Scandinavian Journal of Psychology, 2020, 61, 582–591 DOI: 10.1111/sjop.12642

Personality and Social Psyhology

Time trends in the effects of mindfulness-based cognitive therapy for depression: A meta-analysis

JENS C. THIMM[1] and TOM J. JOHNSEN[2]

[1]*Department of Psychology, Faculty of Health Sciences, UiT The Arctic University of Norway, Tromsø, Norway*
[2]*Private practice, Tromsø, Norway*

Thimm, J. C. & Johnsen, T. J. (2020). Time trends in the effects of mindfulness-based cognitive therapy for depression: A meta-analysis. *Scandinavian Journal of Psychology, 61,* 582–591.

Recent studies suggest that the effects of cognitive therapies for depression show systematic changes over time. A meta-analysis was conducted to explore the temporal development of the effect of mindfulness-based cognitive therapy (MBCT) for current depression in studies that used the Beck Depression Inventory (BDI) or the Hamilton Depression Rating Scale (HDRS) as outcome measures. A systematic search of research databases yielded 20 studies that were included in the analyses. The results showed that MBCT is effective in reducing depressive symptoms. The effect sizes of studies using the BDI or the HDRS as an outcome measure were not moderated by the time of publication. Funnel plots and the trim and fill method suggested that publication bias was low. However, the number of available studies was small, and the time period investigated relatively short. The results should therefore be considered preliminary.

Key words: Mindfulness-based cognitive therapy, depression, effectiveness, time trends, meta-analysis.

Jens C. Thimm, UiT The Arctic University of Norway, Department of Psychology, 9037 Tromsø, Norway. Tel: (+47) 77644348; e-mail: jcthimm@gmail.com

INTRODUCTION

With an estimated global prevalence of 4.4% (WHO, 2017), depression is one of the most common and frequently occurring mental disorders, with a high rate of relapse and recurrence (Steinert, Hofmann, Kruse, & Leichsenring, 2014). As such, depression represents a significant burden on the individual and society (Whiteford, Degenhardt, Rehm, Baxter, Ferrari, Erskine, & Vos, 2013).

A variety of psychological therapies, including cognitive therapy (CT), behavioral activation therapy, interpersonal therapy and short-term psychodynamic therapy, have been shown to be effective in the treatment of depression (Cuijpers, 2017). Recently, mindfulness-based cognitive therapy (MBCT; Crane, 2009; Segal, Williams, & Teasdale, 2002; Segal, Williams, Teasdale, & Kabat-Zinn, 2013) was developed as a modification of CT to specifically prevent the relapse and recurrence of depressive episodes in individuals who had recovered from depression (Lau, 2016). MBCT is a manual-based treatment that combines exercises in mindfulness training with cognitive techniques. The integration of mindfulness practice with cognitive interventions distinguishes MBCT from other mindfulness-based interventions (MBIs), such as mindfulness-based stress reduction (Kabat-Zinn, 1990). The overall goal of MBCT is to increase metacognitive awareness (Lau, Segal, & Williams, 2004) and, thereby, reduce cognitive and emotional reactivity (Gu, Strauss, Bond, & Cavanagh, 2015).

Studies have shown that MBCT is effective in reducing the relapse and recurrence of depression (Kuyken, Warren, Taylor, Whalley, Crane, Bondolfi, & Schweizer, 2016; Piet & Hougaard, 2011). MBCT seems to be equally effective in reducing risk of relapse as CBT (Farb, Anderson, Ravindran, Hawley, Irving, Mancuso, & Segal, 2018) and more effective than antidepressant medications in this regard (Kuyken *et al.*, 2016). Although, in an early paper, the developers of MBCT cautioned against using MBCT to treat treating patients with acute depression (Teasdale, Segal, Williams, Ridgeway, Soulsby, & Lau, 2000), MBCT has subsequently been extended to this group. The treatment of current unipolar depression with MBCT follows the original manual by Segal *et al.* (2013) and is delivered in a group format with up to 12 participants and one or two instructors. After an individual pretreatment interview in which the participant's history of depression is discussed and information about MBCT is provided, the treatment consists of eight weekly two-hour sessions (Baer & Walsh, 2016).

Several meta-analyses have shown that mindfulness-based interventions (MBIs) in general (e.g., Goldberg, Tucker, Greene, Davidson, Wampold, Kearney, & Simpson, 2018; Goyal, Singh, Sibinga, &, Singh, & Sibinga&&, 2014; Hedman-Lagerlöf, Hedman-Lagerlöf, & Öst, 2018; Hofmann, Sawyer, Witt, & Oh, 2010; Khoury, Lecomte, Fortin, Masse, Therien, Bouchard, & Hofmann, 2013; McCarney, Schulz, & Grey, 2012; Strauss, Cavanagh, Oliver, & Pettman, 2014; Wang, Li, Zheng, Xu, Ng, Ungvari, & Xiang, 2018), and MBCT in particular (Galante, Iribarren, & Pearce, 2013; Hofmann *et al.*, 2010; Klainin-Yobas, Cho, & Creedy, 2012; Lenz, Hall, & Bailey Smith, 2016), are effective in reducing depressive symptoms. For example, a recent meta-analysis of randomized controlled trials (RCTs) observed effect sizes (ESs) of $d = 0.59$ for MBIs vs. no treatment and $d = 0.38$ for MBIs vs. active control conditions (Goldberg *et al.*, 2018). For MBCT specifically, similar or higher ESs for the reduction of depressive symptom severity have been reported. For example, Hofmann *et al.* (2010) observed an average ES of 0.85 (Hedges's g) in nine pre-post studies. Lenz *et al.* (2016) reported mean ES of $g = 0.76$ and 0.54 for MBCT vs. waitlist or no treatment and for MBCT vs. alternative treatments, respectively,

in RCTs. Recently. Goldberg, Tucker, Greene, Davidson, Kearney, and Simpson (2019) found that MBCT was superior to non-specific control conditions (d = 0.71) at posttest but not more effective than other active treatments (d = 0.00).

