosocial functioning, and increased positive affect. Moreover, studies by Williams et al. (2008) and Miklowitz et al. (2009) both have reported positive findings regarding reduced depression following MBCT. Williams et al. (2008) investigated the effects of MBCT on bipolar and unipolar patients with suicidal ideation in a randomized controlled trial (RCT). Patients were randomized to either receive MBCT or a waitlist group. Their results revealed that MBCT reduced depressive symptoms for both bipolar and unipolar patients and anxiety in patients with BD. Consistently, Miklowitz et al. (2009) explored the feasibility and efficacy of MBCT in a group of between-episode bipolar patients on medications. Post-intervention findings demonstrated reductions in depressive symptoms and suicidal ideations and to a lower extent in manic and anxiety symptoms. This study also did not find any worsening of manic symptoms post MBCT intervention. Miklowitz et al.'s study highlighted the role of MBCT in lowering subsyndromal depression in BD patients.

While Weber et al. (2010) and Perich et al. (2012) did not find any significant reductions in depression following MBCT in bipolar disorder, Deckersbach et al. (2010), Williams et al. (2008) and Miklowitz et al.(2008) all reported lower depression following MBCT among bipolar participants.

Although there are only a limited number of studies that explored the efficacy of MBCT among bipolar patients, they all recommend this intervention as a promising adjunct to the current pharmacological treatments. So far, none of the studies on MBCT in bipolar disorder have focused on identifying the mediating elements whose changes are related to the changes in depressive outcome. Thus, in addition to investigating depression change following MBCT, our study aimed at finding how some of the previously proposed mechanisms of action of MBCT change across the course of the intervention and in relation to depression in bipolar and unipolar depressed patients.

Potential Mechanisms of MBCT

Understanding the underlying mechanisms of action of MBCT could lead to a better and more directed usage of this intervention towards the causal factors of psychiatric disorders. For instance, understanding these mechanisms could further help us see whether MBCT is a practical tool in targeting bipolar disorder's underlying causal and maintaining factors. Additionally, it is important to continue the search on mechanisms of mindfulness interventions as to compare the proposed mechanisms across various psychiatric disorders in order to see whether mindfulness has similar or different pathways to positive change across these disorders. Discovering different pathways across various disorders could potentially direct us towards adapting the intervention to target distinct pathways across each disorder in order to battle the causal or maintaining factors.

Shapiro et al. (2006), emphasizes the need for a testable theory of the mindfulness mechanisms in order to elucidate whether and how mindfulness affects transformation. According to Shapiro et al. (2006), the search for underlying mechanisms of action of mindfulness calls for two separate but complementary lines of inquiry. Firstly, dismantling studies which separate and contrast active ingredients of mindfulness-based interventions are necessary. Secondly, studies evaluating the central construct of mindfulness to determine whether

or not it is the development of mindfulness itself that leads to positive changes. Consistent with the second line of inquiry, the current study seeks to assess whether participation in a mindfulness intervention leads to increases in mindfulness, to ensure that what is perceived to be a central active ingredient is in fact changing and also to assess whether these increases in mindfulness are associated with reductions in depression symptomatology.

Studies that have examined the mechanisms of action of MBCT so far mostly incorporate patient populations with unipolar depression. Some of the most commonly proposed mechanisms of MBCT are briefly discussed below.

Rumination. Davis and Nolen-Hoeksema (2000) similarly discuss two self -perpetuating properties of dysphoric rumination. These include a reduced willingness to engage in mood elevating activities and a false belief that rumination will increase insight into one's feelings. Thus, rumination in response to depression may prevent the individual from engaging in behaviors that provide positive reinforcement and a sense of control (Nolen-Hoeksema, 1991).Therefore, rumination and depression reinforce each other as parts of a cycle such that rumination is more likely to occur during depression and when one ruminates, this could lead to depressive relapse or prolonging of a current episode.

While rumination has robustly been linked to depressive symptoms (Nolen-Hoeksema, 1991), further analysis of the relationship between rumination and depression has suggested that rumination is a broad concept that can be divided into subtypes. The *Rumination Response Scale (RRS)* (Nolen-Hoeksema, 2003) is the most common assessment tool for measuring depressive rumination. Factor analysis of the RRS has confirmed that this instrument is composed of two sub-components that reveal two distinct subscales of brooding and reflection (Treynor et al., 2003). Reflective pondering/reflection is defined as "purposeful turning inward to engage in cognitive problem solving to alleviate one's depressive symptoms" (Treynor et al., 2003).

Brooding is identified as passively comparing one's current situation with an unachieved standard. Several studies have suggested that brooding is the more maladaptive component of rumination linking it to depression (Burwell and Shirk, 2007; Debeer et al., 2009; Joormann et al., 2006; Lo et al., 2008; O'Connor and Noyce, 2008; Raes and Hermans, 2008). More specifically, Treynor et al. (2003) in a non-clinical sample of participants demonstrated that while brooding is associated with more depressive outcomes at both present and follow-up, reflection was only associated with depressive outcome at present and not at follow-up. Thus, negative affect may instigate reflective rumination or it may be brought on by reflection in the short term but in the long run, reflection can actually become adaptive and help with problem solving leading to a reduction in negative affect (Treynor et al., 2003). However, since brooding was associated with negative and depressive affect both initially and longitudinally, it appears to be the maladaptive ruminative component. Consistently, Joormann et al. (2006) acknowledges that brooding should be the primary target of interventions for emotional disorders but it also mentions that distinguishing between the brooding and the refection components of depressive rumination is more difficult among those who are currently in a depressive state.

***Theoretical Link between Rumination and Mindfulness*.** So far we have elaborated on rumination as an important changing construct during the development of a mindful outlook. Mindfulness assists individuals to acquire a present moment attentional focus which contributes to the flexibility of mental sets and helps them seek alternative coping mechanisms rather than merely ruminating in the hopes of solving their problems. By presenting a decentered view of all thoughts, emotions and sensations, mindfulness works against the repetitive, negative and overly analytic networks of rumination. Decentering from all cognitions and events defeats rumination by taking up the "space" within attentional channels which otherwise would have been occupied with ruminative thoughts. Mindfulness promotes flexibility of the mindset and a decentered atti-

tude which negate the redundancy of depressive cycles of rumination and promote a present moment focus which due to its non-judgemental and plastic nature cannot be dragged into negative ruminative pathways. In such a way, mindfulness trains the attentional skills, teaches disengagement from rumination and helps with the development of alternative flexible cognitive patterns.

Rumination as a Mechanism in MBCT. Several lines of inquiry support the notion that changes in rumination are potential mechanism of action in MBCT including: studies that show a link between lower levels of rumination and higher levels of dispositional mindfulness, studies that show MBCT interventions leads to reductions in rumination, studies that found mindfulness increase along with rumination reduction following MBCT, and finally studies that have assessed rumination as a mediator of decreased depression in MBCT.

Rumination reduction as an outcome of MBCT. Changes in rumination levels have been investigated among several other factors following mindfulness techniques and many studies have reported reductions in levels of rumination following mindfulness treatments. Michalak et al. (2011) reported significant reductions in rumination levels of 24 formerly depressed patients following MBCT. Additionally, post treatment levels of rumination predicted the risk of depressive relapse in the 12 months follow-up, even when the numbers of previous episodes and residual depressive symptoms were controlled for. Keune et al. (2011) aimed at examining the effect of MBCT on rumination, mindfulness and residual depressive symptoms in a group of recurrently depressed patients in remission. Following MBCT, participants exhibited reductions in rumination as well as residual depressive symptoms and increases in mindfulness. Also, a study by Radford et al. (2012) examined MBCT in a primary care context for individuals with high vul-

nerability to depression and anxiety. The results provided support for reductions in rumination levels over the 8-week program and at 6-month follow-up.

In a randomized controlled trial of patients with recurrent depression, van Vught et al. (2012) compared the effectiveness of MBCT vs. a waitlist control group on three different recall dynamics which reflected specific patterns of memory retrieval for valenced information. Memory retrieval of negatively valenced information is considered to be a key attentional process involved in rumination. The MBCT participants demonstrated reduced tendency to sustain trains of negative words, a greater trend to sustain trains of positive words as well as significantly lower tendencies to end recalls with negative words. These findings were reflective of reduced stickiness of negatively valenced mind states following MBCT and indicative of the effectiveness of MBCT in weakening the patterns that bring on rumination. In another randomized controlled trial, Manicavasagar et al. (2012) studied the impact of rumination and mindfulness on treatment outcomes of MBCT vs CBT among a group of patients with non-melancholic depression. Rumination scores significantly decreased from pre- to post-treatment for both conditions as well as significant associations between post-treatment rumination and mindfulness scores were detected. Kingston et al. (2007) allocated residually depressed patients to either MBCT or TAU (treatment as usual) with the TAU group then proceeding to complete an MBCT group. The findings of this study also demonstrated significant rumination reductions following MBCT.

Rumination as a mediator of outcome in MBCT. The mediational role of rumination on the relationship between mindfulness and depressive symptoms has been supported by few previous studies (Shahar et al., 2010; Desresiers et al., 2013; Coffey and Hartman, 2008; van Aalderen et al., 2012; Batink et al., 2013).

Shahar et al. (2010) in a randomized controlled trial of 45 recurrently depressed patients with the majority of them in partial remission, demonstrated that reduction in brooding aspect of rumination mediated the effect of MBCT intervention on depressive symptoms. In a study by van Aalderen et al. (2012) the effectiveness of MBCT vs. TAU was investigated in a group of recurrently depressed patients with or without a current episode who had at least 3 prior depressive episodes. This study demonstrated reductions in rumination and increases in mindfulness following the group. In addition mediational analysis provided support for the mediational role of rumination on the effectiveness of MBCT on depressive symptoms reductions. Another recent study by Batink et al. (2013) used mediation analyses to arrive at the mediators of the pathway from MBCT to reduction in depressive symptoms. The results revealed that changes in cognitive processes such as rumination seem to be the mediator of the effect of MBCT on depressive symptomatology only for those with 2 or less prior depressive episodes. On the other hand according to Batink et al. (2013) among those with 3 or greater prior episodes, changes in affective processes seemed to mediate this relationship.

Heeren and Philippot (2011) also posit that rumination has both adaptive and maladaptive components and proposed that positive outcomes of mindfulness trainings are mediated by a reduction in maladaptive rumination and an enhancement of adaptive rumination (i.e. reflection). In this study a group of adult volunteers were assigned to MBCT vs. a waitlist control group. Assessments of both adaptive and maladaptive rumination along with psychopathological symptoms were obtained before and after the 8 weeks intervention. The analysis of results provided support for the partial mediational roles of both adaptive and maladaptive rumination on the impact of MBCT on clinical symptomatology. MBCT lead to a decrease in maladaptive rumination and an enhancement of adaptive rumination and indirectly caused a decrease in psychopathological symptoms. This study conceptualized mindfulness as a

cognitive bias modification strategy which transforms an individual's ruminative mode. These findings support Teasdale et al.'s (1995) proposal that mindfulness exerts its beneficial effects by reducing maladaptive rumination. By weakening maladaptive rumination and enhancement of adaptive rumination or reflection, mindfulness prevents high level and more abstract, analytical processing of thoughts, feelings and sensations (Bishop et al., 2004) and protects an individual from falling into the self-perpetuating cycles of rumination.

Rumination as mediator of reduced depression in dispositional mindfulness. Finally, a recent study by Desresiers et al. (2013) investigated the link between self-reported rumination, mindfulness and depression symptoms and found that rumination mediated the effect of self-reported mindfulness on depressive symptoms. Specifically, the association between higher levels of mindfulness and lower levels of depressive symptoms was explained by the tendency of higher levels of mindfulness to be linked with less rumination. In agreement to this, Coffey and Hartman (2008) found a mediational role for rumination in the relationship between self-reported mindfulness levels and depression symptom measures.

Mindfulness increases associated with rumination reduction following MBCT. Furthermore a few studies have reported increase in mindfulness skills in addition to reduced rumination following MBCT intervention. Manicavasagar et al. (2012) found a significant association between post MBCT levels of rumination and mindfulness. Furthermore, both Keune et al. (2011) and Shahar et al. (2010) have reported lower rumination levels in addition to greater mindfulness following MBCT. In line with these, Raes and Williams (2010) and Mathew et al. (2010) have reported strong negative correlations between mindfulness and rumination. In their study, Raes and Williams (2010) investigated the effect of naturally occurring levels of mindfulness on rumination among a sample of 164 undergraduate students. This study reported

the existence of a significant negative correlation between mindfulness and rumination even after controlling for current depressive scores and prior history of depression.

These previous findings support the notion that MBCT or any mindfulness enhancing technique boosts awareness and helps the individual notice the ruminative thought patterns and disengage from them. Segal et al. (2002) explains that mindfulness takes up limited resources that would otherwise support rumination and weaken such ruminative cycles by occupying the cognitive resources that would otherwise maintain these cycles. The discussed studies highlight the relationship between rumination and mindfulness and the role of reduced rumination as a potential mediator of MBCT's effectiveness on depressive symptoms.

