Shorter communication

Mindfulness and reduced cognitive reactivity to sad mood: Evidence from a correlational study and a non-randomized waiting list controlled study

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A B S T R A C T

Cognitive Reactivity (CR) refers to the degree to which a mild dysphoric state reactivates negative thinking patterns, and it has been found to play a key causal role in depressive relapse. Although Mindfulness-Based Cognitive Therapy (MBCT) directly aims to address this mechanism of CR, the relationship between mindfulness and CR has not been tested to date. Using a cross-sectional design (Study 1; n = 164) and a non-randomized waiting list controlled design (Study 2; MBCT [n = 18] vs. waiting list [n = 21]), the authors examined the relationship between naturally occurring levels of mindfulness (Study 1) and MBCT (Study 2) on the one hand, and CR on the other hand. In line with predictions, it was found that (a) trait mindfulness is significantly negatively correlated with CR, even when controlled for current depressive symptoms and prior history of depression (Study 1), and that (b) MBCT, compared to a matched control group, significantly reduces CR, and that this effect of MBCT on reduction of CR is mediated by a positive change in mindfulness skills (Study 2). Results provide first evidence for the claim that mindfulness practices in MBCT are designed to address the process of CR.

Introduction

Mindfulness-Based Cognitive Therapy (MBCT) for depression (Segal, Williams, & Teasdale, 2002), was designed to prevent relapse/recurrence of depression in recovered recurrently depressed patients. MBCT integrates components of Cognitive Therapy with training in mindfulness, referring to a non-judgmental and compassionate moment-to-moment awareness of one's experiences. The treatment involves training participants via a range of practices and discussion to become more aware of negative thoughts, feelings, and bodily sensations, relating to them non-judgmentally as passing events in the mind, rather than identifying with them or treating them as necessarily accurate read-outs on reality. The program teaches skills that allow individuals to disengage from habitual ("automatic") dysfunctional cognitive routines, in particular depression-related avoidant and ruminative thought patterns, as a way to reduce future risk of relapse and recurrence of depression. Results from two RCT's suggest that, compared to treatment as usual, MBCT halves the rates of depressive relapse in patients with three or more previous depressive episodes (Ma & Teasdale, 2004; Teasdale et al., 2000). The basic (theoretical) rationale behind MBCT is that it aims to address a mechanism referred to as cognitive reactivity, which research has shown represents a potential key causal risk factor for depressive relapse/recurrence (Lau, Segal, & Williams, 2004).

Cognitive Reactivity (CR; Sher, Ingram, & Segal, 2005), or 'differential activation' (Lau et al., 2004), refers to the degree to which a mild dysphoric state reactivates negative thinking patterns. The idea behind CR is that earlier episodes of depression establish an association between negative thinking patterns and sad mood, and that subsequent depressed mood will reactivate these negative thinking patterns. According to this model, vulnerability does not so much refer to the precise content of thinking in vulnerable subjects, but rather to this process of thought-affect cycles, brought on line at times of lowering mood.

Currently, there are two procedures available to assess CR: mood challenge and self-report. In a mood challenge paradigm, dysfunctional thinking is assessed prior to and following a sad mood induction. The typical observation is that previously depressed patients and never-depressed controls do not differ on self-report of dysfunctional thinking prior to the mood challenge. However, following the mood induction, formerly depressed patients typically self-report elevated levels of dysfunctional cognitions (see Lau et al., 2004, for a review).
Furthermore, high CR as indexed by an increase in dysfunctional cognitions following mood challenge has been found to predict depressive relapse and predicts such relapse even in cases where initial baseline assessment of mood and dysfunctional attitudes do not predict, suggesting that co-existing depressive or sub-threshold symptoms prior to mood challenge are not accounting for the pattern of results (see Fresco, Segal, Buis, & Kennedy, 2007, for a review).