In previous meta-analyses of MBCT for acute depression, the temporal development of ESs in treatment studies has received little attention. This may not be surprising, as MBCT is a relatively new development. However, the investigation of the relationship between time of study and ES is important, as it informs about time trends and developments that can be positive or negative and call for action. For example, a decline in ESs for individual CBT for depression has been observed in published studies over time using a version of the Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and/or the Hamilton Depression Rating Scale (HDRS; Hamilton, 1960) as outcome measures (Cristea, Stefan, Karyotaki, David, Hollon, & Cuijpers, 2017; Johnsen & Friborg, 2015). Several possible explanations for these findings have been discussed, including more heterogeneous and complex samples in more recent trials, therapist training, and lack of adherence to the treatment manual (Dobson, 2016; Johnsen & Friborg, 2015; Waltman, Creed, & Beck, 2016). In contrast, an increase in ESs for group CBT for depression was observed when the BDI was used as outcome measure but was not observed when the HDRS was used (Johnsen & Thimm, 2018). As MBCT is an anti-depressive treatment that shares key concepts and features with traditional CBT and usually is delivered in a group format, the investigation of the time-trends connected to this treatment form can give new and relevant insights. For example, combined with the previous research on the temporal development of ESs in studies of individual CBT and group CBT, analyses such as the present one can provide indications as to whether any time-trends can be connected to the treatment format (group vs. individual therapy), or, alternatively, can be related to the focus of the interventions rather than the treatment format.

Thus, the aim of the present exploratory study is to examine the effect of MBCT on the treatment of current depression and the development of ESs over time. Since the BDI and the HDRS are the most widely used instruments for evaluating the effectiveness of cognitive therapies for depression (Johnsen & Friborg, 2015), the analysis will focus on studies that used the BDI and/or the HDRS as outcome measures to allow for time trends of depression treatment to be compared with previous studies. In the analysis, studies comparing MBCT to control condition with and without active treatments and studies examining pre-post differences were included. Recently, it has been suggested that ESs based on within-group scores should be avoided in meta-analysis if possible (Cuijpers, Weitz, Cristea, & Twisk, 2017). While there is no doubt that between-group RCTs is the gold standard when it comes to conduct meta-analysis, there are also several salient reasons why the inclusion of within-group based ESs could be helpful - albeit used with caution when it comes to interpretation of the results. First, the scope of papers could be greatly expanded, which would increase the statistical power. Second, we believe that meta-analyses on time-trends are not as vulnerable to some of the pitfalls as meta-analyses measuring standard treatment effects. For example, one common objection to within-group pre-post standardized mean differences is that they are influenced by natural processes and characteristics of patients and settings, which cannot be discerned from the effects of the intervention. However, when it comes to research of temporal developments in treatment efficacy related to any particular treatment form, variations in the characteristics of patients and settings (as well as general environment and society) could very well be highly relevant moderators to consider when it comes to interpreting the reasons behind any temporal development of treatment effects. Identification of any characteristics or processes that change systematically with the passing of time, influencing treatment effects, are of major importance. Finally, the most accurate indicator of reliability for any pre-post ES-calculation is heterogeneity. If this index is at a satisfactorily level, within-group ES's could be an informative calculation of ESs. With these considerations in mind, we have for the present study chosen to perform a primary analysis utilizing between-group RCT-based ESs, and a secondary analysis utilizing within-group ESs. We expect that the outcomes of the two calculations regarding the temporal development of ESs would be similar and thus validate each other's results.

METHODS

To identify relevant studies, a systematic search was conducted in research databases MEDLINE, PsychINFO and EMBASE on January 20, 2018. The broad search query "mindfulness AND depress*" was used to minimize the risk of missing relevant studies. In addition, previous systematic reviews and published meta-analyses of MBIs for mental disorders were manually searched. After removal of duplicates, in the first stage of the study selection, the titles, abstracts, types of references, and language of publication were screened by the first author. In the second round, both authors assessed the full text of studies for eligibility. The following inclusion criteria were applied: 1) MBCT was given in a group format aimed at reducing depression; 2) participants were adults (≥18 years of age) diagnosed with depression or showing elevated scores on the BDI (> 13) or the HDRS (> 8), as a group; 3) a version of the BDI or the HDRS was used as an outcome measure; and 4) publication was in English and was in a peer-reviewed journal. Studies were excluded when 1) MBIs other than MBCT were examined, 2) no treatment effects for MBCT were investigated or reported, 3) depression was not the principal problem of the participants; 4) partial or complete sample overlap with a study already included in the meta-analysis was observed, 5) information necessary to calculate ES (i.e., means and standard deviations) was lacking, or 6) only dichotomous outcomes (e.g., relapse) were reported.