Cognitive (in)flexibility. Cognitive flexibility is the ability to switch between multiple cognitive tasks simultaneously. An inflexible mental state lacks this ability and is correlated with ruminative tendencies. Davis and Nolen-Hoeksema (2000) speculated that cognitive inflexibility might be a reason for why people engage in perseverative patterns of rumination in spite of its negative consequences. They introduced rumination as a possible coping mechanism for people who tend to be cognitively inflexible when feeling sad, since due to this inflexibility they have difficulty finding alternative coping mechanisms. Therefore, ruminators may encounter problems when attempting to divert attention from themselves and their negative thoughts and get trapped in ruminative cycles. Additionally cognitive inflexibility may lead to rumination because it makes it harder for individuals to switch their attention away from negative to positive thoughts. Ruminators have difficulty in adapting their cognitive sets to changing environmental contingencies. They become mentally "stuck" in one particular style of relating to the environment even when the adaptiveness of that style is no longer valid (Davis & Nolen-Hoeksema, 2000); hence encountering problems in updating to a new cognitive style in accordance with current needs.

***Cognitive flexibility as a mechanism in MBCT*.** Bishop et al. (2004) have proposed that mindfulness training might be associated with enhancement in cognitive flexibility. Consistently, Alexander et al. (1989) have reported associations between both transcendental meditation and mindfulness trainings with improvements in cognitive flexibility. Heeren et al. (2009) explored the potential mechanism underlying the effect of MBCT on autobiographical memory specificity and found a partial role for cognitive flexibility as a mediator for the impact of MBCT on overgeneral memories. This investigation declared that cognitive flexibility might mediate the effect of MBCT on reducing overgeneral memories by enhancing the ability to disengage from more general and repetitive information and spend more focus on specific and unique informational contents. Accordingly, the partial mediational effect of cognitive flexibility might be one of the possible mechanisms of action of mindfulness on reduction of overgeneral memory and enhancement of memory specificity which has been linked to decreased rumination. Thus increased cognitive flexibility might be involved in decreasing rumination and play a role as another mechanistic factor mediating the effect of mindfulness on outcome.

Although, the study by Heeren and Colleagues (2009) is the only study so far that has evaluated the mediational role of cognitive flexibility on MBCT outcome, the closely related links between rumination and cognitive flexibility make it a potential mediational candidate worthy of further investigation. In our study we aim to investigate whether rumination change is correlated with changes in depression. Upon finding significant associations between the changes in these variables, we would propose that changes in cognitive flexibility would be also associated with changes in both rumination and depression.

Self-compassion. Self-compassion is defined by extending compassion to one's self in instances of perceived inadequacy, failure, or general suffering (Neff, 2003a). It has been found to be inversely associated with psychopathology. In a meta-analysis of the association between

self-compassion and psychopathology, MacBeth and Gumley (2012) confirmed the inverse relationship between these two constructs such that greater self-compassion was linked to lower levels of mental health symptoms. A study by Raes (2011) examined the relationship between self-compassion and depression in a group of three hundred and forty seven undergraduate students and found that self-compassion scores at baseline significantly predicted changes in depressive symptoms at a five month assessment point. Greater self-compassion at baseline was predictive of greater reductions in depression symptoms at a five month period. Self-compassion is proposed to exhibit its buffering effects on depression through its protecting role against rumination increases (Raes et al., 2010). Raes et al. (2010) found a mediating role for brooding component of rumination in the relationship between self-compassion and depression suggesting that self-compassion was linked with rumination (brooding) reductions which was further associated with depression alleviation.

Self-compassion as a mechanism in MBCT. Van Dam et al. (2011) posits that the construct of self-compassion is related to the theoretical components of mindfulness. Lykins and Baer (2009) found greater levels of self-compassion among experienced meditators compared to controls. A study by Baer et al. (2006) found significant correlations between trait mindfulness and self-compassion which was present regardless of what mindfulness questionnaire was used. In a prospective cohort-controlled design study, Shapiro et al. (2007) implemented an MBSR intervention for therapists' training. The results revealed significant increases in self-compassion among the participants. Similarly, Robins et al. (2012) studied a group of adults undergoing MBSR training and found that the MBSR group compared to the control group demonstrated greater increases in mindfulness and self-compassion. In line with these studies, Shapiro et al. (2005) in a randomized controlled trial, investigated the effectiveness of MBSR compared to a waitlist control group on quality of life, self-compassion and stress levels of a group of health

care professionals. This study found that in comparison to the control group, the MBSR group reported significantly lower stress levels and increased self-compassion and quality of life.

While self-compassion has not been examined by many studies as a mechanism of mindfulness, it has been proposed by at least one study as a mechanism for MBCT's effectiveness. In a randomized controlled trial, Kuyken et al. (2010) studied remitted patients with 3 or more prior depressive episodes that were randomly allocated to either maintenance anti-depressant medication (mADM) or MBCT intervention. MBCT resulted in decoupling of the relationship between post-treatment cognitive reactivity and poor outcome such that following MBCT, cognitive reactivity was less strongly associated with negative clinical outcomes only for those assigned to MBCT. Furthermore, the results revealed that regardless of changes in depression severity following MBCT, increases in self-compassion and mindfulness during the course of MBCT were associated with less severe depression symptoms at 15-month follow-up. MBCT's treatment effects on depressive symptoms were mediated by improved mindfulness and self-compassion, suggesting a potential association between this decoupling and development of self-compassion during the course of MBCT treatment.

In our study, we aim to examine whether changes in depression following the MBCT intervention are significantly associated with changes in self-compassion. We predict that changes in these constructs are closely and inversely correlated. Given the findings presented by Raes et al. (2010) there appears to be a close relationship between the development of self-compassion and rumination reduction during the course of MBCT which leads to the alleviation of depressive symptomatology. We propose that there will be significant correlations between the changes in self-compassion and changes in both rumination and depression.

Metacognitive awareness. Moreover, increased accessibility of metacognitive awareness following MBCT has been postulated by one study as the mediator of the effect of MBCT on depression. Metacognitive awareness refers to the way of experiencing negative thoughts and feelings as they take place. The extent to which thoughts are experienced as thoughts rather than being reflections of self or the truth is attributed to metacognitive awareness (Teasdale et al., 2002). Based on this definition increased metacognitive awareness is an attentional skill that theoretically would be involved in inhibiting rumination.

Metacognitive awareness as a mechanism in MBCT. How meta-cognition and accessibility of metacognitive sets work against rumination is a question that has been explored by Papageorgiou and Wells (2003). They proposed that positive metacognitive beliefs are what motivate the individuals to engage in rumination. However, following rumination activation, these individuals are likely to appraise it as uncontrollable and detrimental to interpersonal relationships. The activation of these negative beliefs about rumination then contributes to depression onset. Thus positive metacognitive beliefs lead to engagement in ruminative thoughts in the first place and the negative metacognitive beliefs are the mediators of the effect of rumination on depression (Papageorgiou and Wells, 2003).

A study done by Teasdale et al. (2002) examined whether reduced metacognitive awareness is linked to higher vulnerability to depression and if cognitive therapy (CT) and MBCT are effective in reducing depressive relapse by means of raising metacognitive awareness. This study revealed that the rate of relapse in residually depressed patients was predicted by metacognitive awareness. Thus, interventions such as MBCT and CT that increase metacognitive awareness will allow for reductions in depressive relapse. Additionally Wells and Matthews (1994) have argued that attentional training may contribute to enhancement of cognitive flexibility and metacognitive control. Consistent with this, Papageorgiou and Wells (2000) found

that engagement in attentional training was significantly associated with lower rumination, depression and less negative metacognitive beliefs for up to 12 months following the training.

In our study, we plan to find significantly lower rumination levels following MBCT across both the bipolar and the unipolar groups. Finding support for this hypothesis is likely to suggest that there are possible associations between the development of mindfulness and increases in metacognitive awareness. MBCT which also promotes a present-moment attentional focus might be associated with more flexible cognitive states which in turn promotes higher metacognitive awareness and less rumination.

Although cognitive flexibility, self-compassion and metacognitive awareness have not been replicated as potential MBCT mechanisms as highly as rumination has been replicated, they appear to be some additional potential mechanisms of MBCT that are theoretically linked to rumination.

Summary of mechanisms in MBCT. So far we have discussed some of the most investigated mechanisms of MBCT. These mechanisms included rumination, cognitive flexibility, self-compassion and metacognitive awareness.

MBCT has been associated with increases in mindfulness, self-compassion (Raes et al., 2009; Kuyken et al., 2010) metacognitive awareness (Teasdale et al., 2002) and cognitive flexibility (Heeren et al., 2009). It has been negatively correlated with post treatment levels of rumination (Keune et al., 2011; Shahar et al., 2010; Michalak et al., 2011).

Rumination appears to be associated with the constructs of cognitive flexibility, self-compassion and meta-cognitive awareness. Rumination is a pattern of perseverating self-focused thoughts (Hertel, 1998). The perseverating patterns of rumination are indicative of a lack of flexibility in cognitive functions and an inability to shift between several mental tasks. Thus problems in inhibitory components of the executive functions carry the risk of inflexible mind

contexts which may further bring on the unproductive repetitive thought patterns of rumination. As discussed earlier, rumination and cognitive inflexibility are closely tied constructs. Thus findings that reveal the positive effect of MBCT on rumination reduction and cognitive flexibility enhancement are coherent. MBCT is thought to counter ruminative thinking patterns by teaching the ability to decentre from negatively charged thoughts and feelings. The ability to decentre from habitual, automatic negative thoughts and replacing them with intentional and flexible thoughts and feelings reflects cognitive flexibility. Additionally, self-compassion which appears to be a relatively stable trait characteristic (Raes, 2011) appears to develop or increase during the course of MBCT (Kuyken et al., 2010). We also pointed out findings from previous research indicative of the inverse associations between self-compassion and rumination (Raes et al., 2010). Although no single study so far has examined rumination and meta-cognitive awareness following MBCT, both rumination (Michalak et al., 2011) and metacognitive awareness (Teasdale et al., 2002) have been found to be predictive of depressive relapse following MBCT, which might be indicative of associations in their pathways of development. Rumination appears to be inter-related with the other discussed mechanisms and therefore may be a key mechanism of change worthy of further investigation.

Rumination as an underlying mechanism of action of MBCT will be the primary focus of this study as it is greatly associated with depression and higher depressive relapse (Michalak et al., 2011). Understanding rumination as a principal mechanism of action of MBCT could illuminate the way for future research on how manipulating rumination could potentially lead to controlling depressive symptoms associated with bipolar disorder and depression. Thus, we aim to focus on rumination as a key mechanism essentially due to its great impact on reinforcing depressive symptoms.

Goals of the Current Study

So far, we have discussed findings from current literature that propose MBCT as a promising intervention for decreasing depressive symptoms in bipolar disorder (Miklowitz et al., 2009; Williams et al., 2008) despite the paucity of studies in this field. Results regarding the impact of MBCT on anxiety symptoms in bipolar patients are mixed with some studies indicating a non-significant impact on anxiety (Miklowitz et al., 2009) while others report potential protective effects of MBCT against anxiety among bipolar patients (Williams et al., 2008; Perich et al., 2012). We have also examined some of the most talked about mechanisms of MBCT in the literature and how they may mediate the effect of mindfulness on the reduction of depressive symptoms and relapse. Rumination has been the most frequently evaluated mechanism of action of MBCT which is greatly predictive of depressive symptomatology and relapse (Michalak et al., 2011). Rumination as a mechanism of MBCT was chosen to be the focus of our study due to its strong association with depressive symptoms. The potential role of rumination as a mediator of decreased depression symptoms in MBCT has yet to be evaluated with a bipolar disorder patient population.

The primary goal of our study is to carry out an investigation on the association between an 8-week MBCT intervention and depressive symptoms reduction in a group of bipolar and unipolar patients with current mild to moderate depressive symptoms. Severely depressed patients are not included since research suggests that the attentional control skills required to benefit from MBCT are minimal or absent in patients with severe depressive symptoms (Segal et al., 2002). Our secondary goals include comparing the result of the intervention between the bipolar and unipolar patient groups and assessing those factors that might be mechanisms of action associated with depression reduction in MBCT with a focus on rumination. The hypotheses of this study encompass the following:

1. MBCT participants will experience decreases in depression symptoms from pre to post intervention (as measured by the MADRS and BDI-II).
2. Bipolar and unipolar patients will report similar decreases in depression (as measured by MADRS and BDI-II) from pre to post MBCT.
3. Bipolar and unipolar patients will report similar improvements in quality of life, sleep, anxiety and decentering (as measure by WHOQOL-BREF, PSQI, BAI and EQ) from pre to post MBCT.
4. Bipolar and unipolar patients will report similar improvements in mindfulness, self-compassion and rumination (as measured by FFMQ, TMS, SCS and RRS-RSQ) from pre to post MBCT.
5. Changes in mindfulness, self-compassion and rumination from pre to post MBCT will be associated with changes in depression symptoms, such that increases in mindfulness and self-compassion and decreases in rumination will be associated with decreases in depression symptoms.
6. Depressed individuals demonstrate reduced cognitive flexibility in the form of sticky thoughts and difficulty letting go of negative irrelevant information, which can hinder participants' reaction times and accuracy levels on a cognitive flexibility task. Therefore it is hypothesized that participants will demonstrate improvements in cognitive flexibility as evidenced by their accuracy and reaction time measures following MBCT such that at post-MBCT there will be significant reductions in the interference from the negative irrelevant words leading to enhanced reaction times and response accuracies.
7. Changes observed at post MBCT on all measures (BDI-II, RRS, FFMQ, SCS, BAI, PSQI, WHOQOL-BREF and EQ) will be maintained at 3 month follow-up.