As a supplement to this mood challenge paradigm, Van der Does (2002a) developed the Leiden Index of Depression Sensitivity (LEIDS) to assess CR. The LEIDS is a self-report scale and respondents have to imagine a low mood and then indicate the degree to which a number of statements describe their typical behaviours and cognitions if they were to experience such a low or sad mood (e.g. “When in a low mood, I am more inclined to avoid difficulties or conflicts” and “When I feel sad, I feel more that people would be better off if I were dead”). Results from prior studies show that formerly depressed individuals obtain significantly higher scores on the LEIDS than never-depressed controls (see Moulds et al., 2002a). The LEIDS-R predicts the extent to which people with a history of past depression and suicidality but now in full remission, show behavioural reactivity to a mood challenge (reduced positive future fluency). Importantly, mood variables were not associated with this behavioural measure prior to mood challenge, supporting the validity of the LEIDS as a measure of CR and not simply a proxy indicator of sub-threshold symptoms.

Given the evidence that CR plays a key role in depressive relapse, MBCT aims to address this mechanism of CR. MBCT, using a range of mindfulness practices, helps people (a) to recognize at an early stage when their mood is deteriorating; (b) to observe this mood drop and any accompanying negative reactive thoughts; and (c) to switch to a non-reactive mode of mind and take skilful action. The idea is that by becoming aware of this ‘CR’ at an early stage, and by simply observing it non-judgementally rather than further fuelling this self-perpetuating process of thought-affect cycles, people may prevent their thoughts and feelings from spiralling out of control before they lead to a full-blown relapse (Segal et al., 2002).

Although this concept of CR is central to MBCT’s rationale (Segal et al., 2002), the relationship between mindfulness and CR has hitherto, to the best of our knowledge, not been explored. Therefore, the aim of the present studies was precisely to investigate this relationship. In Study 1 we explored the relationship between the naturally occurring trait of mindfulness and CR in a student sample. In Study 2, using a naturalistic non-randomized waiting list controlled design, we sought to evaluate the effectiveness of MBCT in reducing CR. Our predictions, based on MBCT’s underlying theoretical model, were that trait mindfulness would be negatively correlated with CR (Study 1) and that MBCT would reduce CR and that this reduction would be mediated by MBCT’s positive impact on participants’ mindfulness skills (Study 2).

As a measure of mindfulness, we used in both studies an extended version of the Kentucky Inventory of Mindfulness Skills (KIMS; Baer & Smith, 2004). The KIMS consists of four subscales: Observing, Describing, Act With Awareness, and Accept Without Judgment. In a recent study, however, factor analyses on a combined pool of items from various mindfulness questionnaires showed that there is evidence for five facets of mindfulness (Baer, Smith, Hopkins, Krietzemeyer, & Toney, 2006). Given that the original KIMS only consists of four of these, we decided to add the items of the fifth factor (Non-reactivity to Inner Experience), which was not represented by any item in the original KIMS, to the original KIMS, resulting in what we have called the ‘extended KIMS’ or KIMS-E.

The Leiden Index of Depression Sensitivity-Revised (LEIDS-R). The LEIDS-R (Van der Does, 2002a; Williams et al., 2008) is a 34-item self-report questionnaire measuring CR to sad mood. Items are rated on a 5-point scale (not at all to very strongly) for the extent to which they reflect the participant’s thoughts during a sad mood. Adequate reliability and validity is reported for the LEIDS-R (Williams et al., 2008).

Beck Depression Inventory (BDI-II). The BDI-II (Beck, Steer, & Brown, 1996; Van der Does, 2002b) is a widely used self-rating measure for severity of depressive symptoms.

The Major Depression Questionnaire (MDQ). The MDQ (Van der Does, Barnhofer, & Williams, 2003) is self-report questionnaire used to measure the presence of past and current major depression and consists of questions covering all DSM-IV criteria for current and past major depression (APA, 1994). The MDQ has shown high consistency with diagnoses based on SCID interviews (see Williams et al., 2008).

Procedure

Participants (n = 164) completed all measures during a group administration.

Results and discussion

Psychometric evaluation of the KIMS-E

For the psychometric evaluation of the KIMS-E we used an extra sample of 236 students who filled out the KIMS-E but not the other measures included in the present study, resulting in a total sample of 400 undergraduates (317 women; M = 18.60 year, SD = 1.35, range = 17–36 years).

