Does rumination mediate the relationship between mindfulness and depressive relapse?

Short title: Mindfulness, rumination and depressive relapse

Keywords: Mindfulness, Rumination, Depression, Relapse, Depressive Relapse,
Mindfulness-based Cognitive Therapy, Mediation Analysis

Abstract

Objectives: Major depressive disorder is a significant mental illness that is highly likely to recur, particularly after three or more previous episodes. Increased mindfulness and decreased rumination have both been associated with decreased depressive relapse. The aim of this study was to investigate whether rumination mediates the relationship between mindfulness and depressive relapse. **Design:** This prospective design involved a secondary data analysis for identifying causal mechanisms using mediation analysis. **Methods:** This study was embedded in a pragmatic randomised controlled trial of mindfulness-based cognitive therapy (MBCT) in which 203 participants (165 females, 38 males; mean age: 48 years), with a history of at least 3 previous episodes of depression, completed measures of mindfulness, rumination and depressive relapse over a 2-year follow-up period. Specific components of mindfulness and rumination, being nonjudging and brooding respectively, were also explored. **Results:** While mindfulness negatively predicted rumination and depressive relapse, the relationship between mindfulness and relapse was not found to be mediated by rumination, although there appeared to be a trend. **Conclusions:** Our results strengthen the argument that mindfulness may be an active component of MBCT in preventing relapse but that rumination is not a significant mediator of its effects. The study was adequately powered to detect medium mediation effects, but it is possible that smaller effects were present but not detected.

Practitioner points

- Mindfulness may be an active component of MBCT in preventing depressive relapse, and therefore it is important that instructors support and promote mindfulness practice by attendees.
- Although the original rationale for MBCT rested largely on a model of relapse causally linked to rumination, our findings suggest that the mechanism by which mindfulness impacts relapse is more complex than a simple effect on rumination.

Introduction

Major depressive disorder (MDD) has the highest burden of disease of any mental illness (World Health Organisation, 2008). Relapse rates are high and increase with each episode (Barnhofer & Crane, 2009). By the time a person has experienced three episodes, there is a 90% chance of relapse (Monroe & Harkness, 2012). Reducing the risk of relapse is an important goal of treatment in order to reduce the overall prevalence of MDD and its negative impact on individuals.

Mindfulness-based cognitive therapy (MBCT) is a group-based program developed to reduce depressive relapse (Segal, Williams, & Teasdale, 2013). It integrates aspects of cognitive behaviour therapy with components of a mindfulness-based stress reduction program (MBSR - Kabat-Zinn, 1990). Results from several randomised controlled trials (RCTs) (Barnhofer et al., 2009; Godfrin & van Heeringen, 2010; Ma & Teasdale, 2004; Meadows et al., 2014; Segal et al., 2010; Teasdale et al., 2000) and three meta-analyses (Chiesa & Serretti, 2011; Galante, Iribarren, & Pearce, 2013; Piet & Hougaard, 2011) indicate that, for people with a history of three or more

major depressive episodes (MDEs), MBCT can substantially reduce relapse compared to treatment as usual, with effects at least equal to maintenance antidepressant medication.

As evidence for the efficacy of MBCT in preventing depressive relapse has accumulated, the need for further research into the mechanisms by which MBCT has its effects has been highlighted (e.g., Chiesa & Serretti, 2011; Fjorback, Arendt, Ørnbøl, Fink, & Walach, 2011; Piet & Hougaard, 2011). It is important to study mechanisms of action to identify which components of MBCT should be emphasised to maximise benefits, and for whom MBCT is most likely to be effective (Coelho, Canter, & Ernst, 2007; Kuyken et al., 2010). The two key variables proposed as mediators of the effects of MBCT on depressive relapse are mindfulness and rumination (Bieling et al., 2012; Shahar, Britton, Sbarra, Figueredo, & Bootzin, 2010; Teasdale, Segal, & Williams, 1995; Watkins & Teasdale, 2004).