For each study included in the meta-analysis, the following information was extracted: 1) year of publication; 2) sample size of the MBCT group and the control group; 3) mean age and percentage of females in the MBCT group; 4) number of sessions; 5) modification of the treatment manual by Segal *et al.* (2002) or Segal *et al.* (2013); 6) use of the BDI or BDI-II as outcome measure; 7) no treatment vs. active treatment comparison groups; 8) randomization of participants; and 9) reporting results of intent-to-treat (ITT) analyses.

For the meta-analytic calculations, means and standard deviations of the BDI and/or the HDRS at pre-treatment and post-treatment were extracted for the treatment group and, if present, for the control group(s).

To assess the methodological quality of the studies included in the meta-analysis, the Jadad scale (Jadad, Moore, Carroll, Jenkinson, Reynolds, Gavaghan, & McQuay, 1996) was used. Both authors assessed the studies independently. Rater agreement was calculated using double entry intraclass correlation (McCrae, 2008). The coefficient for study quality was .91. Discrepant ratings were clarified and resolved through discussion.

To obtain the ES for each study, the standardized mean difference (SMD) between the intervention group and control group, and/or the pretest and the posttest was calculated correcting for bias (Hedges' g). Following the recommendations by Rosenthal (1993), a conservative pre-

post correlation of .7 was set. The mean ES across studies was calculated using a random effects model. The analyses were conducted separately for controlled studies (between-group) with and without active treatment comparisons and pre-post differences (within-group) and for the BDI/BDI-II and HDRS as outcome measures. When data for ITT samples were available, these were preferred over data from completer samples.

To examine publication year as moderator for the pooled ES, meta-regression analysis was used.

Heterogeneity among studies was assessed using Q tests and the I^2 statistic (Higgins, Thompson, Deeks, & Altman, 2003), which is a measure of the proportion of the total variance across studies that is due to heterogeneity. Higgins *et al.* (2003) suggest that I^2 values of 25% indicate low heterogeneity, 50% indicate moderate heterogeneity, and 75% indicate high heterogeneity between studies.

To assess publication bias, funnel plots were obtained, and Duval and Tweedie's (2000) trim and fill method was used to estimate the number of missing studies and the ESs after imputation of the missing studies.

All analyses were conducted in Comprehensive Meta-Analysis version 3 (CMA; Borenstein, Hedges, Higgins, & Rothstein, 2017).

RESULTS

Study selection

After duplicates were removed, the search resulted in 4,010 unique studies. In the screening process, 3869 studies were excluded. One hundred forty-one full-text articles were retrieved, 121 of which were excluded based on the eligibility criteria. Thus, 20 eligible studies were retained for the meta-analysis (see Figure 1 for the flowchart of the selection process).

Study characteristics

The study characteristics are displayed in Table 1. The included studies were published between 2007 (Kenny & Williams, 2007; Kingston, Dooley, Bates, Lawlor, & Malone, 2007 and 2017 (Greenberg, Shapero, Mischoulon, & Lazar, 2017). The average number of participants in the MBCT condition was 41.2 (SD = 46.2, range 6 to 212). The total number of participants was 824. In ten studies, the original MBCT manual was modified to adapt the treatment to the target group. Eighteen studies were RCTs (14) or included a control condition without randomization (4). Seven of these 18 studies included an active control condition (antidepressant medication in three studies, and psychological treatment in four studies). Two studies had two control groups (Hosseinian, Shahtaheri, Ebrahimi, Mahdavi, & Sepahvandi, 2016; Michalak, Schultze, Heidenreich, & Schramm, 2015). Two studies used a pre-post design. Treatment outcome was measured with a version of the BDI in 15 between-group studies and two within-group studies and with the HDRS in nine between-group studies. As to study quality, the average Jadad score was 1.90 (SD = 1.17, range 0–3).

Effects of MBCT on current depression and analysis of time trends

The average weighted ES for between-group studies using a no-treatment control group and the BDI as an outcome measure (n = 11) was g = 0.92 (95% CI [0.70, 1.14]; $Q(10)$ = 17.45, p = 0.065, I^2 = 42.7). The trim and fill method suggested that two studies were missing, and the imputed point estimate was g = 0.86 (95% CI [0.63, 1.08]). When an active treatment comparison group was included (n = 5), the ES for the BDI was g = 0.45 (95% CI [0.09, 0.80];$Q(4)$ = 11.16, p = 0.025, I^2 = 64.2). The trim and fill method suggested that no studies were missing. For the between-group studies using the HDRS and a no-treatment control group (n = 7), the ES was g = 0.80 (95% CI [0.61, 0.99]; $Q(6)$ = 7.15, p = 0.308, I^2 = 16.04). The trim and fill method suggested that two studies were missing, and the imputed point estimate was g = 0.72 (95% CI [0.51, 0.92]). For studies using an active treatment control group and the HDRS (n = 4), the mean weighted ES was g = 0.37 (95% CI [0.21, 0.54]; $Q(3)$ = 2.62, p = 0.454, I^2 = 0). The trim and fill method suggested that one study was missing, and the imputed point estimate was g = 0.34 (95% CI [0.12, 0.56]).