Internal consistency. Alpha coefficients for Observing, Describing, Act With Awareness, Accept Without Judgment, and Non-reactivity
to Inner Experience were .80, .91, .77, .86, and .76 respectively. The values for the first four factors are comparable to earlier results with the Dutch four-factor KIMS (Dekeyser et al., 2008). Alpha for the fifth factor of the KIMS-E, Non-reactivity to Inner Experience, is comparable to the alpha coefficient obtained for the original English Non-reactivity factor (Baer et al., 2006).

Confirmatory Factor Analysis. Confirmatory Factor Analysis (CFA) was conducted on the KIMS-E using the Lisrel 8.50® software (Jöreskog & Sörbom, 1993). Model fit is tested using the Root Mean Square Error of Approximation (RMSEA) and the Comparative Fit Index (CFI). A RMSEA value of .05 indicates a close fit; values less than .08 represent reasonable errors of approximation (Browne & Cudeck, 1993). CFI values greater than .90 are interpreted as good fit. Similar to Baer and Smith (2004) and Baer et al. (2006), we conducted CFA using item parcels. We created three parcels for each factor (first item to Parcel 1, second item to Parcel 2, third item to Parcel 3, fourth item to Parcel 1, and so on). We then averaged item scores within each parcel. As such, each factor was represented by three indicators. The hypothesized five-factor model fit our sample reasonably well: CFI = .93, RMSEA = .075.

Relationship between mindfulness and CR

Descriptive statistics for the included variables were as follows: BDI-II, M = 7.38 (SD = 6.06; range = 0–36; 22 participants, or 13%, obtained scores from 14 to 19, indicative of mild depressive symptoms; 7 participants, or 4%, scored above the cut-off of 19, used to indicate the presence of moderate to severe depressive symptomatology); LEIDS-R, M = 36.89 (SD = 15.36; range = 9–84), and KIMS-E, M = 145.64 (SD = 14.22; range = 103–192). As predicted, mindfulness was significantly negatively correlated with CR, r(164) = −.39, p < .001. The more mindful respondents are, the less CR they self-reported on the LEIDS-R. However, CR was also associated with BDI-II scores, r(164) = .50, p < .001, and with presence/absence of a major depressive episode in the past: Participants with a history of a major depressive episode (n = 31) scored significantly higher on the LEIDS-R (M = 45.19, SD = 14.79) compared to those without a depressive episode in their past (n = 133; M = 34.95, SD = 14.89), r(162) = 3.45, p < .001, while both groups did not differ in terms of current depressive symptomatology (BDI-II, r(162) = .06, p = .95 [M = 7.22, SD = 6.29 for those without past depression; M = 8.10, SD = 5.00 for those with past depression]). Therefore, we recalculated the correlation between mindfulness and CR, with BDI-II scores and prior history of major depression partialled. This did not change the pattern of results: Mindfulness remained significantly negatively correlated with LEIDS-R scores, r(160) = −.21, p < .01. Thus, in line with our prediction, people with high scores on the naturally occurring trait of mindfulness showed less CR.

An important and obvious limitation of this first study is its correlational nature, which does not allow definite conclusions regarding the direction of the relationship. Although clearly in line with our prediction, which was based on the theoretical model underlying MBCT, the current correlational results would benefit from confirmation in a design in which the effectiveness of MBCT to reduce CR is studied. Therefore, in a second study, we examined the impact of MBCT on CR, compared to a matched waiting list group.