In the context of MDD, rumination can be defined as a response style characterised by attentional focus on symptoms and their causes and consequences (Nolen-Hoeksema, 1991). Rumination has been found to be positively correlated with onset, severity and duration of depressive symptoms (Barnhofer & Crane, 2009; Kenny & Williams, 2007; Nolen-Hoeksema, 1991; Watkins, 2008). In addition, rumination is theorised to be a critical part of the negative thinking patterns that lead to depressive relapse (Teasdale et al., 1995) because it involves dwelling on past negative events and possible negative future repercussions of these, thereby compounding a dysphoric mood state (Segal et al., 2013).

Mindfulness has been defined as “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally” (Kabat-Zinn, 1994, p. 4).

Teasdale et al. (1995) theorised that mindfulness could prevent depressive relapse by deploying cognitive resources to the present moment, thereby decreasing the resources available for past and future based ruminative processing. Largely through the instruction of mindfulness, but with some cognitive behavioural elements, MBCT teaches clients to: (a) become more aware of thoughts, feelings and bodily sensations; (b) view thoughts as transient events in the mind rather than as necessarily reflecting reality; and (c) disengage from habitual dysfunctional cognitive routines, especially depression-related rumination (Segal et al., 2013). It is proposed that by becoming more aware of their depressogenic thought patterns at an early stage of the ruminative cycle, and choosing to disengage from them, clients are potentially able to avert a relapse.

Evidence exists for mindfulness and rumination being mediators of the effects of mindfulness-based interventions on depressive relapse or related outcomes, and also for rumination being a mediator of the effects of mindfulness on relapse. For example, Kumar, Feldman and Hayes (2008) showed that mindfulness training was associated with increased mindfulness and decreased rumination and avoidance. In addition, Brown and Ryan (2003) found that mindfulness was inversely correlated with both rumination and negative emotional states, including depression. MBSR has also been found to lead to increases in mindfulness, and these increases mediated a reduction in rumination (Shapiro, Oman, Thoresen, Plante, & Flinders, 2008). In addition, Jain et al. (2007) demonstrated that rumination (but not distraction) mediated the effects of mindfulness training on overall psychological distress. Therefore, as Kingston et al. (2007) argued, the hypothesis that increased mindfulness reduces depressive symptoms, and that rumination mediates this reduction, warrants investigation.

The measurement of both mindfulness and rumination has evolved over the last decade, enabling more granular analyses of their effects. One commonly used measure of mindfulness, derived from the Kentucky Inventory of Mindfulness Skills (KIMS) and other mindfulness measures, is the Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The five facets of the FFMQ are describing, observing, acting with awareness, nonjudging of inner experience and nonreactivity to inner experience. Baer et al. argued that consideration of individual facets is important for clarifying the relationships between mindfulness and other constructs.

Rumination is often measured using the Ruminative Response Scale (RRS), a subscale of the Response Style Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). In a psychometric analysis of the RRS, it was found that 12 of the 22 items overlapped substantially with depressive symptoms from the Beck Depression Inventory, and should be ignored in subscale analyses. The remaining 10 items were divided into two subscales, brooding and reflection, each having different relationships to depression (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Brooding has been described as the most maladaptive rumination factor, and is the factor most strongly related to depression (Treynor et al., 2003; Watkins, 2008). The relationship between reflection and depression remains unclear, as there is conflicting evidence regarding the circumstances under which reflection is adaptive or maladaptive (Nolen-Hoeksema et al., 2008; Treynor et al., 2003).

Compared to research that used total mindfulness and rumination scores, there is considerably less evidence for the relationships of specific components of mindfulness

and rumination with depressive relapse. In one study of 613 undergraduate students, the FFMQ nonjudging facet was the strongest predictor of psychological symptoms (Baer et al., 2006). More recently, in a trial of MBCT, the KIMS “acceptance without judgement” facet mediated the effects of MBCT on depressive symptoms (van Aalderen et al., 2012). In a neuroimaging study with 15 participants, those who reported higher scores on the RRS brooding subscale showed greater benefit from a breathing meditation, as measured by electroencephalography of their prefrontal α -asymmetry (Barnhofer, Chittka, Nightingale, Visser, & Crane, 2010). Greater activation of the left prefrontal area predicted increased positive affect, which in turn may be protective against depressive relapse (Barnhofer et al.). In another mediation analysis of the effects of MBCT on depressive symptoms, brooding was found to be a significant mediator, while reflection was not (Shahar et al., 2010). More recently, the brooding subscale was found to fully mediate the relationship between “acceptance without judgement” (KIMS) and depressive symptomatology in a non-clinical sample (Alleva, Roelofs, Voncken, Meevissen, & Alberts, 2014). These authors noted the need for further investigation of this relationship in a clinical population. Furthermore, the studies by Alleva et al. and Shahar et al. were limited by the concurrent measurement of the mediators and the outcome. Therefore, further exploration of relationships between depressive relapse and components of mindfulness and rumination, particularly nonjudging and brooding, using a prospective design, is warranted.