Methods

Participants

A sample of 22 participants (14 Unipolar and 8 bipolar) were recruited through the Mood Disorders Program at St. Joseph's Healthcare, Hamilton.

Inclusion criteria.

1. Lifetime diagnosis of Bipolar Disorder or Major Depressive Disorder,
2. Current depressive symptoms defined as at least two diagnostic symptoms of depression with at least one of these symptoms being feeling depressed or experiencing decreased interest,
3. If diagnosed with Bipolar Disorder, has been taking a mood stabilizer medication for at least 3 months, the dosage is within therapeutic range. (Mood stabilizing medications and therapeutic doses are: lithium, serum level 0.6-1.4 mEq/L; divalproex, serum level 350-700 mM; risperidone 1-6 mg/day; olanzapine 5-30 mg/day; quetiapine IR or XR 300-900 mg/day; aripiprazole 10-30 mg/day; and ziprasidone 80-160 mg/day),
4. Age 18-65 inclusive,
5. Fluent in English and capable of providing informed consent.

Exclusion criteria.

1. A history of rapid cycling, defined as ≥ 4 mood episodes in the preceding 12 months,
2. Manic, hypomanic, or subsyndromal hypomanic symptoms, defined as a Young Mania Rating Scale (YMRS) score ≥ 8 currently or retrospective report of symptoms within the last 3 months,
3. Current severe depression symptoms defined as score >34 on the MADRS,
4. At high risk for suicide, as defined by a score of ≥ 4 on the suicide item of the MADRS, or in the opinion of the investigator,
5. Active substance dependence, other than caffeine or nicotine dependence, in the preceding 3 months,

6. Unstable medical illness, as defined by a change in medication or other treatment in the past 4 weeks, or in the opinion of the investigator,

7. Already practicing mindfulness meditation regularly (greater than 3 times a month).

Measures

Clinician administered.

Structured clinical interview for DSM-IV-TR disorders (SCID-I). (First et al., 2002) is a researcher's administered interview which assesses symptoms of both major depressive disorder and bipolar disorder. It has shown a diagnostic reliability of 0.74 for DSM-IV criteria of bipolar disorder (Gunderson et al., 2006) and an inter-rater reliability of 0.66 for major depression (Lobbestael et al., 2011).

Montgomery–Asberg depression rating scale (MADRS). (Montgomery et al., 1979) is a 10-item diagnostic questionnaire used to measure the severity of depressive episodes in patients with mood disorders. Higher MADRS scores indicate more severe depression. The overall score ranges from 0 to 60. The MADRS is conducted as a semi-structured clinician-rated interview and has a fixed scaling of seven points (from 0 through 6) for each item. The MADRS was used to assess depression symptom severity.

Young mania rating scale (YMRS). (Young et al., 1978) is one of the most frequently utilized rating scales to assess manic symptoms. The YMRS is a semi-structured clinician-rated interview. The scale has 11 items and is based on the patient's subjective report and clinical observations made during the course of the clinical interview. There are four items that are graded on a 0 to 8 scale, while the remaining seven items are graded on a 0 to 4 scale. The YMRS was used to assess mania symptom severity and ensure patients meet the inclusion criteria of no significant current mania symptoms.

Self-report questionnaires.

World health organization quality of life – BREF (WHOQOL-BREF). (World Health Organization, 1998) was used to assess quality of life. The WHOQOL-BREF instrument comprises 26 items, which measure the following broad domains of quality of life: physical health, psychological health, social relationships, and environment. The WHOQOL-BREF is a shorter version of the original instrument.

Beck anxiety inventory (BAI). (Beck and Steer, 1990) is a 21-item self-report questionnaire that measures the common symptoms of anxiety. The scale is reliable and valid and is able to differentiate anxiety from depression.

Pittsburgh sleep quality index (PSQI). (Buysee et al., 1989) was used to assess sleep quality. The PSQI is a self-rated questionnaire that assesses sleep quality and disturbances over a 1-month interval. The scale is comprised of 19 items that measure subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction.

Five facet mindfulness questionnaire (FFMQ). (Baer, 2006) was used to assess trait mindfulness. The FFMQ is a self-report instrument developed through factor analysis of five available mindfulness questionnaires, i.e. the Mindfulness Attention Awareness Scale, the Freiburg Mindfulness Inventory, the Kentucky Inventory of Mindfulness Skills, Cognitive and Affective Mindfulness Scale, and the South Hampton Mindfulness Questionnaire. The FFMQ allows for a multifaceted assessment of mindfulness and is sensitive to changes in mindfulness levels over the course of a mindfulness meditation intervention program.

Toronto mindfulness Questionnaire (TMQ). (Lau et al., 2006) was used to assess state mindfulness. The TMQ is a 13-item, with a two-factor structure (Curiosity, Decentring) that has been validated in a number of clinical contexts. The items of Factor 1 (Curiosity) reflect an

attitude of wanting to learn more about one's experiences. The items of Factor 2 (Decentring) reflect a shift from identifying personally with thoughts and feelings to relating to one's experience in a wider field of awareness.

Rumination response scale, response styles questionnaire (RRS-RSQ). (Nolen-Hoeksema and Morrow, 1991) was used to measure the tendency to ruminate. The Ruminative Responses subscale of the RSQ (Nolen-Hoeksema and Morrow, 1991) consists of 21 items assessing responses to depressed mood that are self-focused (e.g., "Think about all your shortcomings, failings, faults, mistakes"), symptom focused (e.g., "Think about how hard it is to concentrate"), or focused on possible causes and consequences of the depressive mood ("Think I won't be able to do my job/work because I feel so badly"). Rumination has been proposed as a mechanism of change associated with the mindfulness based interventions (Jain et al., 2007; Labelle et al., 2010).

Self-compassion scale (SCS). (Neff et al., 2003) is designed to measure self-compassion, a construct associated with mindfulness. Self-compassion entails being kind and understanding toward oneself in instances of failure rather than being harshly self-critical; perceiving one's experiences as part of the larger human experience rather than seeing them as isolating; and holding painful thoughts and feelings in mindful awareness rather than over-identifying with them. Self-compassion has been shown to be a predictor of psychological health and has been proposed as a mechanism of change in mindfulness interventions (VanDam, 2011).

Experiences questionnaire. (Teasedale et al., 2007) was originally designed to measure two facets of decentering and rumination. The decentering component of the experiences questionnaire has been found to have high internal consistency in both clinical and non-clinical samples and is composed of 11 items. The decentering facet has shown good psychometric properties and has been found to have negative correlations with rumination, experiential

avoidance, emotional suppression, anxiety and depression. In our study we only administered and analyzed the decentering facet of EQ.

Cognitive flexibility memory task. (Sternberg et al., 1969) is a computer based task. This measure was implemented in order to test whether following MBCT there will be any changes in participants' cognitive flexibility as evidenced by accuracy levels and response latencies of identifying negative irrelevant words. This is important since depressed patients suffer from ruminative thoughts and negative bias towards formerly relevant but currently irrelevant negative words. By investigating the changes in their performances (reaction times and accuracy of their performances) we can evaluate whether or not post-MBCT the interference from the negative irrelevant probes (that normally hinders depressed individuals' performances) is significantly reduced. This computer task consists of eight different conditions which differ from one another based on probe valence (positive or negative) and the probe condition (relevant, irrelevant/intrusion, new). The relevant probes were those that included words from the relevant list, the irrelevant or intrusion probes were words from the irrelevant list and the new positive and the new negative probes were new probes (were not displayed previously) that were either positive or negative in valence. Each condition was presented four times in each block and each run was composed of three blocks. There were a total of 120 trials across the three blocks. In the critical trials, there were a total of six words such that three words would be presented on top and three on the bottom and these sets of three would always differ in their color (either appear in red or in blue). The red and the blue list included either only positive words or only negative words and the two lists always differed in valence. In each block there were also eight trials inserted in which the positive and the negative words were scattered among red or the blue list in order to prevent the participants from using the valence of the list as a cue in their performance when responding to probes. The task included 5 practice trials and a total of 120 trials in which a sample

of words from the word list was selected without replacement for each run. The order of blocks along with the sequence of trials within each block were randomized. In each block, words would only be presented once but they could be presented up to three times within each experiment. The presentation of the blue and the red lists on the upper or the lower part of the screen as well as the possible combinations of assigning colors to positive and the negative lists were equally often.

At the beginning of each trial, a fixation probe was presented for the duration of 500 ms. This was followed by the presentation of six words in two rows. The words in each row would differ in color and were either blue or red. The participants were to read the six words and memorize them. This display had the duration of 7.8 s (1.3 s × number of words in the display). A blank screen was then presented for 800 ms followed by the *cue* display which included a red or a blue frame. The color of the frame would indicate which of the recently presented word lists (red or blue) is relevant for the approaching probe decision making. The probe which was a word finally would appear inside the frame and the participant was required to indicate whether it came from the relevant list (same color as the color of the frame) or irrelevant list (the opposite color to the color of the frame) or was a new word (was not present in the recently displayed trial and was completely new) by pressing different keys on a keyboard. Participants completed the 120 trials within the three blocks with short breaks between these blocks. This task took approximately 30 minutes to complete. Participants' responses were recorded and their response times and accuracies were extracted for analysis. Only a sample of seven participants completed this measure. Our hypothesis states that participants will demonstrate higher reaction times and lower accuracy levels in identifying a negative (not positive) irrelevant (but not the new) probes. Thus we predict that elongated reaction times and lower accuracy levels will exist only while rating the *negative irrelevant* words. We also hypothesize that following MBCT this bias in

rating negative irrelevant words indexed through higher reaction times and lower accuracy levels, will no longer exist or will be significantly reduced.

Demographic information. Participants were asked to indicate the following information: age, gender, ethnicity, and marital status. This data provided information about the sample and enabled comparisons between diagnostic groups.

Meditation experience. Participants were asked about their knowledge and previous experience with meditation in order to characterize baseline levels of familiarity with meditation and ensure that they met the eligibility criteria of not currently practicing mindfulness meditation regularly.

Previous treatment. Information regarding previous involvement in psychosocial interventions were collected in order to further characterize the sample.

Current medications. Participants were asked to report any psychoactive medication that they were taking, the dosage and whether there had been any changes in medication in the last three months.

Weekly Measures during Intervention.

Beck depression inventory-II (BDI-II). (Beck et al., 1996) is a 21-item self-report questionnaire that aims to assess the severity of depressive symptoms. The items on the BDI-II relate to DSM-IV-TR symptoms of depression, such as hopelessness and irritability, feelings of guilt or feelings of being punished, as well as physical symptoms such as fatigue, weight less, and lack of interest in sex. The BDI-II was completed weekly during the intervention to allow for monitoring of changes in depressive symptom severity from week-to-week.

Meditation homework log. Participants were asked to complete a homework log reporting the total minutes of meditation they practiced for homework each day, whether they

completed their homework and a rating of factors that interfered if they did not complete their homework.

Procedures

Recruitment. Clinicians within the Mood Disorder Program, St. Joseph's Healthcare, Hamilton, referred patients to the MBCT waitlist as a part of normal care. In order to recruit patients meeting our eligibility criteria, patients on the MBCT waitlist, who had previously consented to be contacted for research, were contacted by phone by the student investigator. The student investigator assessed eligibility (experiencing mild to moderate depressive symptoms, and interested in attending an MBCT intervention) during the phone call and further described the study. Eligible and interested patients were invited to attend an initial assessment session with the student investigator at which time the formal informed consent process was completed. Patients not interested in participating in the study proceeded to participate in MBCT as usual. This study was approved by St. Joseph's Healthcare's research ethics board.