Study 2: a non-randomized waiting list controlled study

Method

Participants

Participants were recruited via the Institute for Attention and Mindfulness (IAM) in Heusden (Belgium). Potential candidates were those who subscribed for an MBCT treatment at IAM and they were sent an e-mail with an invitation to participate. It was an open trial and no exclusion criteria were set. Participants who volunteered to participate and who enrolled for the MBCT treatment between September 15 and November 15 2006 were included in the experimental (MBCT) group. Those who volunteered to participate and enrolled for the MBCT treatment between May 15 and July 15 2007 were included in the Waiting List control group. Inclusion in the Waiting List group did not mean that participants’ waiting time to start MBCT was artificially prolonged, as all of them subscribed at least nine weeks before the start of their first MBCT-session. To check that the comparison group was comparable to the experimental group, we examined their sociodemographic characteristics and pre-test scores and found no differences either in sociodemographic or the experimental variables of interest in this study (see below). The control group consisted of 21 individuals (mean age = 40.43; SD = 8.59). The experimental, MBCT-group, consisted of 24 individuals (mean age = 43.29; SD = 10.89). For the control group, all participants were available for all the assessments (pre-test and post-test). For the MBCT-group, 6 participants were lost to post-test. Complete data were available for the MBCT-group for 18 participants (mean age = 43.06; SD = 11.61). There were no differences between MBCT-participants lost to follow-up and those who completed follow-up in terms of depression scores, CR, and mindfulness, t < 1.02, ps > .34. All other participant characteristics are reported in the results section. The MBCT-group received the 8-week MBCT manualized treatment as developed by Segal et al. (2002). Participants received two film tickets or a meditation CD upon completion of the post-test questionnaires packet.

Measures

The same instruments were used as in Study 1: the KIMS-E, the LEIDS-R, the BDI-II, and the MDQ.

Procedure

Participants filled out the questionnaires at two time points. Participants in the MBCT-group were mailed the first packet of questionnaires and were asked to fill out the questionnaires in the week before their first MBCT-session and to return these via mail to the first author. At the last MBCT-session, they were given the post-test questionnaire set, and they were asked to return them via mail. Participants in the control group filled out the questionnaire at two time points, equally spread in time.

Results and discussion

Participant characteristics

As shown in Table 1, no significant differences in demographic characteristics (age, gender distribution, and level of education), past and/or current depression diagnoses, depression severity scores (BDI-II), CR (LEIDS-R), and mindfulness skills (KIMS-E) were found between the participants in the MBCT-group and the waiting list control group at baseline.

Comparison of MBCT and waiting list

We calculated three separate 2 (Condition: MBCT vs. Waiting list) × 2 (Time: Pre-test vs. Post-test) repeated-measures ANOVAs, with, respectively, BDI-II scores (depressive symptomatology), KIMS-E scores (mindfulness skills), and LEIDS-R scores (CR) as the dependent variable (see Table 2). For severity of depressive symptoms (BDI-II), there was no main effect of Condition, F(1, 37) = 2.46, p = .13. There was, however, a significant main effect of Time, F(1, 37) = 28.01, p < .001, with lower BDI-II scores, across conditions, at post-test. The Condition by
Time interaction did not reach significance, $F(1, 37) = 2.14, p = .15$ (Partial $\eta^2 = .06$, indicating a medium effect size). The BDI-II scores for MBCT-participants decreased significantly from pre-test to post-test, $F(1, 37) = 21.19, p < .001$ (Cohen’s $d = 1.17$, indicating a large effect size). As for the Waiting List group, BDI-II scores also showed a significant drop from pre-test to post-test, $F(1, 37) = 7.94, p < .01$ (Cohen’s $d = .38$, indicating a small to medium effect size).

For mindfulness skills (KIMS-E), there was a marginally significant main effect of Condition, $F(1, 37) = 4.01, p < .06$, reflecting an overall trend of higher KIMS-E scores in the MBCT-group as compared to the Waiting List group. There was also a significant main effect of Time, $F(1, 37) = 12.33, p < .01$, with higher KIMS-E scores, across conditions, at post-test. Importantly, and as predicted, this main effect was qualified by a significant Condition by Time interaction, $F(1, 37) = 8.63, p < .01$ (Partial $\eta^2 = .19$, indicating a large effect size). The KIMS-E scores for MBCT-participants increased significantly, $F(1, 37) = 19.33, p < .001$ (Cohen’s $d = .80$, indicating a large effect size), whereas the KIMS-E scores for the control participants did not change from pre-test to post-test, $F < 1$.