In summary, the development of MBCT was based on the theory that the decentered perspective promoted by mindfulness practice would lead to a decrease in rumination, thereby averting depressive relapse, and there is some evidence to support these relationships. Accordingly, the primary aim of this longitudinal study was to

investigate whether higher levels of mindfulness predicted less depressive relapse, and whether this relationship was mediated by rumination. The first hypothesis was that: (a) higher total mindfulness would predict less depressive relapse; and (b) that this relationship would be mediated by rumination. The second hypothesis was that analogous mediation models, substituting nonjudging for total mindfulness and/or brooding for total rumination, would also be significant.

Method

Participants

The current study was embedded within a pragmatic RCT of MBCT. Two hundred and three participants (165 females and 38 males; mean age = 48.4 years, $SD = 12.4$) were recruited from private and public community health care sites, and through newspaper advertisements, in the cities of Melbourne and Geelong in the Australian state of Victoria. In line with the pragmatic intent of the study (Patsopoulos, 2011), we reduced exclusion criteria where possible. Inclusion criteria were > 2 MDEs and a diagnosis of either MDD (recurrent) or Bipolar Disorder (BD) I or II, aged 18-75 years, and being fluent in spoken and written English. Exclusion criteria included a current MDE; current symptoms of a psychotic disorder or treating clinician's opinion that MBCT was contraindicated for those with a past psychotic disorder; current eating disorder; current borderline or antisocial personality disorder; obsessive compulsive disorder; organic disorder or pervasive developmental delay; current alcohol or drug dependency (other than tobacco); or current benzodiazepine (or equivalent) intake of >20 mg per day. All participants provided written informed consent.

All participants in this study were included in this mediation analysis, despite only approximately half being allocated to the intervention MBCT group. Preliminary analysis showed that none of the mediation variables were significantly related to treatment group. This also maximised power for the main mediation analyses, containing data from a large sample with varying degrees of mindfulness exposure. An estimate of the sample size needed to enable .8 statistical power for a Baron and Kenny (1986) mediation analysis indicated a minimum of $n = 118$ (Fritz & MacKinnon, 2007). This calculation assumed medium mediation path beta values, and a small beta value from the independent variable to the dependent variable after controlling for the mediator. Therefore, the total sample size of 203 participants was expected to provide sufficient power, allowing for a 20% attrition rate.

Measures

The questionnaires used in the analyses described in this paper are detailed below.

Mindfulness

Mindfulness was measured using the Five Facet Mindfulness Questionnaire (FFMQ), a 39-item instrument (Baer et al., 2006). The five facets are observing, describing, acting with awareness, nonjudging of inner experience and nonreactivity to inner experience. Items are answered on a five-point likert scale, ranging from *never or very rarely true* (1) to *often or always true* (5). Higher scores indicate greater mindfulness (Baer et al., 2006; Baer et al., 2008). The FFMQ has previously been shown to have adequate to good internal consistency, with Cronbach's alpha coefficients for the subscales ranging from .75 to .91 (Baer et al., 2006). All facets have also been shown to have adequate

convergent, discriminant and incremental validity (Baer et al., 2006). The nonjudging facet, however, has been reported as having the strongest relationship with psychological symptoms (Baer et al., 2006). Consequently the nonjudging facet, along with the total score, was selected for the analyses. In this study, Cronbach's alpha was .90 for the total scale and .86 for nonjudging.