With respect to pre-post differences on the BDI, studies using a within-group design were pooled with between-group studies (n = 17), resulting in an ES of g = 0.90 (95% CI [0.70, 1.09]; $Q(16)$ = 120.36, p < .001, I^2 = 86.7). The trim and fill method suggested that no studies were missing. The ES of the Abolghasemi, Gholami, Narimani, and Gamji (2015) study was considerably larger than the ESs of the other studies (g = 5.18, 95% CI [3.70, 6.70]). When the Abolghasemi *et al.* (2015) study was removed from the analysis, the average weighted ES was g = 0.82 (95% CI [0.66, 0.99], $Q(15)$ = 84.27, p < .001, I^2 = 82.2). There were no within-group studies that used the HDRS as an outcome measure. ESs for the individual studies are presented in Figures 2 through 6.

Visual inspections of the funnel plots revealed largely symmetrical distributions. The funnel plots of the observed and imputed studies are provided in the supplemental material Figures S1 to S5.

Analysis of time trends showed no significant relationships between year of publication and ES for between-group studies with the BDI as an outcome measure and with no-treatment comparisons (b = −0.03, 95% CI [−0.11, 0.05], p = 0.440), active treatment comparisons (b = −0.02, 95% CI [−0.28, 0.24], p = 0.863), and in pre-post designs (b = −0.01, 95% CI [−0.07, 0.05], p = 0.657, and b = −0.03, 95% CI [−0.08, 0.01], p = 0.155 when the Abolghasemi *et al.* (2015) study was excluded). For studies using the HDRS, the associations between year of publication and ES were not significant for between-group comparisons with no treatment (b = −0.04, 95% CI [−0.13, 0.05], p = 0.348) and active treatment comparisons (b = −0.10, 95% CI [−0.95, 0.74], p = 0.810).

Analysis of other moderators

In addition to year of publication, sample size, average age, gender distribution, and baseline level of depression in the MBCT group, as well as study quality (Jadad score), were examined as moderators. None of these variables moderated the ESs of between-group studies with no-treatment controls using the BDI (sample size: b = 0.00, 95% CI [−0.01, 0.00], p = 0.389; age: b = −0.01, 95% CI [−0.07, 0.05], p = 0.758; gender: b = −0.01, 95% CI [−0.03, 0.02], p = 0.677; baseline depression: b = 0.02, 95% CI [−0.02, 0.06], p = 0.262; study quality: b = −0.07, 95% CI [−0.28, 0.15], p = 0.546) or the

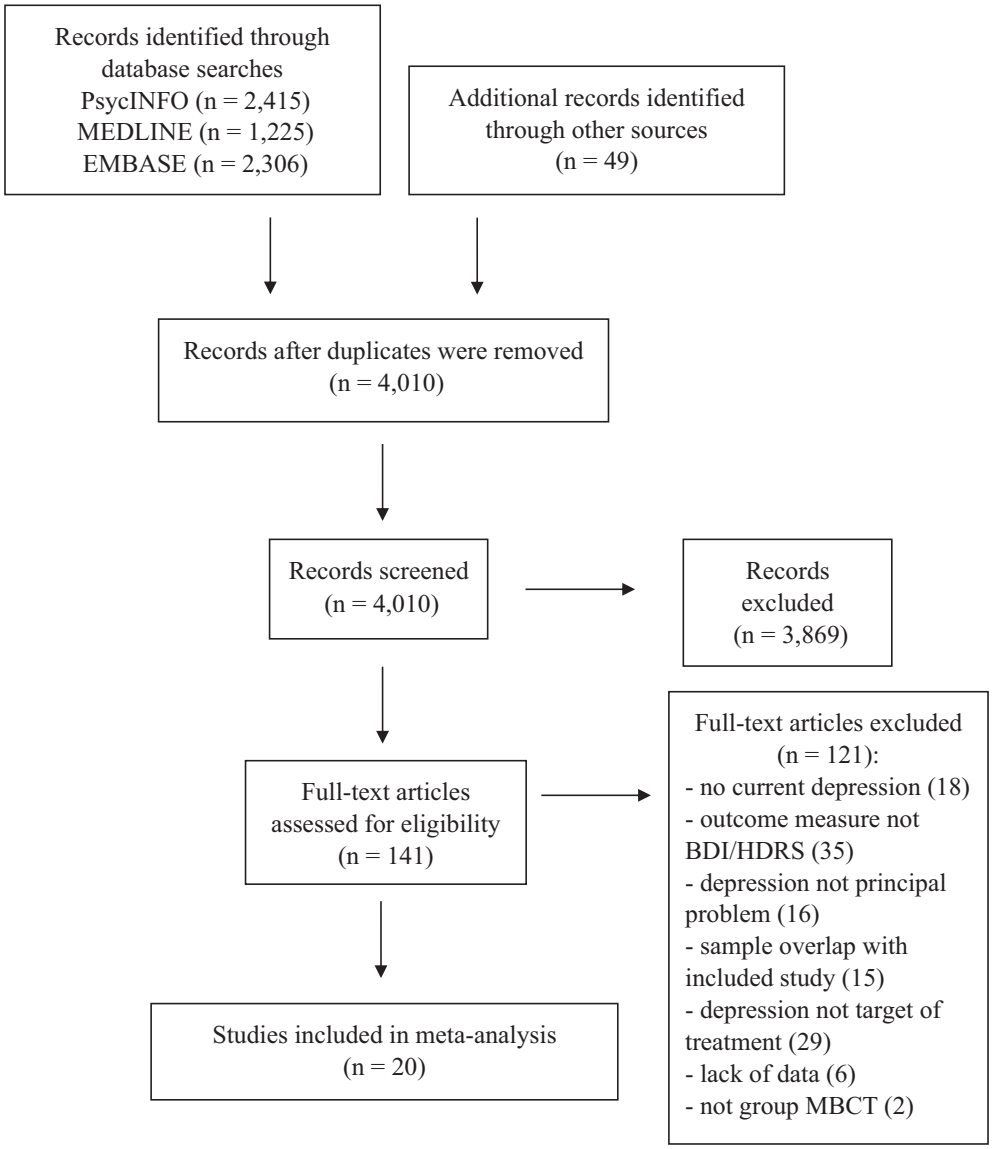

Fig. 1. Flowchart of the search and selection procedure.