For CR (LEIDS-R), there was no main effect of Condition, $F(1, 37) = 1.14, p = .29$. There was, however, a significant main effect of Time, $F(1, 37) = 4.30, p < .05$, with overall lower LEIDS-R scores at post-test. Importantly, and as predicted, this main effect was qualified by a significant Condition by Time interaction, $F(1, 37) = 4.40, p < .05$ (Partial $\eta^2 = .11$, indicating a medium to large effect size). The LEIDS-R scores for MBCT-participants decreased significantly from pre-test to post-test, $F(1, 37) = 8.08, p < .01$ (Cohen’s $d = .60$, indicating a medium to large effect size), whereas the LEIDS-R scores for the control participants did not change, $F < 1$.

In sum, the present findings showed, as predicted, a significant increase in mindfulness skills and a significant decrease in CR for participants in the MBCT-group (medium to large effect sizes), whereas participants in the control group did not change on any of these variables. The MBCT-group also showed a significant decrease in depressive symptoms (large effect size). Participants in the control group showed a significant decrease in depressive symptoms as well, but here the effect size was only small to medium. Note, however, that the Condition by Time interaction was not significant for depression scores. Still, the effect size for this interaction was small to medium, which suggests that the non-significance of the interaction is most likely due to lack of power (small sample size).

**Mediation analyses**

Next, we conducted a mediation analysis to see whether reductions in CR are due to changes in mindfulness as would be predicted based on the theoretical model of MBCT. Following recent recommendations by MacKinnon, Lockwood, and Williams (2004) for directly examining mediation in small samples, we used a non-parametric, resampling approach (bootstrapping procedure; Preacher & Hayes, 2004b) to test the significance of the hypothesized mediation model. In particular, we used the non-parametric, resampling method (bias-corrected bootstrap) with 5000 resamples to derive 95% confidence intervals for the indirect effect of group (MBCT vs. control) via the hypothesized mediator (change in mindfulness from pre-test to post-test) on change in CR to examine the statistical significance of the indirect effect (MacKinnon et al., 2004; Preacher & Hayes, 2004b). To this end, we used the SPSS Macro provided by Preacher and Hayes (2004a). As covariates, we included pre-test KIMS-E and LEIDS-R scores, BDI-II change scores, and history of past depression. The true indirect effect was estimated to lie between $-9.6357$ and $-6818$ with 95% confidence. Because zero is not in the 95% confidence interval we can thus conclude that the indirect effect is significantly different from zero at $p < .05$, and that, as predicted, change in mindfulness mediates the relationship between group (MBCT vs. control) and change in CR. The direct effect of group was not significant, $p > .05$.

We also tested the reverse model, wherein change in mindfulness would be due to a reduction in CR (and which would not be predicted based on the theoretical model underlying MBCT). The same non-parametric, resampling method was used, but now change in mindfulness was the dependent variable and change in CR was the mediator in the model. The true indirect effect was estimated to lie between $-.0118$ and $11.5947$ with 95% confidence. Because zero is included in the 95% confidence interval we can conclude that the indirect effect is not significantly different from zero at $p < .05$, and that change in CR does not mediate the relationship between group (MBCT vs. control) and change in mindfulness.

**General discussion**

The present studies sought to investigate the relationship between mindfulness and cognitive reactivity (CR), which research has shown represents a potential key causal risk factor for depressive relapse/recurrence (Lau et al., 2004). Although this concept of CR is central to MBCT’s rationale (Segal et al., 2002), the relationship between mindfulness/MBCT and CR has not yet been explored. Based on the theoretical underpinnings of a mindfulness-based approach like MBCT, which aims to directly address the mechanism of CR in order to prevent depressive relapse, we predicted and showed in the first study that those people with high