Rumination

Rumination was measured using the Ruminative Response Style questionnaire (RRS), a 22-item sub-scale of the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991). On the RRS, respondents rate how often they generally respond in various ways to feeling depressed on a 4-point likert scale, ranging from *almost never* (1) to *almost always* (4). Higher scores indicate greater rumination. The RRS total and brooding subscale scores were used in this study, as the total score provides comparability to previous studies, and the brooding subscale has been previously found to be most strongly related to depression (Treynor et al., 2003; Watkins, 2008). In prior research, the RRS was found to have adequate test-retest reliability ($r = .67$) and a Cronbach's alpha coefficient of .89 to .90 (Nolen-Hoeksema, Larson, & Grayson, 1999; Nolen-Hoeksema & Morrow, 1991; Treynor et al., 2003). In the present study, Cronbach's alpha was .90. The brooding subscale has previously been found to have a test-retest correlation of $r = .62$, and a coefficient alpha of .77, which were considered adequate as the subscale has only 5 items (Treynor et al.). In the current study, Cronbach's alpha for brooding was .79.

Depressive relapse

The outcome measure for the present study was depressive relapse (yes/no) over the two year post-MBCT period. This was assessed using the Composite International Diagnostic Instrument (CIDI) 2.1 12-month version during face-to-face interviews held at 12 and 24 months post-treatment.

Procedure

The RCT in which this study was embedded was a prospective, multi-site, single (rater)-blind trial. Ethics approval was received from all participating institutions. Consenting participants who met the selection criteria were randomly assigned to either the depression relapse active monitoring (DRAM) comparison group or the DRAM plus MBCT group. Treatment as usual continued for all participants. DRAM involved training in the management of depression through symptom self-monitoring. MBCT comprised an individual 1-hour orientation to the MBCT program, followed by eight weekly 2-hour group training sessions. Three-monthly 5-hour ‘booster sessions’ were also offered to participants following completion of MBCT.

Participants completed the FFMQ and RRS at baseline (pre-treatment) and four and eight weeks after commencing the study (half-way through and immediately post-treatment) then three monthly over the next two years (online or by postal questionnaire). The assessments at baseline and 12 and 24 months post-treatment were conducted via face-to-face interview, with the interviewer blind to the participant’s group assignment. Only these face-to-face assessments included the CIDI, and therefore depressive relapse was measured retrospectively at 12 and 24 months post-treatment for the previous 12 months.

Statistical analyses

Preliminary analyses

Data were analysed using SPSS Version 21. Prior to conducting the mediation analyses, correlations were computed between the variables in the mediation analyses, baseline characteristics and treatment group. This was to determine if any covariates should be controlled in the analyses, and to assess the strength of correlations between the mediation variables. Pearson's r correlations were used for continuous mediation variables. Pearson's biserial correlations were used for correlations with depressive relapse (yes/no) because there is an underlying continuum of symptoms (Field, 2009).

Mediation analyses

The first stage of the mediation analyses followed the causal steps method described by Baron and Kenny (1986), with mindfulness as the independent variable, relapse as the dependent variable and rumination as the mediator. These steps are described in the results. For mediation to be demonstrated, beta values for the first three steps must be significant, and beta values for the fourth step non-significant. In mediation analysis, measurement of the independent variable normally precedes measurement of the mediator, and both must precede measurement of the outcome (Kraemer, Wilson, Fairburn, & Agras, 2002). The outcome chosen in this case was relapse over the two years of follow-up. Given that both the independent variable (mindfulness) and the mediator (rumination) were expected to change concurrently (Segal et al., 2013), the same post-treatment time point was used for both (i.e., immediately prior to commencement of the two-year follow-up period). Four mediation models for each

combination of the hypothesised mediation variables were tested (see Figure 1) involving both logistic and linear regression.

The second stage of the mediation analyses followed the recommendations of MacKinnon et al., (2004) by applying a nonparametric bootstrapping procedure to test the indirect effects of mindfulness on depressive relapse through the potential mediator, rumination. The SPSS boot-strapping script provided by Preacher and Hayes (2004) was used to calculate 95% confidence intervals for the indirect effect using 5000 bootstrap resamples. Mediation is said to occur if zero is not within the range spanned by the 95% confidence intervals.