HDRS (sample size: $b = 0.00$, 95% CI [−0.01, 0.01], $p = 0.624$; age ($b = -0.04$, 95% CI [−0.12, 0.04], $p = 0.313$; gender: $b = 0.02$, 95% CI [0.00, 0.03], $p = 0.087$; baseline depression: $b = -0.02$, 95% CI [−0.05, 0.01], $p = 0.271$; study quality: $b = 0.07$, 95% CI [−0.48, 0.33], $p = 0.727$). No moderation of these variables was also found for studies with active treatment comparisons using the BDI (sample size: $b = 0.00$, 95% CI [−0.01, 0.01], $p = 0.835$; age: $b = -0.01$, 95% CI [−0.04, 0.03], $p = 0.752$; gender: $b = 0.02$, 95% CI [−0.01, 0.05], $p = 0.252$; baseline depression: $b = 0.00$, 95% CI [−0.06, 0.06], $p = 0.908$; study quality: $b = -0.30$, 95% CI [−0.78, 0.17], $p = .208$) and the HDRS (sample size: $b = 0.00$, 95% CI [0.00, 0.00], $p = 0.183$; age: not enough studies; gender: $b = -0.01$, 95% CI [−0.03, 0.01], $p = 0.462$; baseline depression: $b = 0.01$, 95% CI [−0.01, 0.04], $p = 0.177$; study quality: $b = -0.03$, 95% CI [−0.31, 0.25], $p = 0.854$).

For within-group comparisons using the BDI, sample size ($b = 0.00$, 95% CI [−0.01, 0.00], $p = 0.013$), age ($b = -0.08$, 95% CI [−0.12, −0.03], $p < 0.001$), and baseline depression ($b = 0.04$, 95% CI [0.01, 0.06], $p = 0.002$) were significant moderators, but sex ($b = -0.01$, 95% CI [−0.03, 0.01], $p = 0.353$) and study quality ($b = -0.14$, 95% CI [−0.29, 0.01], $p = 0.078$) were not. When the Abolghasemi *et al.* (2015) study was excluded from the analyses, sample size ($b = 0.00$, 95% CI [−0.01, 0.00], $p = 0.002$) and baseline depression ($b = 0.03$, 95% CI [0.00, 0.05], $p = 0.020$) were significant moderators but not age ($b = -0.03$, 95% CI [−0.07, 0.01], $p = 0.110$), sex ($b = 0.00$, 95% CI [−0.02, 0.02], $p = 0.976$), and study quality ($b = -0.10$, 95% CI [−0.24, 0.05], $p = 0.202$). Thus, smaller sample size and higher baseline depression was associated with higher ESs across statistical conditions.

DISCUSSION

The present meta-analysis explored the development of ESs for MBCT over time in the treatment of current depression in studies that used the BDI or the HDRS as outcome measures. Previous findings indicated significant changes in the ESs of individual and

Table 1. *Overview of studies included in the meta-analysis*

Study	Sample	MBCT protocol modified	*N* MBCT condition	Comparison condition (*N*)	Random-ization	No. of treatment sessions	Depression measures	Jadad score
Abolghasemi *et al.* (2015)	Depression	yes	15	CT (15)	yes	12	BDI-II	1
Barnhofer, Crane, Hargus, Amarasinghe, Winder, and Williams (2009)[1]	Chronic depression	yes	16	TAU (15)	yes	8	BDI-II	3
Chiesa, Castagner, Andrisano, Serretti, Mandelli, Porcelli, and Giommi (2015)[1]	Depression	yes	23	Psycho-education (20)	yes	8	HDRS BDI-II	3
Crane, Barnhofer, Duggan, Hepburn, Fennell, and Williams (2008)	Past depression and active suicidal ideation	yes	19	Waitlist (23)	yes	8	BDI-II	3
De Raedt, Baert, Demeyer, Goeleven, Raes, Visser, and Speckens (2012)	Former depression	no	44	No intervention (26)	no	8	BDI-II	0
Eisendrath et al. (2008)[1]	Treatment-resistant depression	yes	55	none	n/a	8	BDI-II	0
Eisendraht et al. (2015)	Depression	yes	19	Antidepressant management (17)	no	8	HDRS	1
Geschwind, Peeters, Drukker, Os, and Wichers (2011)[1]	Past depression and residual depressive symptoms	no	63	Waitlist (66)	yes	8	HDRS	3
Godfrin and van Heeringen (2010)[1]	Recurrent depression	no	52	Waitlist (54)	yes	8	BDI-II HDRS	3
Greenberg *et al.* (2017)	Depression	no	12 (BDI) 16 (HDRS)	Waitlist (BDI: 13; HDRS: 9)	yes	8	BDI-II HDRS 2	2
Hamidian, Omidi, Mousavinasab, and Naziri (2013)	Dysthymia	no	22	Medication (22)	yes	8	BDI-II	2
Hosseinian *et al.* (2016)	Depression	no	12	- Metacognitive therapy (12) - nonspecified control (12)	yes	8	HDRS	1
Kenny and Williams (2007)	Treatment-resistant depression	no	46	none	n/a	8	BDI	0
Kingston *et al.* (2007)	Recurrent depression	no	6	Waitlist (11)	no	8	BDI-II	1
Kuyken, Hayes, Barrett, Byng, Dalgleish, Kessler, and Byford (2015)[1]	Recurrent depression	yes	212	Antidepressive medication (212)	yes	8	BDI-II HDRS	3
Manicavasgar, Parker, and Perich (2011)	Depression	yes	19	CBT (26)	yes	8	BDI-II	2
Mann, Kuyken, O'Mahen, Ukoumunne, Evans, and Ford (2016)[1]	Previous depression	yes	19	TAU (19)	yes	8	BDI-II	3
Michalak *et al.* (2015)[1]	Chronic depression	yes	36	- CBASP (35) - TAU (35)	yes	8	BDI-II HDRS	3
van Alderen et al. (2012)[1]	Recurrent depression	no	102	TAU (103)	yes	8	BDI HDRS	3
Verhoeven, Vrijsen, Oostrom, Speckens, and Rinck (2014)	Remitted depressed patients	no	28	Waitlist, patients treated for depression (26)	no	8	BDI-II	1