Study Design

The study utilized a pre and post intervention assessment design. Participants who volunteered for the experiment were asked to attend an initial assessment session at the Mood Disorders Program prior to the commencement of the intervention in which a diagnostic interview (Structured Clinical Interview for DSM-IV: SCID) and the clinician administered mood symptom severity scales (Montgomery–Asberg Depression Rating Scale: MADRS and Young Mania Rating Scale: YMRS) were completed. This initial assessment took approximately 1 hour to complete. Participants were also asked to attend a 1 hour orientation session one week prior to the commencement of the intervention in which the details of the intervention were outlined, expectations for completing home practice were discussed and the pre-intervention self-report questionnaire packages were completed. Participants then attended the 8-week MBCT

intervention. During the intervention they completed an adherence measure (homework log) and a brief symptom measure (Beck Depression Inventory: BDI-II) at each session. At the completion of the intervention the participants attended a post-intervention assessment session that took approximately 1 hour where they were interviewed and also completed the self-report questionnaire package once again. Participants were also mailed the self-report questionnaire package to complete 3 months after the intervention. Return envelopes with postage were provided.

MBCT intervention

The program was facilitated by two mental health professionals. One of the facilitators was a psychologist with previous experience leading mindfulness meditation interventions and a personal meditation practice. The other facilitator was a mental health professional or a mental health professional in training with experience in delivering cognitive behavioural therapy for mood disorders. The intervention took place at the Mood Disorders Program, St. Joseph's Healthcare, Hamilton.

The intervention was 8-weeks in duration and consisted of eight weekly 2-hour group sessions and home practice. Each group had approximately 8 to 16 participants and included patients with bipolar disorder and major depressive disorder. The treatment closely followed the Segal et al. (2002) MBCT 8-session protocol. The intervention included a focus on awareness of mood symptoms. Each group session included a didactic section and experiential exercises. Participants received a CD recording of guided mindfulness exercises, which they were requested to listen to and practice for approximately 30 minutes per day. They also received a manual that summarized key points from the educational material (consistent with Segal et al., 2002 protocol). Participants were asked to complete meditation homework logs, for the duration

of the mindfulness intervention, in which they would record the details of the homework that they completed each week.

Data Analysis

Power analysis. In selecting a sample size for this study, the goal was to have 80% power to test the primary hypothesis regarding the ability of an MBCT intervention to reduce depressive symptoms in participants from pre to post intervention. The criterion for statistical significance was alpha = .05 (two-tailed).

A few studies exist examining the ability of MBCT to reduce depressive symptoms in bipolar disorder patients. The study that most closely resembles our proposed study design is that of Williams and colleagues (2008). This study investigated the effects of an MBCT intervention on depressive symptoms in 14 bipolar disorder patients with residual depressive symptoms. Depressive symptoms were assessed pre and post intervention using the BDI-II. Results indicated that reports of depression symptoms decreased from pre to post intervention for participants in the mindfulness intervention (pre-intervention M = 15.8, SD = 14.4; post-intervention M = 7.1, SD = 7.7). Given these observed changes in symptoms a sample size of 16 participants per group was necessary to see a significant effect of a mindfulness intervention on depression symptoms in a bipolar disorder patient population. In order to account for an approximate attrition rate of 20% a sample of 20 bipolar and 20 unipolar patients was needed to be recruited to participate in the study.

Statistical analysis. The hypotheses comparing reported changes from pre to post intervention between bipolar patients and unipolar patients were tested using a series of analyses of variance (ANOVAs) rather than a multivariate analysis of variance (MANOVA). Although the use of MANOVA has several advantages it also holds the potential for suppressing some

significant univariate effects (i.e. increased risk of Type II error). Given the exploratory nature of this study the ANOVA procedure was deemed more appropriate. Group differences following MBCT intervention in the outcome variables were analysed by means of a series of repeated measure ANOVAs. The two components of the repeated measures included time (pre-MBCT vs. post-MBCT) and diagnostic criteria (Bipolar vs. Unipolar). Both bipolar and unipolar groups received an identical MBCT intervention and the outcome variables were compared across these diagnostic groups.

Demographic & baseline characteristics. In order to detect any existing differences between the two diagnostic groups in baseline demographic characteristics including sex, education, marital status and occupation Pearson chi squared tests were used (variable × diagnostic group). One way ANOVA was performed on the variable of age in order to assess any significant difference that may have existed in age among the two diagnostic groups. Additionally characteristics including age of onset of the primary disorder, duration of last depressive episode, number of previous depressive episodes, number of MBCT classes attended and number of completed homework logs were assessed between the two diagnostic groups using independent t-Tests. Other population characteristics including therapy in the past year, presence of other comorbid psychiatric disorders and currently taking any psychoactive medications were also evaluated using Pearson chi squared tests (variable × diagnostic group) in order to determine if the bipolar and unipolar patient groups differed in any of these variables at time 1 (pre-MBCT).The global assessment of functioning (GAF) scores were also compared between the diagnostic groups in order to trace any significant differences between the groups at baseline. Furthermore, the mean and standard deviations of all the questionnaires were calculated for each of the diagnostic groups as well as for the overall sample of patients (See Table 3).

Non-completers. In order to examine whether the individuals who completed the MBCT study were similar to those participants who did not complete the group on the categorical variables at pre-MBCT (i.e., gender, diagnosis, education, ethnicity and marital status), a series of Pearson chi squared analyses were conducted. Additionally we examined the comparability of completers of the group with the non-completers on continuous variables at pre-MBCT (i. e., age, number of previous depressive episodes, global assessment of functioning (GAF) scores, MADRS scores, age at first depressive episode) using a number of one way ANOVAs.

Mindfulness adherence. As mentioned above, number of completed MBCT homework logs along with number of attended MBCT classes and the minutes of at home practice were calculated for each of the diagnostic groups and contrasted between these groups using independent t-tests in order to examine whether they differ significantly across the two diagnoses. Greater number of completed homework logs, higher attendance and greater minutes of at home practice were assumed to reflect greater adherence to mindfulness.

Hypothesis 1. The primary outcome for the study was mean improvement in MADRS and BDI-II scores from pre to post intervention. MADRS scores were analysed using the Wilcoxon's t-test since they did not follow a normal distribution and transformation did not result in normality either. BDI-II scores were analysed using dependent t-tests since they exhibited a normal distribution.

Hypothesis 2. A 2 (Diagnosis: major depressive disorder patients vs. bipolar disorder patients) X 2 (Time: Time 1 vs. Time 2) RM-ANOVA for BDI scores and Friedman's test for MADRS scores were used to evaluate the prediction that bipolar and unipolar patients will report similar decreases in depressive symptoms.

Hypothesis 3. To test the hypothesis that unipolar and bipolar participants will report similar changes in sleep, anxiety, quality of life and decentering (PSQI, BAI, WHOQOL-BREF, EQ) from pre to post intervention, a series of RM-ANOVAs were implemented.

Hypothesis 4. A series of 2 (Diagnosis: MDD vs. BD) X 2 (Time: Time 1 vs. Time 2) RM-ANOVAs for the variables of mindfulness, self-compassion and rumination (as measured by FFMQ, TMQ, SCS, RRS-RSQ) were used to evaluate the prediction that bipolar and unipolar patients will report similar improvements in these key areas.

Hypothesis 5. In order to examine the hypothesis that increases in mindfulness and self-compassion as well as decreases in rumination are correlated with reduction of depressive symptoms, Pearson correlation analyses were implemented.

Hypothesis 6. The analysis of the cognitive flexibility memory task followed the same basis of the analysis used in the study done by Joormann and Gotlib (2008). Participants' outputs were extracted and broken down into response accuracy and response latency (reaction time). Analysis of both response accuracies and latencies followed the same steps. Our participants' accuracy measures did not follow a normal distribution and could not be successfully transformed to exhibit a normal distribution, thus non-parametric analyses were implemented for response accuracy measures. Following Joormann and Gotlib (2008) the accuracy measures were compared across positive and negative valences of the relevant trials (conditions 1 and 2, see Table 10 & 11) as well as between irrelevant trials (conditions 3 and 4) and the new trials of the same valence (conditions 6 and 8, also see Table 10 & 11). Since all the accuracy measures were non-normally distributed, Friedman's test was used for making the comparisons across both the accuracy levels of the relevant trials as well as irrelevant and new trials of same valence.

Additionally not all the reaction time scores (response latencies) were normally distributed, hence we used both parametric as well as non-parametric analyses for analyzing the

reaction time measures. To make the comparisons across the positive and negative valences of relevant trials, Friedman analysis was used. On the other hand, both the irrelevant trials and the valence matched new trials exhibited normal patterns of distribution and thus were analysed using repeated measure ANOVAs and comparisons were made across valence (positive vs. negative), condition (irrelevant vs. new) and time (pre vs. post MBCT).

Hypothesis 7. To investigate whether changes observed at post-MBCT were also maintained at a 3 month follow-up, all variables (BAI, RRS, BDI-II, FFMQ, SCS, PSQI, WHOQOL-BREF, and EQ) were contrasted between post-MBCT and the 3 month follow-up.

All the analyses were implemented in SPSS Windows version 22 (SPSS Inc**.,** Chicago, IL, USA). In cases that the statistical assumption for the Pearson chi-square test was not met (i.e. expected cell frequencies were not > 5), we have reported Fisher's exact p-values. Mean calculations of all the questionnaires were based on patients who completed those measures (intent to treat analysis was not used). Not all the questions within these questionnaires were completed by each participant. Missing values were not replaced. The criterion for statistical significance was alpha = 0.05 (two tailed) for all of the statistical analyses. Additionally, all the data were inspected for outliers using the outlier labeling rule (Hoaglin et al., 1986; Hoaglin and Iglewicz, 1987) and no outliers were detected. The main goal of this study was to investigate whether mindfulness is associated with reductions in depression symptoms as well as reductions in rumination levels. We further were interested in finding associations between depression change following MBCT and changes in mindfulness, self-compassion and rumination

Results

Participants' Characteristics

Twenty two participants were recruited for the MBCT intervention. The overall dropout rate was 27% (n =6) which was due to scheduling conflicts or other unknown reasons. Sixty

seven percent (n = 4) of the dropouts were unipolar and approximately thirty three percent (n =2) were bipolar patients. The dropout rates did not differ significantly between the two groups, χ^2 (1) = .631, Fishers Exact p = 1.000. The final sample was composed of 16 participants with 10 unipolar and 6 bipolar patients.

The individuals who completed the intervention had a mean age of 54.37 (SD = 13.11) years, mostly consisted of females (82.4%), were mainly Caucasian (93.8%), and married (58.8%). The majority of participants were not working (58.85%), and they had a range of education levels ranging from high school (17.6%), college (35.3%), undergraduate (35.3%) or graduate (5.90%) education.

Participant characteristics were compared across the diagnostic groups. A one way ANOVA was performed on the variable of age at pre-MBCT and found no significant difference in age between the two groups (F (1, 14) = 2.203, p = 0.160; Also see Table 1). Moreover, Pearson chi squared tests did not find any differences among the demographic variables of sex, education, marital status, and ethnicity among bipolar and unipolar groups (See Table 1). A difference was detected between the groups in occupational status (χ^2 (3) = 11.250, p = 0.010) with half of MDD participants being unemployed and on disability (50%) and the majority of BD participants being unemployed (80%) (But not receiving disability). Participants did not differ in regards to whether or not they had comorbid conditions or whether they were currently taking psychoactive medications (see Table 1). Bipolar and unipolar participants did not vary significantly in the disorder's age of onset (p = .108), duration of last depressive episode (p = .366), number of previous depressive episodes (p =.675) and therapy in the last year (p = 1.000).

The Global Assessment of Functioning (GAF) scores at baseline were also analyzed. The results revealed that at baseline there were not any significant differences between the two groups in GAF scores (p = .791, Also see Table 2).

Non-Completers

Analysis of categorical demographic variables including gender, diagnosis, level of education, ethnicity and marital status found no significant differences in these variables between the completers and non-completers of MBCT (see Table 4). Additionally, further analysis of continuous variables (i.e., age, number of previous depressive episodes, global assessment of functioning (GAF) scores, MADRS scores, age at first depressive episode) revealed that these factors were also comparable ($p > 0.05$) between those who completed the MBCT and those who did not (see Table 4).

Mindfulness Adherence

The mean number of sessions attended were 6.3 (1.3) in unipolar and 7.0 (0.9) for bipolar group out of a potential 8 sessions. Approximately 18.2% of participants attended all 8 sessions of MBCT course, 22.7% attended 7 classes, 18.2% attended 6 classes, 9.1% attended 5 classes and 4.5 % attended only 4 sessions. Likewise, 27.3% of participants handed all seven of the homework logs, 0% completed six homework logs, 18.2% completed five homework logs, 9.1% completed four homework logs, 13.6% handed three homework logs, 4.5% completed 2 homework logs and 4.5% completed only one homework log. The mean minutes of meditation practice at home was 948.4 minutes or approximately 20 minutes per day over the course of the intervention (assuming that no practice was completed if the homework log was not handed in). Approximately 30 minutes of practice per day was requested during the intervention. Three independent t-tests revealed that bipolar and unipolar groups did not differ in the number of attended classes ($t(18) = .861$, $p = 0.400$), the number of completed homework logs ($t(19) = .981$, $p = 0.339$) and the minutes of homework practice ($t(13) = -.107$, $p = 0.917$).