Sensitivity analyses were undertaken to investigate potential influences from missing data or diagnosis (MDD or BD). This involved rerunning the analyses using Expectation Maximisation (EM) to impute for missing data (Tabachnick & Fidell, 2007), and also rerunning analyses without subjects who had BD in addition to >2 MDEs.

Results

Missing values analyses showed that, although mindfulness, rumination and relapse data was missing for up to 22.2% of participants, missing values were missing completely at random [Little's MCAR test $\chi^2 = 16.65$ (12), $p = .16$]. Primary analyses therefore proceeded using available data.

Preliminary Analyses

Baseline clinical and demographic characteristics are shown in Table 1. Baseline means and standard deviations for the FFMQ and RRS are shown in Table 2. Correlations

between baseline clinical and demographic characteristics, and mediation variables (Table 3), were weak, with none exceeding $r = \pm 0.26$. There were no significant correlations between any mediation variable and treatment group (MBCT + DRAM, DRAM), and no differences between these groups in baseline demographics, rumination, mindfulness, or relapse over two years. There were also no differences in the mindfulness and rumination variables between the MDD and BD groups.

INSERT TABLE 1, 2 & 3 ABOUT HERE

Mediation Analyses

For the main mediation analyses, all participants were combined into one sample.

Treatment group was not controlled for since it had no significant relationship with, or effect on, the mediation variables.

Step 1: Standard linear regression showed that relationships between mindfulness and rumination were significant in all four models, as shown in Figure 1 ($p < .001$ for all).

Step 2: Logistic regressions indicated that the comparable B (standardised coefficient) values for the direct relationships (i.e., when rumination is not accounted for) between mindfulness and relapse were significant (see Figure 2).

Step 3: Logistic regressions showed that the comparable B values between rumination and relapse were non-significant in all four models, as shown in Figure 1. The lowest p -values ($p = .08$) found were in models 1 and 2 (using total rumination as the mediator, and total mindfulness and nonjudging respectively as the independent variables).

Step 4: Multivariate logistic regression indicated that none of the models yielded a significant relationship between mindfulness and relapse when controlling for rumination, as shown in Figure 1.

As can be seen by comparing Figures 1 and 2, the inclusion of rumination in the model consistently decreased the comparable B value between mindfulness and relapse compared to the total effect, albeit not sufficiently to reach significance. In the first two models, although total rumination was not a significant predictor of relapse when controlling for mindfulness (total and nonjudging), the results suggest a possible trend in the expected direction ($p = .08$ in both models).

Results of the bootstrap analyses testing the indirect effect of rumination as a mediator indicated that the true indirect effect was estimated to lie between -.018 and .001 for model 1, -.074 and .004 for model 2, -.013 and .005 for model 3 and -.048 and .025 for model 4. Because these 95% confidence intervals all contained zero, this confirmed that rumination did not mediate the effect of mindfulness on depressive relapse in this sample. These mediation analyses were rerun using relapse in the first year of follow-up only (rather than over two years) with similar non-significant results.

Sensitivity analyses

All analyses were rerun using Expectation Maximisation (EM) to impute for missing data (Tabachnick & Fidell, 2007). Results of these EM analyses were very similar to the complete case analyses. The analyses were also rerun by removing the 10% of subjects who had BD in addition to >2 MDEs, again with non-significant outcomes. Here, possibly due to reduced power, the overall results for the two-year follow-up data were weaker, with the direct effects in each of the four models no longer significant.

INSERT FIGURES 1 AND 2 ABOUT HERE

Discussion

The aim of this study was to investigate whether rumination mediated the effects of mindfulness on depressive relapse for people with a history of recurrent depression. This is important for understanding the mechanisms by which mindfulness interventions reduce depressive relapse. Hypothesis 1(a), that increased total mindfulness would predict decreased relapse, was supported with a significant direct relationship between total mindfulness and relapse. In contrast, hypothesis 1(b), that the relationship between total mindfulness and relapse would be mediated by total rumination, was not supported, although a possible trend towards significance was evident. The second hypothesis was that mediation would also exist when the nonjudging facet and/or the RRS brooding subscale were used as the measures of mindfulness and rumination, respectively. Compared to total mindfulness, the nonjudging facet had a higher correlation with rumination (both total and brooding), as expected based on prior research. However, correlations between relapse and both total mindfulness and the nonjudging facet were similar. As with total rumination, brooding did not mediate the effect of either total mindfulness or the nonjudging facet on relapse. Therefore, none of the hypothesised mediation models reached significance, although there appeared to be a trend towards significance for the first two hypothesised models involving total rumination scores.