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Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>MBCT (n = 18)</th>
<th>Waiting List (n = 21)</th>
<th>MBCT vs. Waiting List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (%)</td>
<td>77.78</td>
<td>90.48</td>
<td>$\chi^2(1) = 1.20, p = .27$</td>
</tr>
<tr>
<td>Age</td>
<td>43.06 ± 11.61</td>
<td>40.43 ± 8.39</td>
<td>$t(37) = -.81, p = .42$</td>
</tr>
<tr>
<td>Level of education</td>
<td>8.17 ± 1.20</td>
<td>7.86 ± 1.24</td>
<td>$t(37) = -.79, p = .44$</td>
</tr>
<tr>
<td>Current depression</td>
<td>0</td>
<td>9.52</td>
<td>$\chi^2(1) = 1.81, p = .18$</td>
</tr>
<tr>
<td>Past depression</td>
<td>50.00</td>
<td>71.43</td>
<td>$\chi^2(1) = 1.88, p = .17$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>F(1, 37)</th>
<th>Partial $\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI-II</td>
<td>11.56</td>
<td>6.53</td>
<td>14.05</td>
<td>10.01</td>
<td>4.67</td>
<td>5.14</td>
<td>10.14</td>
<td>10.48</td>
</tr>
<tr>
<td>LEIDS-R</td>
<td>41.56</td>
<td>14.51</td>
<td>42.33</td>
<td>17.44</td>
<td>32.78</td>
<td>14.47</td>
<td>42.38</td>
<td>18.62</td>
</tr>
<tr>
<td>KIMS-E</td>
<td>148.22</td>
<td>22.22</td>
<td>142.86</td>
<td>22.39</td>
<td>166.89</td>
<td>22.04</td>
<td>144.43</td>
<td>28.13</td>
</tr>
</tbody>
</table>

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Note: $^*$ $p < .05$; $^*$ $p < .01$.
scores on the naturally occurring trait of mindfulness show less CR. Apparently, the more naturally skilled people are in mindfulness, the less likely they are to be characterized by CR. These correlational findings were corroborated and extended in a second study, in which we predicted and showed that MBCT significantly reduces CR as compared to a matched control group. Interestingly, mediation analyses in Study 2 suggested, as predicted by the theoretical model underlying MBCT, that the effect of MBCT on reduction of CR was mediated by a positive change in mindfulness skills. As a whole, the present results offer further evidence for the validity of MBCT’s underlying theoretical perspective, namely that MBCT aims to actively address CR.

Several limitations of the present research should be noted. First, the use of an undergraduate sample in the first study limits to some extent the external validity of its results. Future studies will need to test the generalizability of these findings to patient samples. A second limitation of the first study is its correlational nature, which was addressed in our second study. And although the results of Study 2 were clearly in line with our predictions and even though a matched control group was used, the current findings await replication in a randomized design, using a larger sample, including follow-up assessments (to investigate to what extent the reduction in CR is maintained). Third, due to the fact that the effects of MBCT were studied in MBCT-classes that were open to anybody, not all participants experienced prior depressive episodes. Given that MBCT is a treatment for the prevention of relapse, future research will need to investigate the effects of MBCT in reducing CR in samples exclusively consisting of previously depressed participants. Fourth, given the pre-post design of Study 2, and thus the fact that the temporal precedence requirement for mediation could not be checked (Murphy, Cooper, Hollon, & Fairburn, 2009), the results of the present mediation analyses need to be treated with caution. Finally, the present results would benefit from confirmation in studies examining the impact of mindfulness/MBCT on CR measured by a mood challenge paradigm instead of self-report. Recall, however, that scores on the LEIDS-R self-report questionnaire that was used in the present studies as a self-report measure of CR, have been found to be significantly higher in previously depressed as compared to never depressed in multiple studies (for a review, see Moulds et al., 2008) including in the first study reported here. Also, and most importantly, scores on the LEIDS-R have been found to predict the amount of change in dysfunctional thinking following a mood challenge (Van der Does, 2002a), which is regarded as the gold standard to assess CR. All this supports the validity of the LEIDS-R as a measure of CR.

In conclusion, and notwithstanding the above limitations, the present studies offer first evidence that CR is inversely related to mindfulness, even when controlling for current depressive symptoms and past depression, and that MBCT, a therapeutic programme intended to increase peoples’ mindfulness skills, significantly reduces CR. As such, the present results provide further evidence for the validity of the theoretical model underlying MBCT specifically and mindfulness-based interventions generally.

References