Hypothesis 1

Analysis of MADRS scores using the Wilcoxon test (MADRS scores were not normally

distributed) revealed significant reductions in depressive symptoms of the participants at post-MBCT compared to pre-MBCT (Z = - 2.31, p = .021). Similarly, paired t-test analysis of BDI scores was indicative of significant depression reduction following MBCT participation with a medium effect size (t (15) = 3.56, p = .003) (See Table 3, 5 & 9). Thus as predicted, both BDI-II and MADRS revealed significant reductions in depression symptoms following MBCT ($p<0.05$, see Table 5).

Hypothesis 2

Analysis of BDI scores using a two way RM -ANOVA also provided support for our hypothesis that participants would show improvements in BDI scores from pre to post intervention (F (1, 14) = 15.69, p = .001) and that these improvements would not significantly differ between the bipolar and unipolar groups (F (1, 14) = 2.22, p = .158), (See Table 6 & 9).

Using Friedman test for the analysis of MADRS scores (MADRS scores were not normally distributed) we found significant reductions from pre to post MBCT (χ^2 (2) = 21.194, p = .000) (See table 6 & 9). However, Friedman test was only able to detect a difference in MADRS scores from pre to post MBCT, thus to examine any possible differences between groups at either pre or post intervention, Mann-Whitney analysis was also implemented (a between group assessment). The results demonstrated that bipolar and unipolar groups did not differ in their MADRS scores at pre-MBCT (U (14) =31.500, z = -0.151, p = 0.880) nor at post-MBCT (U (14) = 21.000, z = - 0.985, p = 0.325).

Hypothesis 3

We examined the patterns of improvement of bipolar and unipolar groups in variables of sleep (PSQI), quality of life (WHOQOL-BREF), anxiety (BAI) and decentering (EQ) among the two diagnostic groups using a series of RM -ANOVAs. The analysis of sleep (PSQI) among all

participants illustrated that both bipolar and unipolar patient groups did not report significant improvements in their sleep following MBCT (F (1, 14) = 0.22, p = .649).

There were no significant time effects for any of the WHOQOL-BREF subscales (physical: F (1, 14) = 4.35, p = .056; psychological: F (1, 14) = 0.45, p = .515; social: F (1, 14) = 0.87, p = .366; environment: F (1, 14) = .15, p = .701). Additionally, participants across both groups reported no significant changes in response to these subscales (WHOQOL-physical: F (1, 14) = 0.27, p = .610; WHOQOL-psychological: F (1, 14) = 0.18, p = .675; WHOQOL-social: F (1, 14) = .03, p = .855; WHOQOL-environment: F (1, 14) = .006, p = .939).

Similarly, no significant reductions in anxiety symptoms (BAI) were observed from pre to post intervention (F (1, 14) = 1.29, p = .275) and both groups reported a similar lack of change from pre to post MBCT in anxiety symptoms (BAI: F (1, 14) = .25, p = .621)

Finally, examining the changes in the decentering component of EQ revealed no significant differences between the pre and the post- MBCT scores across both groups (F (1, 4) = 6.312, p = .066) as well as no significant differences between the two groups in their patterns of change (F (1, 4) = 1.898, p = .240) (See Table 6 & Table 9).

Hypothesis 4

In order to examine whether bipolar and unipolar groups reported similar patterns of change in self-compassion (SCS) and rumination (RRS-RSQ), RM ANOVAs were performed on these variables. Participants showed improvements in self-compassion (F (1, 14) = 5.48, p = .034) and rumination (F (1, 14) = 5.14, p = .040) from pre to post MBCT. Bipolar and unipolar patients did not differ in terms of their improvements in self-compassion (F (1, 14) = .18, p = .674) or rumination scores (F (1, 14) = .001, p = .971) (See Table 7). The reductions in both the brooding and the reflection components of the RRS were also significant (Brooding: F (1, 14) =

7.74, p = .015; Reflection: F (1, 14) = 5.53, p = .034, also see Table 7). Both self-compassion and rumination exhibited medium effect sizes.

Additionally implementing 2 way RM ANOVAs on TMQ scores revealed no significant improvements in the TMQ *curiosity* or *decentering* scores at post MBCT (TMQ-Curiosity: F (1, 4) = .25, p = .642; TMQ-Decentering: F (1, 4) = 3.10, p = .153) and yielded similar outcomes for bipolar and unipolar groups in both the *curiosity* and the *decentering* components of the TMQ (TMQ-curiosity: F (1, 4) = 5.61, p = .077, TMQ-decentering : F (1, 14) = 0.03, p = .873 ; See Table 7). Although the effect size of the Curiosity scale of TMQ was small, the effect size of the decentering component was large (See Table 9).

Similar analyses on the FFMQ and its sub-components revealed improvements in the total FFMQ score (F (1, 14) = 7.414, p = .017), the observe (F (1, 14) = 6.78, p = .021), the actaware (F (1, 14) = 5.83, p = .030) and the nonreact (F (1, 14) = 4.88, p = .044) subcomponents of FFMQ from pre to post MBCT but no improvements in the describe (F (1, 14) = 1.09, p = .312) and the nonjudge (F (1, 14) = 4.30, p = .057) subcomponents of FFMQ were present. The total FFMQ had a medium effect size.

Furthermore, both bipolar and unipolar groups reported similar patterns of change in most of the components of the FFMQ (FFMQ-total : F (1, 14) = 0.74, p = .405; FFMQ-describe: F (1, 4) = 3.05, p = .103; FFMQ-observe: F (1, 14) = .27, p = .611; FFMQ-act-aware: F (1, 14) = .89, p = .359; FFMQ-nonreact: F (1, 14) = .00, p = .983; See Table 7) . The nonjudge component of the FFMQ was the only variable that did not contain similar improvements across bipolar and unipolar groups (F (1, 14) = 5.87, p = .030; See Table 7). Follow-up analysis of the non-judge subscale of the FFMQ revealed that unipolar patients did not exhibit any enhancements in the non-judging quality at the testing session 2 (t (9) = - .268, p = .795) while bipolar patients

demonstrated improvements in the non-judge component of the FFMQ at post-MBCT (t (5) = 3.228, p = .023).

Hypothesis 5

Pearson correlations were used to examine whether changes in mindfulness, self-compassion and rumination were associated with changes in depression. Correlations indicated that greater improvement in rumination levels were associated with greater improvements in depression as measured by the BDI-II (r =. 533, p = .033). Greater reductions in depression (improved BDI scores) were also associated with greater increases in the mindfulness skill of non-judgement assessed through the FFMQ-nonjudge subscale (r = -.598, p =.015) but not associated with changes in the total FFMQ scores (r = -.31, p = .242). Changes in self-compassion were not significantly associated with changes in depression (r = -.16, p = .540) (Refer to Table 8).

Hypothesis 6

Only seven participants completed the cognitive flexibility task (2 BD & 5 MDD).The mean percentage of correct responses (accuracy levels) as well as the mean (SD) of response latencies / reaction times were calculated for each of the two diagnostic groups across all the eight task conditions (See Table 10 & 11). At testing session 1 bipolar and unipolar patients did not differ in their mean response latencies / reaction times (U (14) = 32.000, z = .000, p = 1.000) nor in their percentage of accuracies (U (14) = 18.000, z = - 1.477, p = 0.140) in any of the eight task conditions. The two groups also demonstrated similar mean response latencies / reaction times (U (14) = 20.000, z = - 1.260, p = 0.208) as well as comparable accuracy percentages (U (14) = 31.500, z = - .053, p = 0.958) in all eight task conditions at testing session 2.

Accuracy analysis. We conducted Friedman's analysis in order to investigate differences in the number of correct responses as a function of time of testing (pre vs. post-MBCT) and probe valence. Friedman's analysis for examining the effect of time (pre vs. post-MBCT) on correctly identifying relevant words (words from the relevant list, conditions 1, 2; See Table 10 and 11) indicated no significant differences between the accuracy levels of identifying positive and negative relevant words at testing session 1 versus testing session 2 (χ^2 (3) = 1.884, p = 0.597). Thus, overall the participants did not improve in their ability to correctly identify the positive and negative relevant probes from pre to post MBCT.

We also conducted Friedman's analysis comparing correct responses to intrusion probes (i.e., probes from the irrelevant list; Conditions 3 and 4 in Table 10 and 11) and responses to new probes of the same valence (Conditions 6 and 8 in Table 10 and 11) which provided significant results (χ^2 (7) = 33.250, p = 0.000) indicating that a difference could exists between either the positive and the negative probes, the irrelevant and new probes or between the pre vs. post MBCT. In order to determine where this difference exists (i.e., valence, condition, time of testing), follow-up analyses were conducted using a series of Wilcoxon's signed ranked tests. Our results indicated that at *post*-MBCT the accuracy measures of the positively valenced irrelevant and new trials significantly differed from one another (difference existed in *condition* for the *positive* probes). Thus, at post-MBCT only the positive irrelevant and new trials significantly differed from one another in their accuracy measures. Additionally we found that at *pre*-MBCT the negative irrelevant and new trials significantly differed in their measures of accuracy (difference existed in *condition* for the *negative* probes). Therefore, at pre-MBCT only *the negative* irrelevant and new trials differed significantly from each other in their accuracy levels. These findings indicated that prior to MBCT the accuracy of differentiating irrelevant and new probes was only

significantly affected for the negative probes while following MBCT the irrelevant versus new conditions significantly differed in their accuracy levels for the positive probes only.

According to our findings, at both pre and post-MBCT, participants made fewer errors when assessing a new probe than an irrelevant probe. At pre-MBCT this was significant for the negative probes while at post-MBCT significance existed only for the positive probes. At both pre and post-MBCT the accuracy of identifying irrelevant words was reduced compared to new probes.

However, following Bonfronni correction for these multiple comparisons (since 12 different pairwise comparisons were conducted to see where the difference exists) no more significant differences between the irrelevant and new probes at pre and post MBCT were evident. Thus the difference in the accuracy of identifying irrelevant versus new probes was no longer present (see Table 13).

Reaction time analysis. In line with Joormann and Gotlib (2008), we did not have any specific predictions regarding changes in reaction times due to the time of testing or differences in probe valence in response to the relevant probes. Consistent with this, Freidman test conducted on the decision latencies of probes from the relevant lists (Conditions 1 and 2 in Table 10 & 11) did not yield any significant main effects for the time of testing or the valence of the relevant probes nor did it find any significant interactions between them (χ^2 (3) = 0.429, p = 0.934).

We predicted that reaction times to the irrelevant probes would be reduced significantly following MBCT. Therefore, we expected the existence of a significant three-way interaction between time of testing, probe valence, and condition. We hypothesized that prior to participation in MBCT, individuals would exhibit greater intrusion from negative irrelevant probes (indexed through increased reaction times) causing them to be significantly slower (compared to post-MBCT) in determining whether the negative irrelevant probes came from the relevant list.

Additionally we did not hypothesize to find this pattern of reduction in reaction times following MBCT for the new probes of the same valence.

We examined this prediction by analyzing the reaction times in the irrelevant conditions and comparing them with the new conditions of same valence using a three way ANOVA (Time of Testing (pre vs. post); Probe Valence (positive vs. negative); Condition (irrelevant: conditions 3,4 vs. new: conditions 6,8); See Table 10 and Table 11). This analysis yielded a significant main effect for condition (F (1, 5) = 8.049, p = .036) which was qualified by a significant three way interaction of probe valence × condition × testing time (F (1, 5) = 11.054, p = .021). To further investigate our hypothesis that a significant interaction between condition and time of testing is only present for the negatively valenced irrelevant vs. new probes but not for the positive irrelevant vs. new probes, follow-up analyses were separately conducted for the positive and negative probes.

In terms of the follow-up analyses, we did not expect to find any significant main effects or interactions among the positive probes. As expected, for positive irrelevant vs. new probes no significant main effects or interactions were detected indicating that reaction times of responding to positive probes does not significantly differ between irrelevant and new conditions at neither testing session1 nor at the testing session 2 ($p > .05$). Follow-up analysis of the negative probes among irrelevant and new conditions only found a significant main effect for condition (F (1, 5) = 17.306, p = .009) which was not further justified by a significant interaction between condition and the time of testing. Thus, our prediction that an interaction between time of testing and condition would exist only for the reaction times of the negative probes was not supported by our findings.

Hypothesis 7

In order to investigate whether the changes observed at post MBCT were still present at 3

month follow-up, comparisons were made between post MBCT and follow-up using a series of paired t-tests (All scores were normally distributed). Except for the variable of self-compassion, all the other variables demonstrated no significant differences in participants' scores from post MBCT to follow-up, indicating that changes observed during the intervention were largely maintained at the 3 month follow-up (see Table 12). Further analyses were implemented separately for bipolar and unipolar patient groups on the variable of self-compassion. It was found that although unipolar patients did not show any significant changes from post MBCT to follow-up (t (7) = 1.846, p = .107), bipolar patient group illustrated significant increases in self-compassion from post-MBCT to follow-up (t (4) = 3.609, p = .023). However, the effect sizes of the change in all these variables were small.