The lack of mediation found in all hypothesised models, particularly Model 1 involving total mindfulness and total rumination, was surprising in light of the theoretical rationale for MBCT and previous empirical evidence. It is possible that

although rumination alone was not a significant mediator of the effects of mindfulness on depressive relapse in our sample, it may be one of a number of concurrent mediators, implying that the mechanism by which mindfulness-based interventions like MBCT prevent relapse might have multiple components. Alternatively, it is possible that the models tested were not the best representation of the experiences of these patients. Other elements such as self-compassion have become a recent focus of research. Self-compassion could be a key skill learned in MBCT that is important in decreasing rumination to reduce depressive symptoms and avert relapse (Krieger, Altenstein, Baettig, Doerig, & Holtforth, 2013; Kuyken et al., 2010; MacBeth & Gumley, 2012; Raes, 2010; Van Dam, Sheppard, Forsyth, & Earleywine, 2011). Another possibility is the existence of moderators that suppressed mediation effects. For example, one previous RCT of MBCT found that stability of remission at baseline interacted with treatment condition to determine subsequent relapse rate (Segal et al., 2010). Finally, although the study was adequately powered to detect moderate mediation effects, it is possible that the null result may have been a type II error arising from smaller than expected mediation effects. Consistent with this, the correlations of mindfulness and rumination with relapse were lower than expected, and lower for brooding than for total rumination and mindfulness. Post-hoc power analyses indicated that if small mediation effects actually existed, a sample size of around 400 would be needed to have an 80% chance of detecting them (Fritz & MacKinnon, 2007).

Limitations

The participants in this study were not currently depressed at baseline, had experienced at least three previous episodes of depression and were sufficiently motivated to

participate in an RCT. In addition, approximately half the sample was exposed to MBCT and all were exposed to DRAM. Given the nature and process of recruitment, selection biases may have been operating which could influence the generalisability and external validity of the findings in relation to other populations, such as those who are currently depressed or have had less than three previous episodes. It is possible that these may have reduced the effect of rumination on depressive relapse.

A second limitation relates to measurement. The most appropriate definition and measure of mindfulness continues to be debated (Grossman & Van Dam, 2011). Measures such as the FFMQ are self-report instruments, therefore discrepancies may arise between self-rated mindfulness and actual mindfulness (Grossman, 2008). Furthermore, such measures might be subject to different levels of reporting bias and/or interpreted differently by meditators compared to non-meditators (Grossman & Van Dam). As noted earlier, the RRS as a measure of rumination has also been criticised, including as it does some items that overlap with depression and others that may relate to depression in contradictory ways. While the brooding subscale may be the purest measure of rumination as a maladaptive process, it is limited by the small number of items. In addition, the analyses examined rumination without taking into account the effects of worry as this was not specifically measured. We therefore cannot exclude the possibility that rumination is part of a broader pattern of unproductive, repetitive thinking (Muris, Roelofs, Rassin, Franken, & Mayer, 2005).

A third limitation already discussed is the power restriction in this study for detecting small mediation effects. Finally, participants with BD were included in line with the pragmatic design of the trial. While our analyses did not suggest that the BD group had any differential influence on the pattern of relationships observed, it is

possible that they may have experienced the effects of rumination differently to participants with unipolar depression (Gruber, Eidelman, Johnson, Smith, & Harvey, 2011; Johnson, McKenzie, & McMurrich, 2008).