[1]Results from intent-to-treat analyses reported. n/a = not applicable.

group CBT for depression over time (Cristea *et al.*, 2017; Johnsen & Friborg, 2015; Johnsen & Thimm, 2018). The main goal of the present study was, therefore, to examine if reported time trends of ESs for MBCT for depression could be observed in the different studies.

The results showed that the ESs of studies using between- and within-group designs and the BDI or the HDRS as an outcome measure were not moderated by the time of publication. In previous studies of time trends of ESs, diverging results for the BDI and HDRS have been observed (e.g., Johnsen & Thimm,

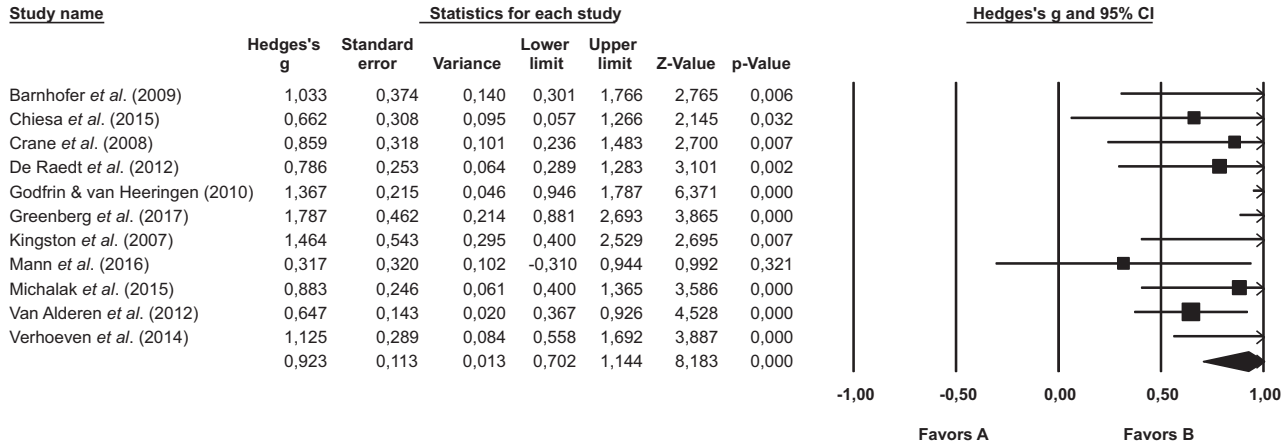

Fig. 2. Forest plot for between-group studies using the BDI and no-treatment control groups.

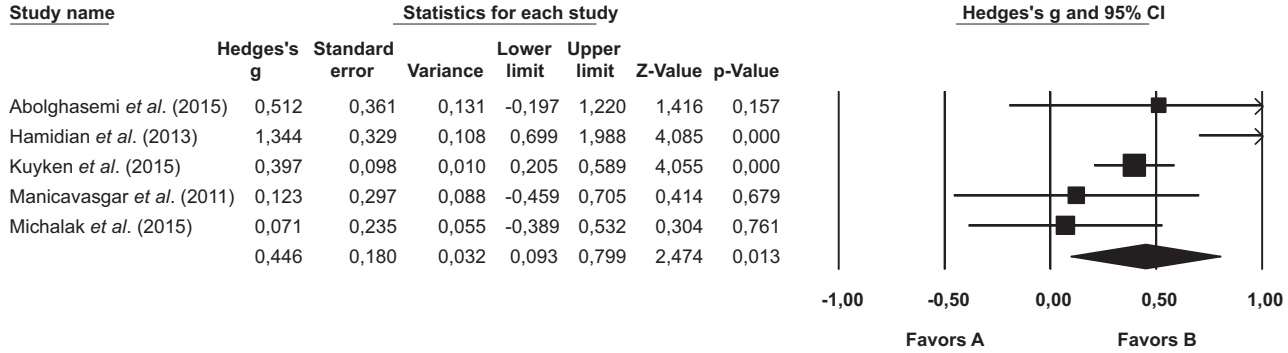

Fig. 3. Forest plot for between-group studies using the BDI and active treatment control groups.