Discussions

This study examined the effectiveness of an eight week mindfulness based cognitive therapy (MBCT) program for reducing depressive symptomatology in a group of patients with a bipolar or unipolar diagnosis. It also investigated changes in rumination, mindfulness and self-compassion following this intervention and compared the patterns of change in these variables across the two diagnostic groups. Furthermore, factors of sleep, quality of life, and anxiety were examined among these groups in order to determine whether these groups report similar improvements in these variables following MBCT.

Impact of MBCT on Depression

Our first hypothesis predicted that post-MBCT participants would exhibit significant reductions in their depressive symptoms. In investigating the results of this hypothesis we found significant declines in depressive symptomatology among our participants following the intervention. This finding contributes to the current literature regarding the effect of mindfulness and particularly MBCT on depression alleviation. In line with previous research whose findings

were supportive of the effectiveness of MBCT on depression reduction (Teasdale et al., 2000; Kingston et al., 2007; Teasdale and Ma, 2004), our results provided further support for an existing link between undergoing an 8 week mindfulness intervention and lower depressive symptomatology. Our findings are in line with the results of Kingston et al. (2007), which found significant reductions on the BDI scores of nineteen residually depressed individuals following a MBCT intervention. The results of this research build on earlier studies whose findings provided evidence for the efficacy of MBCT in easing depression symptoms among recurrently depressed individuals both in remission (Teasdale et al., 2000; Teasdale and Ma, 2004; van Aalderen et al., 2012) and those currently depressed (Kingston et al., 2007; van Aalderen et al., 2012). Furthermore, patients with bipolar disorder also exhibited lower depression following MBCT which is in line with prior research on the effectiveness of this intervention in managing depression in bipolar disorder (Williams et al., 2008; Miklowitz et al., 2009). Consistent with Miklowitz et al. (2009) this reduction in depression was not associated with any aggravation of manic symptoms in patients with bipolar disorder. Therefore, the present study found significant and similar improvements in both unipolar and bipolar patients in line with the second hypothesis of this investigation and these reductions were not related to worsening of manic symptoms among those with bipolar disorder.

Impact of MBCT on Sleep, Anxiety, Quality of Life and Decentering

Consistent with our third hypothesis, we examined the changes in sleep, anxiety and overall quality of life since the course of depression and bipolar disorder encompass problematic sleep, anxiety and lower life quality. Both depression and bipolar disorder are highly comorbid with anxiety disorders and the durations of these episodes frequently overlap with the anxiety symptoms. Thus, the examination of the changes in anxiety symptomatology was crucial. Moreover, sleep disturbances are very common among those who suffer from either of these

disorders and hence were investigated as well. Finally, since both depression and bipolar disorder are vastly debilitating conditions, the quality of life of those affected by either of these disorders is greatly reduced. We also were interested in finding whether an 8-week MBCT program is effective in improving the overall life quality in these individuals. We hypothesized that following MBCT, bipolar and unipolar groups will have similar improvements in quality of life (WHOQOL), sleep (PSQI), anxiety (BAI) and decentering (EQ). However, we did not find any significant improvements in any of these variables following MBCT, but both diagnostic groups did in fact respond similarly and both failed to show any significant improvements in these areas. To our knowledge, no study so far has examined the changes in sleep or quality of life in a group of patients with unipolar and bipolar depression following an MBCT intervention. Thus, we cannot make any robust comments in this regard. However, changes in both sleep and quality of life require longer than 8 week follow-up periods, as changes in these variables are slower and evolve over longer periods of lifetime. Despite lack of significant findings regarding anxiety reduction following MBCT, our results were indicative of no worsening of anxiety symptoms which is consistent with Miklowitz et al.'s (2009) findings. This finding is helpful as it adds to the previous literature regarding the positive influence of MBCT on depression alleviation without aggravating any of the anxiety symptomatology. Furthermore, a sample of only six participants had completed the EQ at both time points. Hence, the failure to detect significant improvements in the decentering quality is likely attributed to this small sample size.

Impact of MBCT on Potential Mechanisms of Change Variables

This study also explored the links between improvements in depression across both of the diagnostic groups and the changes in mindfulness, self-compassion and rumination. Rumination, self-compassion and mindfulness have previously been found to mediate the effect of mindfulness interventions on depression reduction. Hence, in our study we aimed at further

elucidating the relationships between these constructs and the depression change. We found partial support for our fourth hypothesis by finding that bipolar and unipolar groups demonstrated similar significant enhancements in total FFMQ, the observe, the actaware and the non-react subcomponents of the FFMQ. There were not any significant improvements in the curiosity and the decentering components of the TMQ. Less number of participants completed the TMQ compared to the FFMQ. Therefore, significant improvements found for most of the subscales of the FFMQ and the lack of any improvements in the TMQ components could be attributed to the lower number of participants completing the TMQ.

In addition, similar significant increases in self-compassion were observed along with comparable significant reductions in rumination symptoms across bipolar and unipolar groups. The brooding and the reflection subcomponents of the rumination response scale were also separately examined and analyses of both of these subscales revealed significantly lower brooding and reflection scores following MBCT.

The only variable that did not contain similar patterns of change among the two diagnostic groups was the non-judge subcomponent of the FFMQ. The bipolar group demonstrated significant improvements in this category following undergoing MBCT while this facet remained relatively unchanged in the unipolar group. Investigating the levels of non-judgment at baseline revealed that the bipolar and unipolar groups significantly differed in this variable prior to participation in MBCT. Bipolar group showed significant improvements in non-judgement while the levels of non-judgement remained relatively unchanged within the unipolar group. Making confident comments as for why non-judgement failed to improve within the depressed group is not advisable without implementing similar study designs with greater number of participants across both group. However, since the bipolar group exhibited significantly lower non-judgement at baseline and gained significant increases in this construct

following MBCT, it can be suggested that MBCT might be primarily effective in enhancing non-judgement among those who fundamentally lack or possess very low levels of non-judgement quality. Future studies need to investigate the associations between mindfulness interventions and the process of non-judgement development across larger groups of depressed and bipolar patients.

Another factor which we were interested in investigating was whether the reductions in depressive symptoms (BDI, MADRS) across all participants would be associated with increases in mindfulness (FFMQ, TMQ) and self-compassion (SCS) and with decreases in rumination (RRS) scores. In further examining this question we found that decreases in depression (BDI) scores were associated with reductions in rumination (RRS) scores and improvements in the non-judge subcomponent of the FFMQ (FFMQ-nonjudge). However, we did not find any associations between the depression changes and the other facets of mindfulness (other components of the FFMQ) nor between the depression changes and the changes in self-compassion. Findings from previous literature suggest that a negative association exists between depression and self-compassion among the depressed individuals (Krieger et al, 2013) despite our study's failure to detect significant associations between changes in depression and self-compassion. We suggest that an increase in sample size would most likely address this problem and will be able to detect a relationship between changes in self-compassion and depression as well as mindfulness and depression in line with a previous study done by Weber et al. (2010) whose findings were supportive of significant negative associations between mindfulness and depression following an 8-week MBCT program. Our study only detected small non-significant correlations between changes in mindfulness and depression as well as changes in self-compassion and depression which needs further investigations.

Significant correlations between mindfulness (FFMQ) and self-compassion (SCS) were also detected. These finding are consistent with prior findings vis-à-vis the close associations between the development of mindfulness and self-compassion (Baer et al., 2006). These findings imply that the course of development of mindfulness and self-compassion may occur simultaneously. Thus as a mindful insight is developed one might employ more compassion towards self or as one gains more self-compassion, one might be more prone to cultivate a mindful outlook on life.

Identifying significant relationships between depression, mindfulness and self-compassion could be illuminating to future interventions whose augmentation of mindfulness and self-compassion could weaken and break the depressive cycles. The emphasis of mindfulness on promoting a focus of attention which simply appreciates the present moment helps strengthen attentional resources and creates flexibility within the mental contexts. This process in turn replaces engaging in rumination as the mere coping strategy with alternative strategies brought on by more flexible cognitive styles and hence precludes experiencing depression.

Impact of MBCT on Cognitive Flexibility Task

According to our earlier discussions, the working memory is negatively biased during depressive disorders. Depression tends to reinforce ruminative cycles which is also associated with deficits in working memory by preventing or hindering the process of upgrading attentional resources from formerly relevant to currently relevant information. Individuals with depression and bipolar disorder appear to exhibit greater bias to recall negative rather than positive or neutral cues. Hence, we further evaluated the change in the response accuracy and the response latency within the context of a computerized cognitive flexibility task following the MBCT intervention. With regards to our sixth hypothesis, following MBCT no significant improvements

in response latencies or accuracies of identifying irrelevant negative words were detected across our participants. The lack of any significant findings could most likely be attributed to our very small sample size of only seven individuals. Increasing the sample size as well as inclusion of active control groups would be beneficial in understanding how individuals' responses to irrelevant negative cues change within the context of depression and bipolar disorder following receiving MBCT. In the study done by Joormann and Gotlib (2008) the patterns of response of three groups (depressed, induced sad mood and healthy controls) were contrasted with one another and found significantly greater reaction times for detecting negative irrelevant words among the MDD group only. However, the effect of MBCT or any other interventions on participants' performances was not investigated in Joormann and Gotlib's study. The significantly higher reaction times among the depressed group in Joormann and Gotlib's (2008) study provided a solid support for deficits in the ability of depressed individuals to let go of formerly relevant negative information. Designing similar studies that also examine the efficacy of MBCT within analogous research contexts is a crucial step in understanding whether MBCT is associated with significant changes in identifying negative irrelevant cues in depression and bipolar disorder.

Maintenance of Improvements Associated with MBCT

Finally, we conducted analyses in order to investigate whether the improvements observed following MBCT were still sustained at a 3 month follow-up. This is important since finding improvements that last up to three months could help us outline the minimum amount of time before MBCT needs to be implemented again. Our results provided support for our assumption indicating that improvements following an 8 week intervention would be maintained at the follow-up session. This was the case for all the assessed variables except for self-compassion which had significantly increased among bipolar patients from post group evaluation

to the 3 month follow-up. Nevertheless, this rise in self-compassion among the bipolar group does not refute our hypothesis since all of the improvements observed at post-MBCT were still maintained at our follow-up session and in case of self-compassion it was even improved (though for the bipolar group only). We cannot make any firm conclusions about the outcome of significant increases in self-compassion from post-MBCT to the follow-up session in the bipolar and not the unipolar group due to the small sample size (only 5 bipolar participants completed the 3 months follow-up evaluations and 8 unipolar individuals completed the follow-up). Thus, larger sample sizes need to be included in the future studies in order to be able to draw more generalizable conclusions. Nevertheless, we found significant increases in self-compassion among our bipolar participants at the 3 month follow-up. This is likely due to greater amount of homework practice and meditation exercises among the bipolar group following the termination of the MBCT group. These outcomes highlight the fact that not only the enhanced effects of MBCT on the examined factors last for up to three month but also these improvements may potentially increase even further by augmentation of greater practice in daily life. Incorporating greater sample sizes could help clarify whether these improvements will still be existent in larger and more comparable group settings.

Study Limitations

There are several limitations that we need to acknowledge. First, the small sample size in the present study was a major restriction and our findings need to be interpreted with caution. Due to a lack of sufficient power, implementation of mediation analysis and exploring mediators of the effect was not possible. Future studies need to incorporate larger number of participants to be able to effectively examine the factors that mediate the effect of MBCT on the outcomes. Second, our sample size lacked a gender representative quality since it was mainly consisted of females (roughly 83%). Therefore, we could not confidently make any comments regarding the

outcomes of similar interventions in a group of primarily males. Inclusion of comparable number of male and female participants is necessary in order to contrast the patterns of response among genders. Third, the lack of an active control group does not allow us to attribute any significant findings to specific elements of mindfulness rather than to non-specific factors such as group support, teacher's skills or merely the passage of time. Thus, to disentangle the specific and non-specific elements of MBCT, incorporating active control groups is an absolute must. Fourth, although significant declines in depressive symptoms were evident following an 8 week MBCT intervention as well as at a 3 month follow-up, it is not possible to establish any causation on the part of mindfulness skills without any further manipulations of mindfulness within the contexts of randomized controlled trials or trials in which mindfulness is experimentally varied, in order to determine if these variables have any causal relations with one another. Fifth, despite finding significant reductions in clinician rated MADRS scores following MBCT, the remaining of our included measures were self-reported. Thus, we could not be certain about whether the observed improvements are significant at a clinical level and whether they reflect the effect of MBCT on clinical symptomatology or if they are merely reflective of patients' perceptions. Although self-report measures have been used in a variety of similar studies, it is important to acknowledge that patients' reports are vulnerable to their perceptions and these measures may include inaccuracies and or biases. Therefore, using clinician administered measures in addition to self-report measures is advisable. Finally, the amount of time between evaluation at post-MBCT and follow-up was not long enough which might not have allowed for the complete unfolding of relapse-free periods and potential relapses to occur. Longer and more frequent follow-up periods are required in order to carefully examine how long the prophylactic effects of MBCT will last.