Clinical implications and suggestions for future research

MBCT has multiple components besides mindfulness, and therefore not all of its effects are likely to be explained by mindfulness alone (Chiesa & Serretti, 2011). This argument is supported by a meta-analysis conducted by Hofman, Sawyer, Witt and Oh (2010) in which the mean effect size on depressive symptoms across nine MBCT studies was Hedges $g = 0.85$ (95% CI [0.71, 1.00]), compared to 19 MBSR studies having a Hedges g of 0.49 (95% CI [0.42, 0.56]). Sauer, Lynch, Walach and Kohls (2011) argued for the importance of combining mindfulness with change-oriented approaches to increase the benefits, as is the case with MBCT. Nevertheless, mindfulness training is a major component of the MBCT course, and participant's mindfulness levels have been shown to increase following MBCT, with these increases related to improved depressive symptoms (Bieling et al., 2012; Kuyken et al., 2010; Shahar et al., 2010; van Aalderen et al., 2012). The association between mindfulness and improvement in depression has also been demonstrated in many studies (Bränström, Duncan, & Moskowitz, 2011; Brown & Ryan, 2003; Cash & Whittingham, 2010; Kumar et al., 2008; Mathew, Whitford, Kenny, & Denson, 2010).

A direct relationship between mindfulness and relapse, however, is less established. Michalak, Heidenreich, Meibert and Schulte (2008) found that mindfulness increased significantly post-MBCT treatment compared to pre-treatment levels, and was a significant predictor of relapse over the following 12 months. On the other hand, in a

study by Kuyken et al. (2010), increased mindfulness failed to predict relapse over a 15-month follow-up period regardless of whether mindfulness developed through MBCT or with antidepressant medication treatment. In this study the effects of MBCT on mindfulness and relapse rates were not significant compared to the control condition. There are a number of possible reasons for the weak effects in these domains, including for example the unusually low relapse rate in the control group compared to previous MBCT trials, the active effects of DRAM and the regular completion of mindfulness measures in the control condition, and the relatively high proportion (24%) of MBCT participants who did not complete an adequate dose of the course (see Meadows et al., 2014 for further details). Nevertheless, our results strengthen the argument that mindfulness is a protective factor in preventing relapse and that it is important for MBCT instructors to support and promote mindfulness practice by attendees. However, the modes of action for mindfulness may be broader than a simple effect on rumination.

Rumination is one of many potential mediators or moderators of the effects of mindfulness on depressive relapse. Future research including several mediators in one model could reduce parameter bias due to omitted variables, test if multiple mediators jointly mediate the effect of mindfulness on depressive relapse (even if some mediators are not individually significant) and compare the relative magnitude of specific indirect effects associated with each mediator (Preacher & Hayes, 2008). Therefore, alternative or joint mediators should be considered in future research. Other possible mediators include neuroticism (Baer et al. 2006), worry (van Aalderen et al., 2012), avoidance (Barnhofer & Crane, 2009; Williams, 2008), self-criticism (Gilbert, McEwan, Matos, & Ravis, 2011), perfectionism (Williams, 2008) and self-regulation and self-management (Shapiro, Carlson, Astin, & Freedman, 2006). Alternative mediation models with self-

compassion as the independent variable would also be worthwhile testing (MacBeth & Gumley, 2012; Van Dam et al., 2011). Potential moderators should also be considered, such as stability of remission (Segal et al., 2010), amount of mindfulness practice (van Aalderen et al.) and/or use of medication. Inclusion of multiple mediators and moderators in one model would enable a more sophisticated analysis of the role of each when they are all combined, as they are likely to be in reality. As well, further research is required to explore the relationship of RRS total and RRS subscales with depression in greater detail.

It should be noted that although the sample included MBCT participants and had good representation from the population targeted by MBCT, the fact that it also included participants not exposed to MBCT limits the degree to which conclusions can be made relating to MBCT. RCTs are expensive and difficult to implement and in the present study including only MBCT participants would have led to substantially underpowered mediation analyses. It is possible that MBCT research clinics may be a more effective way to establish sampling frames for examining mechanisms of action. Pooled analyses could be another feasible approach. Furthermore, this long-term, pragmatic study, with an active comparison group, suggested that MBCT may have a smaller than anticipated effect on relapse rate. Therefore, greater sample sizes and resource allocation must both be considered before other studies on this are undertaken.