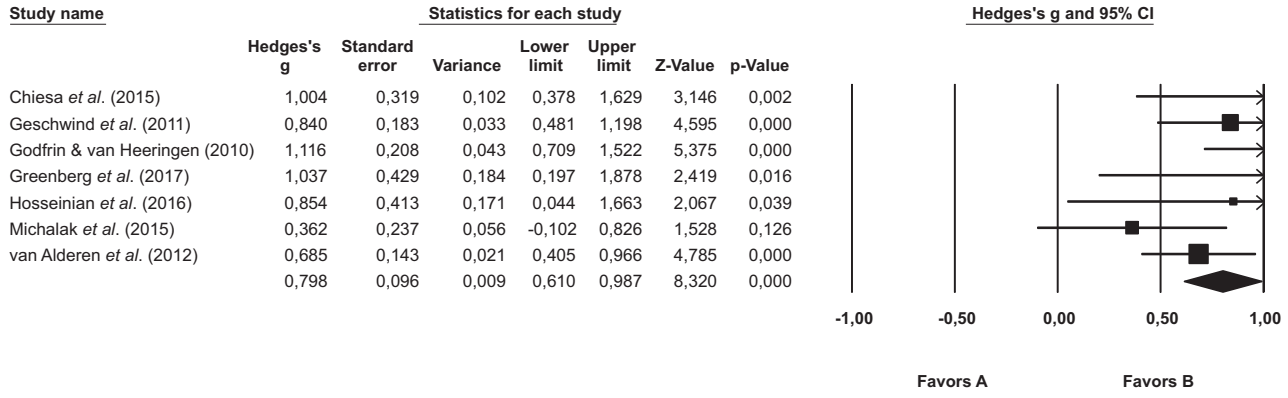

Fig. 4. Forest plot for between-group studies using the HDRS and no-treatment control groups.

2018) and have been related to the different ways of administration of the two instruments: the BDI is a self-report inventory, while the HDRS is rated by a clinician. In addition, the BDI assesses cognitive symptoms of depression to a higher degree than does the HDRS, which focuses more on somatic symptoms (cf. Wampold & Imel, 2015). Thus, while a decline in ESs for individual CBT for depression and an increase in ESs for group CBT have been observed (Cristea *et al.*, 2017; Johnsen & Friborg, 2015; Johnsen & Thimm, 2018), no effects of time for the ESs of MBCT were found. Neither were there any indications of potential trends towards a decline or increase in ES, as the regression line was nearly neutral (flat) for all statistical conditions. A probable reason for this finding is that studies of MBCT for depression have used heterogeneous samples from the beginning, i.e., included participants with various conditions in addition to depression and had no strict exclusion criteria (cf. Dobson, 2016). On the other hand, an improvement in ESs over time was not observed either. It can only be speculated whether the reported ESs of MBCT for current depression already represent the upper limit of its effectiveness or whether factors such as insufficient therapist training and supervision (cf. Waltman *et al.*, 2016) inhibit an increase of the effects.

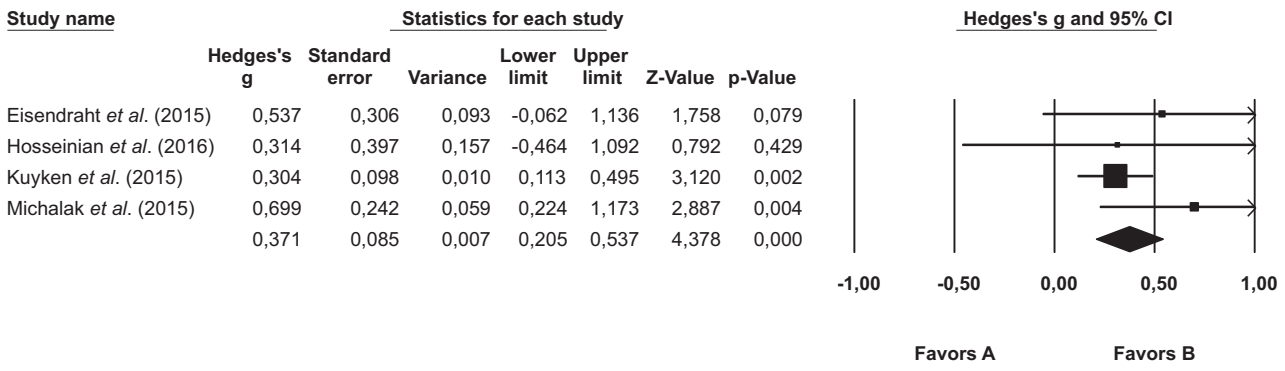

Fig. 5. Forest plot for between-group studies using the HDRS and active treatment control groups.