Conclusions

The present study extends prior research by examining and comparing the patterns of change in depression following participation in MBCT in a group of patients with either bipolar or unipolar depression. This study is the first in its kind to evaluate the changes in a variety of symptoms among bipolar and unipolar patients within the same settings. The results of this investigation revealed that following an 8 week MBCT intervention, individuals reported significantly lower depressive and ruminative symptoms. Moreover, there were significant improvements in mindfulness and self-compassion. Keeping the aforementioned study limitations in mind, this study supports an association between undergoing a mindfulness intervention program and alleviation in depressive symptoms in a group of mildly to moderately depressed individuals with bipolar disorder or depression with improvements which appeared to linger for at least 3 months following the termination of the intervention. Addressing the shortcomings of this study will help identify the specific changing and reinforcing elements throughout the course of mindfulness whose mechanistic interplay brings on the positive change.

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Table 1. Demographic Characteristics

Demographic Variable	Diagnosis Group			Statistical Analysis
	Unipolar	Bipolar	Overall	Results
Age	58(12.16)	48.3(13.4)	54.37(13.11)	$F(1,14) = 2.203$ $p = 0.160$
Sex				
Women	90%	67%	82.40%	$\chi^2(1) = 1.570$
Men	10%	33%	17.60%	$p = 0.515$
Marital Status				
Single	36%	33%	35.30%	$\chi^2(2) = 1.966$
Married	64%	50%	58.80%	$p = 0.374$
Common Law	0%	17%	5.90%	
Ethnicity				
White	100%	83%	93.80%	$\chi^2(1) = 1.948$
Black	0%	17%	6.20%	$p = 0.353$
Education				
High school or less	18.20%	16.7%	14.40%	$\chi^2(3) = 0.485$
College	36.40%	33.30%	30.40%	$p = 0.922$
Undergraduate	36.40%	33.30%	34.80%	
Graduate	9.10%	0%	8.70%	
Occupational Status				
Employed	20%	0%	11.80%	$\chi^2(3) = 11.250$
Unemployed	0%	80%	23.50%	$p = 0.010$
On Disability	50%	20%	35.30%	
Retired	30%	0%	17.60%	

*$p<.05$

Table 2. Baseline Characteristics

	Diagnosis Group			Statistical Analyses
Therapy in the last year	Unipolar	Bipolar	Overall	Results
Yes	90%	100%	93.7%	$\chi^2(1) = 0.647$
No	10%	0%	6.3%	p = 1.000
Comorbid Diagnoses				
GAD	30%(n=3)	33%(n=2)	31.2%(n=5)	
OCD	10%(n=1)	33%(n=2)	18.7%(n=3)	
PTSD	20%(n=2)	17%(n=1)	18.7%(n=3)	$\chi^2(1) = 0.069$
Social Phobia	20%(n=2)	17%(n=1)	18.7%(n=3)	p = 0.659
Panic Disorder	20%(n=2)	0%(n=0)	12.5%(n=2)	
Currently Taking Psychoactive Medication				
Yes	90%(n=9)	83%(n=5)	82.4%(n=14)	$\chi^2(1) = 0.006$
No	10%(n=1)	17%(n=1)	17.6%(n=3)	p = 1.000
Duration of Last Depressive Episode (in weeks)	14.6(12.7)	7.5(11.1)	12.25(12.2)	t(10)=0.948 p = 0.366
Number of Previous Depressive Episodes	6.5(9.6)	4.6(1.5)	5.8(7.5)	t(11)=0.431 p = 0.675
Number of MBCT Classes Attended	6.3(1.3)	7(0.9)	6.6(1.2)	t(14)= -1.131 p = 0.277
Number of Homework Logs Completed	4.9(2.1)	5(1.9)	4.8(1.97)	t(15)= -0.264 p = 0.795
Age of onset	34.75(10.5)	23.6(12.3)	30.46(12.1)	t(11) = 1.748 p =0.108
Baseline Global Assessment of Functioning Scores (GAF)	61.67(10.3)	63(4.5)	62.14(8.5)	t (12) =-.272 p = 0.791

Note. Continuous variables are reported as mean (standard deviations); categorical variables are listed as column-wise percentages (number of participants). For Pearson Chi Square analyses Fishers Exact p-values are reported.

Table 3. Pre and Post Values by Diagnostic Group

Questionnaire	Pre-Values By Group			Post-Values By Group		
	Unipolar	Bipolar	Overall	Unipolar	Bipolar	Overall
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
BAI	18.8(10.7)	21(13.1)	19.6(11.26)	17.7(11.2)	16.8(9.2)	17.37(10.2)
RRS	55.9(13.9)	55.7(12.06	55.8(12.9)	48.2(10.3)	47.5(13.2)	48(11.1)
BDI-II	18.6(10.01)	22.7(8.5)	20.06(9.4)	15.4(10.9)	14.5(8.7)	15.6(9.9)
SCS	2.3(0.71)	2.15(0.38)	2.27(0.609)	2.7(0.77)	2.4(0.27)	2.6(0.639)
WHOQOL-BREF						
Physical	48.05(10.5)	39.3(11.3)	44.96(11.3)	50.7(13.9)	46.4(8.4)	49.1(12)
Psychological	48.1(14.9)	37.3(7.95)	44.3(14.3)	47.1(17.6)	39.2(9.3)	44.14(15.1)
Social	46.97(21.1)	37.5(18.06)	43.6(20.1)	49.17(16)	40.3(17.8)	45.8(16.7)
Environmental	69.03(17.5)	71.35(8.25)	69.85(14.6)	70.3(16.2)	72.4(11.07)	71.09(14.13)
PSQI	9.9(4.13)	8.5(3.7)	9.4(3.9)	10.8(4.05)	8.5(5.2)	9.9(4.5)
MADRS	18(9)	17.3(8.7)	17.7(8.3)	11(7.2)	13.8(8.3)	12.06(4.7)
YMRS	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
TMQ						
Curiosity	12.6(4.7)	11(3.7)	11.85(4.2)	11.2(5.2)	14.75(3.7)	12.8(5.12)
Decentering	13.14(3.8)	10.7(5.05)	12(4.4)	15.4(8.3)	16.5(2.4)	15.9(6.05)
FFMQ						
Total	111(23.1)	99.17(19)	106.8(21.92)	123.2(26.5)	114.2(16.1)	119.8(23.02)
Describe	25.7(8)	23.7(3.3)	25(6.6)	27.2(8.8)	23.17(4.4)	25.69(7.53)
Observe	20.45(4.37)	22.7(8.7)	21.23(6.09)	25.7(4.55)	26(4.19)	25.81(4.27)
Actwithawareness	22.1(7.35)	19.5(4.7)	21.17(6.5)	23.6(7.2)	23.17(3)	23.43(5.86)
NonJudge	26.36(5.35)	18(5.7)	23.4(6.7)	26.7(5.65)	23.17(7.7)	25.37(6.5)
NonReact	16.36(5.3)	15.3(6)	16(5.38)	20.0(4.8)	18.7(3.3)	19.5(4.2)
EQ (Decentering)	31.6(8.2)	21.5(3.5)	28.7(8.46)	33.4(6.7)	27.5(0.71)	31.7(6.2)

Note. Mean and standard deviations of all the questionnaire. MADRS = Montgomery-Asberg Depression Rating Scale, BDI = Beck Depression Inventory, FFMQ = Five Facet Mindfulness Questionnaire, WHOQOL-BREF = World Health Organization Quality of Life, PSQI = Pittsburgh Sleep Quality Inventory, BAI = Beck Anxiety Inventory, SCS = Self-Compassion Scale, RRS= Rumination Response Scale, TMQ = Toronto Mindfulness Questionnaire, YMRS = Young Mania Rating Scale, EQ = Experiences Questionnaire.

Table 4. Comparison of Categorical and Continuous Variables among Completers and Non-completers

Categorical Variables	Completers	Non-Completers	Statistical Analysis
Gender (%Females)	82.40%	50%	$\chi^2(1) = 2.148$ p = 0.283
Diagnosis			
BD	37.5%	50%	$\chi^2(1) = 0.282$
MDD	62.5%	50%	p = 0.655
Education			
High School	14.40%	17%	$\chi^2(1) = 0.525$
College	30.40%	33%	p = 0.913
Undergraduate	34.80%	33%	
Graduate	8.70%	17%	
Ethnicity			$\chi^2(1) = 0.393$
Caucasian	93.80%	100%	p = 1.000
African-American	6.20%	0%	
Marital Status			
Married	58.80%	50%	$\chi^2(1) = 0.573$
Common Law	5.90%	0%	p = 0.751
Single	35.30%	50%	

Continuous Variables	Completers M (SD)	Non-Completers M (SD)	Statistical Analysis
Age	54.37 (13.11)	49.20 (14.27)	t(19) = -.756 *p* = .459
MADRS at pre-MBCT	17.94 (8.58)	17.17 (12.91)	t(20) = -.164 *p* = .872
Age at depression onset	30.46 (12.11)	32.25 (14.52)	t(15) = .248 *p* = .808
Total number of depressive episodes	5.77 (7.47)	6.25 (5.85)	t(15) = .117 *p* = .908
Global Assessment of Functioning (GAF) at pre-MBCT	62.14 (8.48)	61.00 (4.18)	t(17) = -.285 *p* = .779

*$p<.05$

Table 5. Hypothesis 1: Depression Changes

Outcome Measure	Mean (SD)		Statistical Analyses	
	Pre	*Post*		
MADRS	17.94 (8.58)	12.06 (7.46)	**Z = -2.31	p = 0.021*
BDI-II	20.43(9.61)	15.06(9.89)	t(15) = 3.56	p = 0.003*

Note. MADRS = Montgomery-Asberg Depression Rating Scale, BDI-II = Beck Depression Inventory, Values reported as Mean (Standard Deviation). Decreases in BDI-II and MADRS represent improvements. BDI-II was indexed by the self-report. MADRS was clinician administered.
*$p < .05$
** A Wilcoxon signed ranked test was implemented for the analysis of the MADRS because it was not normally distributed. A t-test was used for the analysis of the BDI-II.

Table 6. Hypothesis 2 & 3: Change in Symptoms by Diagnosis Group

Outcome	Diagnosis Group Change: Pre to Post			Statistical Analyses RM-ANOVA Results					
Measure	Overall	Bipolar	Unipolar	Time Effect		Group Effect		Interaction Effect	
MADRS	-5.87 (8.49)	-3.50 (7.69)	-7.30 (9.01)	**					
BDI-II	-5.37 (6.03)	-8.17 (7.08)	-3.70 (4.94)	F (1, 14) =15.69	p =.001*	F (1, 14) = 0.07	p = .791	F (1,14) = 2.22	p = .158
WHOQOL-Physical	5.36 (10.35)	7.14 (9.84)	4.28 (11.01)	F (1,14) =4.35	p=.056	F (1,14) = 1.25	p = .283	F (1,14) = 0.27	p = .610
WHOQOL-Psychological	0.97 (6.56)	1.91 (6.92)	0.42 (6.64)	F (1, 14) = 0.45	p= .515	F (1, 14) = 1.41	p = .255	F (1,14) = 0.18	p = .675
WHOQOL-Social	3.64 (13.93)	2.78 (18.00)	4.17 (11.95)	F (1, 14) = 0.87	p= .366	F (1, 14) = .87	p= .367	F (1, 14) = .03	p =.855
WHOQOL-Environment	1.37 (12.45)	1.04 (5.82)	1.56 (15.47)	F (1, 14) = .15	p = .701	F (1, 14) = .11	p = .744	F (1,14) =0.01	p =.939
Decentering (EQ)	3.17 (3.87)	6.00 (4.24)	1.75 (3.30)	F (1, 4) = 6.31	p = .066	F (1, 4) =1.61	p= .273	F (1, 4) = 1.90	p = .240
Sleep Quality (PSQI)	0.31 (2.02)	0.00 (2.76)	0.50 (1.58)	F (1,14) = .22	p = .649	F (1,14) = 0.93	p = .351	F (1, 14) = .22	p = .649
Anxiety (BAI)	-2.56 (9.59)	-4.17 (6.40)	-1.60 (11.31)	F (1,14) = 1.29	p = .275	F (1, 14) = 0.01	p = .937	F (1, 14) = .25	p = .621

Note. MADRS = Montgomery-Asberg Depression Rating Scale, BDI-II = Beck Depression Inventory, PSQI = Pittsburgh Sleep Quality Inventory, WHOQOL = World Health Organization Quality of Life- The Brief Version, EQ = Experiences Questionnaire, BAI = Beck Anxiety Inventory. Decreases in MADRS, BDI-II and BAI represent improvements, whereas increases in WHOQOL, EQ and PSQI represent improvements. Change from pre to post reported as Mean (Standard Deviation). All variables except for MADRS were indexed by self-reports.