Conclusion

Our results showed that increased mindfulness predicted both decreased rumination and decreased depressive relapse, but the hypothesis that rumination is a significant mediator in the relationship between mindfulness and relapse was not supported.

Despite the null findings, trends in the data suggest that a mediating role of rumination, with a smaller effect size than expected in the current study, cannot be ruled out, since the study was adequately powered to detect only medium to large effects. A larger sample size, providing a minimum of 80% statistical power to detect a small effect, might increase the likelihood of finding evidence for the hypothesised mediation relationships. However, although the original rationale for MBCT rested largely on a model of relapse causally linked to rumination, our findings suggest that the mechanism by which mindfulness impacts relapse is more complex than a simple effect on rumination. Accordingly, it will be important to explore more widely the mechanisms of this complex intervention by considering other potential mediators and moderators of the relationship between mindfulness and depressive relapse.

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Table 1. Baseline Demographic and Clinical Characteristics of Participants (*n* = 203)

Characteristic	<i>n</i>	%
Gender:		
Female	165	81.3
Male	38	18.7
Marital Status:		
Single	53	26.1
Married or cohabiting	113	55.7
Separated, Divorced or Widowed	35	17.2
Missing data	2	1.0
Employment:		
Employed	110	54.2
Unemployed	13	6.4
Student	12	5.9
Volunteer	3	1.5
Retired/Age Pension	23	11.3
Other pension or allowance (e.g., Disability Support)	17	8.4
Home duties	25	12.3
Highest Level of Education:		
Secondary	90	44.3
Tertiary	113	55.7
Diagnosis:		
MDD currently in remission with >2 prior MDEs	182	89.7
Bipolar Disorder I currently in remission with >2 prior MDEs	21	10.3
Site of usual care:		
Primary care	75	36.9
Specialist care	128	63.1
Taking antidepressants or mood stabilisers	127	62.6

Note. MDD = Major Depressive Disorder; MDE = Major Depressive Episode

Table 2. Baseline Means and Standard Deviations (SD) for Measures ($n = 203$)

Measure	Mean	SD
FFMQ Total	123.99	17.95
FFMQ Nonjudging	24.20	6.66
RRS Total	52.41	11.58
RRS Brooding	11.74	3.32

Note. FFMQ = Five-facet Mindfulness Questionnaire; RRS = Ruminative Response Scale

Table 3. Correlations between Mediation Model Variables (Sample Size in Parentheses)

	FFMQ (total)	FFMQ (NJ)	RRS (total)	RRS (brood)	Relapse (yes/no) ^a
FFMQ (total)	1.00 (176)	—			
FFMQ (NJ)	.74**(176)	1.00 (176)	—		
RRS (total)	-.49**(175)	-.65**(175)	1.00 (175)	—	
RRS (brood)	-.50**(172)	-.64**(172)	.87**(172)	1.00 (172)	—
Relapse (yes/no) ^a	-.24* (162)	-.21* (162)	.26* (161)	.18 (158)	1.00 (177)

Note. Pearson's r correlation coefficients, with sample size (n) in parentheses.

FFMQ = Five Facet Mindfulness Questionnaire; RRS = Ruminative Response Scale; NJ = Nonjudging

^aPearson's biserial correlation coefficients

* $p < 0.05$; ** $p < 0.01$

Model 1

Model 2

Model 3

Model 4

Figure 1.

Model 1

Model 2

Model 3

Model 4

Figure 2.

Figure 1. Path diagrams representing the mediation models for the effects of rumination (RRS total and brooding) on the relationship between mindfulness (FFMQ total and nonjudging) and relapse

Note. RRS = Ruminative Response Scale, FFMQ = Five Facet Mindfulness Questionnaire.

*** $p < .001$, ** $p < .01$, * $p < .05$, ns = nonsignificant ($p > .05$).

Figure 2. Path diagrams representing the direct relationship between mindfulness (FFMQ total and nonjudging) and relapse

Note. FFMQ = Five Facet Mindfulness Questionnaire.

*** $p < .001$, ** $p < .01$, * $p < .05$, ns = nonsignificant ($p > .05$).