*p <.05, ** MADRS was not normally distributed, therefore Friedman and Mann-Whitney analyses were performed, rather than RM-ANOVA, see text page 37 for results.

Table 7. Hypothesis 4: Changes in Other Factors by Diagnosis Group

Outcome Measure	Diagnosis Group Change: Pre to Post			Statistical Analyses RM-ANOVA Results					
	Overall	Bipolar	Unipolar	Time Effect		Group Effect		Interaction Effect	
TMQ-Curiosity	.50 (5.57)	3.25 (3.30)	-5.00 (5.65)	*F* (1,4) = .25	*p* = .642	*F* (1,14) = 1.52	*p* = *.285*	*F* (1,14) = 5.61	*p* = .077
TMQ- Decentering	4.00 (4.56)	4.25 (4.57)	3.50 (6.36)	*F* (1, 4) =3.10	*p* = .153	*F* (1,14) = 1.28	*p* = .320	*F* (1,14) = 0.03	*p* = .873
FFMQ-Total	12.87 (18.35)	15.00 (21.44)	11.60 (17.36)	*F* (1, 14) = 5.96	*p* = .029*	*F* (1,14) = 0.07	*p* = .801	*F* (1,14) = 0.74	*p* = .405
FFMQ-Describe	1.06 (2.95)	-.50 (2.25)	2.00 (3.02)	*F* (1,14) = 1.09	*p* = .312	*F* (1,14) =.58	*p* = *.459*	*F* (1,14) = 3.05	*p* = .103
FFMQ-Observe	4.37 (6.04)	3.33 (6.31)	5.00 (6.13)	*F* (1, 14) = 6.78	*p* = .021*	*F* (1,14) = .23	*p* =.635	*F* (1,14) =.27	*p* =.611
FFMQ-act-aware	2.37 (4.21)	3.67 (4.76)	1.60 (3.89)	*F* (1, 14) = 5.83	*p* =.030*	*F* (1,14) = .22	*p* =.648	*F* (1,14) = .89	*p* =.359
FFMQ-Nonjudge	1.69 (5.12)	5.17 (3.92)	.40 (4.72)	*F* (1, 14) = 4.30	*p* =.057	*F* (1,14) = 4.99	*p* =.042*	*F* (1,14) = 5.87	*p* =.030*
FFMQ-Nonreact	3.37 (5.70)	3.33 (6.62)	3.40 (5.46)	*F* (1, 14) = 4.88	*p* =.044*	*F* (1,14) = .38	*p* =.548	*F* (1,14) = .00	*p* =.983
Self- Compassion (SCS)	0.32 (.49)	.25 (.21)	.36 (.61)	*F* (1,14) = 5.48	*p* =.034*	*F* (1,14) = 0.59	*p* = .456	*F* (1,14) =0.18	*p* = .674
Rumination (RRS-RSQ)	-8.00 (13.26)	-8.22 (10.92)	-7.90 (15.06)	*F* (1, 14) = 5.14	*p* =.040*	*F* (1,14) = 0.01	*p* = .919	*F*(1,14) = .00	*p* = .971
Brooding (RRS)	-.45 (.68)	-.68 (.45)	-.30 (.78)	*F* (1, 14) = 7.74	*p* = .015*	*F* (1, 14) = .08	*p* = .789	*F* (1,14) = 1.22	*p* = .288
Reflection (RRS)	-.38 (.65)	-.50 (.65)	-.30 (.66)	*F* (1, 14) = 5.53	*p* = .034*	*F* (1, 14) = .12	*p* = .734	*F* (1,14) = .35	*p* = .566

Note. TMQ = Toronto Mindfulness Questionnaire, FFMQ = Five Facet Mindfulness questionnaire, SCS = Self-Compassion Scale, RRS-RSQ = Rumination Response Scale-Response Style Questionnaire. Change reported as Mean (SD). Decreases in state rumination, increases in self-compassion and mindfulness represent improvements. *$p < .05$

Table 8. Correlations

Changes in Outcome Variables	BDI change	MADRS change[1]	FFMQ total change
FFMQ-total	-.31	.23	1.00
FFMQ-non-judge	-.60*	.13	.67*
FFMQ-observe	-.14	.15	.84*
FFMQ-describe	.14	-.47	.27
FFMQ-act-aware	-.34	.27	.90*
FFMQ-non-react	-.13	.12	.91*
WHOQOL Physical	-.61*	.22	.29
WHOQOL Psychological	-.40	.08	.24
WHOQOL Social	.02	-.04	.28
WHOQOL Environment	.07	.34	.06
Sleep (PSQI)	.15	-.03	.43
Anxiety (BAI)	.48	.45	-.21
Self-Compassion (SCS)	-.16	-.03	.55*
Rumination (RRS-RSQ)	.53*	-.31	-.43

Note. Correlation are between BDI, MADRS and total FFMQ change scores and the changes scores in other variables. *$p < 0.05$

FFMQ = Five Facet Mindfulness Questionnaire, WHOQOL-BREF = World Health Organization Quality of Life, PSQI = Pittsburgh Sleep Quality Inventory, BAI = Beck Anxiety Inventory, SCS = Self-Compassion Scale, RRS-RSQ= Rumination Response Scale-Response Styles Questionnaire.

[1]Correlations indicated for MADRS scores are Spearman correlations since these scores were not entirely normally distributed. All the other reported correlations are Pearson correlations.

Table 9. Effect Sizes

Outcome Measure	Effect Size (Cohen's d) by Group		
	Unipolar	Bipolar	Overall
BDI-II	-.31	-.95	-.55*
Anxiety (BAI)	-.14	-.37	-.23
Rumination (RRS-RSQ)	-.62	-.60	-.65*
Self-Compassion (SCS)	.47	.91	.50*
FFMQ-Total	.46	.85	.56*
FFMQ-describe	.23	.12	.15
FFMQ-observe	1.10	.48	.82*
FFMQ-act-aware	.21	.93	.37*
FFMQ-nonjudge	.07[1]	.75[1]	.25
FFMQ-nonreact	.66	.70	.69*
Sleep (PSQI)	.12	.00	.07
Decentering (EQ)	.20	2.36	.40
TMQ-Curiosity	1.10	1.01	.11
TMQ-Decentering	.50	1.42	.95
WHOQOL Physical	.36	.70	.47
WHOQOL Psychological	.03	.18	.07
WHOQOL Social	.20	.15	.19
WHOQOL Environment	.09	.11	.09
MADRS	-.87	-.43	-.73*

Note. Effect size (Cohen's d) was calculated comparing testing session one values vs. testing session two values within each of the conditions. Negative effect size indicates that the direction of change reflects a decline in performance.
BDI = Beck Depression Inventory, FFMQ = Five Facet Mindfulness Questionnaire, WHOQOL-BREF = World Health Organization Quality of Life, PSQI = Pittsburgh Sleep Quality Inventory, BAI = Beck Anxiety Inventory, SCS = Self-Compassion Scale, RRS= Rumination Response Scale, TMQ = Toronto Mindfulness Questionnaire, MADRS = Montgomery-Asberg Depression Rating Scale
*indicates significant time effect on RM-ANOVA analysis or Friedman's test.
[1]indicates significant group effect

Table 10. Experimental Conditions, Reaction Times, and Percentage of Accuracies at Pre-MBCT

Condition	Relevant	Irrelevant	Probe	MDD			BD		
				Reaction Time Mean	Reaction Time SD	% Accuracy	Reaction Time Mean	Reaction Time SD	% Accuracy
1	+	-	Rel	2916.0	684.2	81	2353.9	209.2	92
2	-	+	Rel	2935.9	560.5	75	3133.8	1256.5	92
3	-	+	Irrel	3551.0	663.7	68	2679.2	1400.4	50
4	+	-	Irrel	3727.1	403.5	64	2988.2	547.6	42
5	+	-	New pos	2412.5	379.7	83	2674.2	102.3	92
6	-	+	New pos	2645.1	518.6	89	2846.6	212.2	87
7	-	+	New neg	2692.0	394.3	87	2756.3	365.9	96
8	+	-	New neg	2583.0	440.6	87	2593.5	109.1	92

Note. Rel = relevant; Irrel = irrelevant; New pos = New positive; New neg = New negative; SD = standard deviation; MDD = participants with major depressive disorder; BD = participants with bipolar disorder. Reaction times are given in milliseconds (ms).

Table 11. Experimental Conditions, Reaction Times, and Percentage of Accuracies at Post-MBCT

Condition	Relevant	Irrelevant	Probe	MDD			BD		
				Reaction Time Mean	Reaction Time SD	% Accuracy	Reaction Time Mean	Reaction Time SD	% Accuracy
1	+	-	Rel	3193.8	345.0	90	2713.3	795.1	92
2	-	+	Rel	3263.9	586.6	87	2546.3	769.8	83
3	-	+	Irrel	3438.2	671.5	83	3365.0	975.1	46
4	+	-	Irrel	3557.5	457.6	75	2887.3	1085.1	50
5	+	-	New pos	2659.5	454.2	93	2435.1	887.5	92
6	-	+	New pos	2629.7	335.1	98	2456.0	546.3	100
7	-	+	New neg	2522.3	308.5	93	2441.3	644.4	96
8	+	-	New neg	2504.0	205.2	95	2711.4	845.1	96

Note. Cond = condition; Rel = relevant; Irrel = irrelevant; New pos = New positive; New neg = New negative; SD = standard deviation; MDD = participants with major depressive disorder; BD = participants with bipolar disorder. Reaction times are given in milliseconds (ms).

Table 12. Hypothesis 7: Change from Post-MBCT to 3 Month Follow-Up

Outcome Measure	Mean (SD) *Post*	*Follow-up*	Statistical Analyses	
BAI	16.92 (11.12)	15.00 (10.72)	t (12) = - .69	p = .503
BDI-II	14.69 (11.00)	13.46 (8.16)	t (12) = - .74	p = .472
FFMQ total	122.77 (24.70)	128.10 (26.20)	t (12) = 1.25	p = .236
WHOQOL Physical	49.18 (12.21)	50.27 (11.15)	t (12) = .29	p = .775
WHOQOL Psychological	44.39 (14.52)	46.47 (14.11)	t (12) = .66	p = .521
WHOQOL Social	42.95 (15.90)	42.95 (22.53)	t (12) = .00	p = 1.000
WHOQOL Environment	71.90 (15.70)	73.80 (12.34)	t (12) = .72	p = .487
PSQI	9.85 (4.84)	9.46(5.80)	t (12) = - .44	p = .668
SCS	2.64 (.67)	2.81 (.68)	t (12) = 2.84	p = .015*
RRS	47.15 (11.86)	44.40 (12.23)	t (12) = - .87	p =.404
EQ	34.50 (6.00)	34.75 (7.36)	t (3) = .10	p = .928

BAI = Beck Anxiety Inventory, BDI = Beck Depression Inventory, FFMQ = Five Facet Mindfulness Questionnaire, WHOQOL-BREF = World Health Organization Quality of Life, PSQI = Pittsburgh Sleep Quality Inventory, SCS = Self-Compassion Scale, RRS = Rumination Response Scale, EQ = Experiences Questionnaire.

Table 13. Wilcoxon Test's Outputs for the Accuracy Measures

Comparisons Made	Z-score	Sig. (2-tailed)
Pre-MBCT positive vs. negative Irrelevant trials	-.93	.352
Pre-MBCT positive vs. negative New trials	-.74	.461
Pre-MBCT positive New vs. Irrelevant trials	-1.87	.062
Pre-MBCT negative New vs. Irrelevant trials	-2.11	.035*
Post-MBCT positive vs. negative Irrelevant trials	-.63	.527
Post-MBCT positive vs. negative New trials	-1.34	.180
Post-MBCT positive New vs. Irrelevant trials	-2.21	.027*
Post-MBCT negative New vs. Irrelevant trials	-1.86	.063
Pre vs. post MBCT for positive irrelevant trials	-1.26	.207
Pre vs. post MBCT for negative irrelevant trials	-1.02	.310
Pre vs. post MBCT for positive new trials	-.82	.414
Pre vs. post MBCT for negative new trials	.00	1.000

Note. Comparisons made using a series of Wilcoxon's signed rank tests to find where the difference exists. We manipulated valence (positive, negative), condition (irrelevant, new) or time of testing (pre-MBCT, post-MBCT) one at a time to see where there is a difference. * denotes a significant difference. Following Bonfronni correction for the Wilcoxon tests, the observed significant differences (*) were no longer significant.