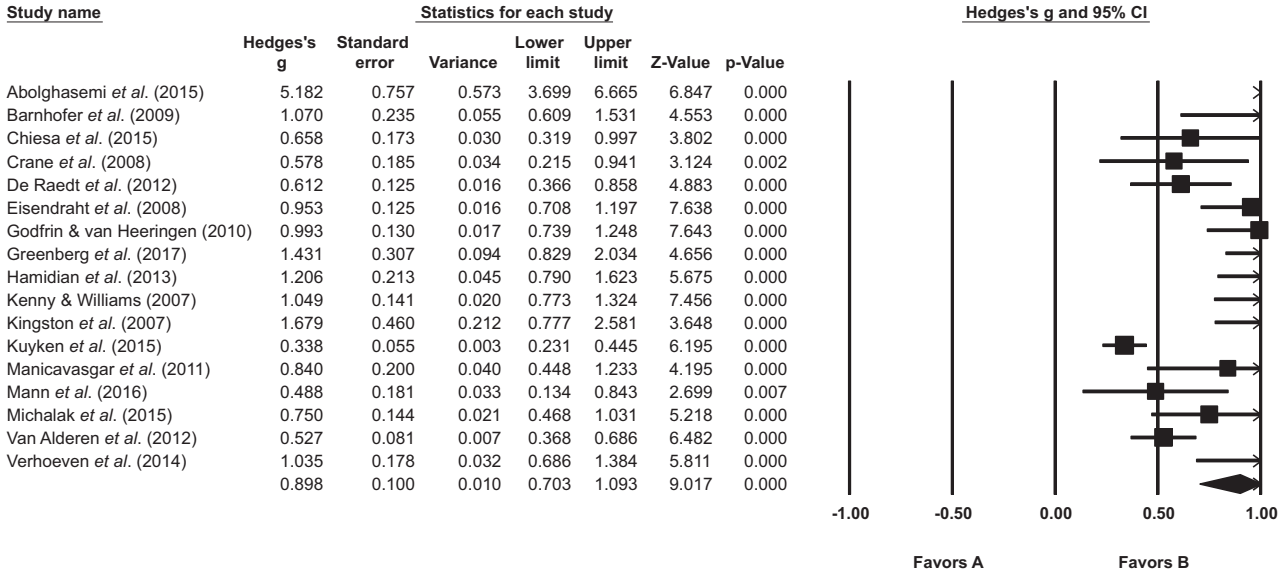

Fig. 6. Forest plot for within-group studies using the BDI.

As to the overall effect of MBCT for acute depression, the results of the present study are consistent with previous meta-analytic studies (e.g., Goldberg et al., in press; Lenz *et al.*, 2016), suggesting that MBCT is effective in reducing symptoms of depression. Applying Cohen's (1992) criteria, the average ESs for between-group studies comparing MBCT to no-treatment control conditions and pre-post studies were large for both outcome measures. Studies with active control conditions showed moderate average ESs in favor of MBCT. The trim and fill method indicated that publication bias was present for three of the five meta-analytic conditions. However, the estimated number of missing studies did not exceed two, suggesting that overall publication bias is low. Consistent with previous findings (e.g., Kühberger, Fritz, & Scherndl, 2014), there was a negative association between sample size and ES in within-group studies, i.e., studies with smaller samples tended to show higher ES than studies with larger samples. Similarly, higher baseline levels of depression were related to higher ESs. Based on the robust finding of the effectiveness of MBCT for current depression, it has been proposed that MBCT should be offered as a first-line treatment for depression on equal terms with other evidence-based treatments (Strauss *et al.*, 2014). However, more research is needed to support this claim. It should be noted that the average ES observed for MBCT when compared to no treatment comparisons is lower than those for other psychological treatments. For example, for individual and group CBT, average ESs of $g = 1.37$ and $g = 1.14$, respectively, have been reported for between-group studies using the BDI (Johnsen & Friborg, 2015;Johnsen & Thimm, 2018). The corresponding ES for MBCT in the current study was $g = 0.92$. Additionally, for pre-post comparisons, the average ES for MBCT observed in the present study ($g = 0.90$, $g = 0.82$ when the Abolghasemi *et al.* (2015) study was excluded) is smaller than those for individual and group CBT in clinical trials ($g = 1.65$ and $g = 1.33$, respectively; Johnsen & Friborg, 2015; Johnsen & Thimm, 2018) and in routine clinical practice ($d = 1.06$; Hans & Hiller, 2013).

When interpreting the results of the present investigation, several limitations have to be considered. Compared to previous examinations of temporal development of the effects of CBT for depression, the period in which the studies investigating the effects of MBCT for depression were conducted was relatively short. Further, the number of available studies was small. Chronicity of depression and an assessment of adherence to the MBCT manual was not reported in most publications and could,

therefore, not be included in the analyses. Particular caution is warranted when interpreting the results from within-studies due to data dependence (Cuijpers *et al.*, 2017). Heterogeneity was found to be significant for two of the analyses (between-group studies using an active treatment control group and the BDI and pre-post differences on the BDI). The I^2 index further indicated that heterogeneity was low for the two analytical conditions based on the HDRS ($I^2 = 0$, and $I^2 = 16.04$, respectively), while two of the conditions based on the BDI showed moderate ranges ($I^2 = 42.7$ and $I^2 = 64.2$, respectively). These values are highly acceptable, especially when taking into consideration that meta-analyses in the field of psychology are notorious for having large degrees of heterogeneity, as proven in a recent study examining rates of I^2 in 61 published meta-analyses in Psychological Bulletin between 1990 and 2013 (van Erp, Verhagen, Grasman, & Wagenmakers, 2017). The authors found that over half of the between-study meta-analyses showed $I^2 > 70$. For the final analysis in the present study, $I^2 = 86.7$ was found for the within–group condition. This is not uncommon, as higher degrees of heterogeneity are associated with within-group analyses. The finding may be due to the less rigid (and less precise) statistical requirements, as no control groups are implemented in the analysis, thus inherently leaving room for larger variability between the included studies. In addition, the high heterogeneity might be due to differences between studies in the efficacy of MBCT. Future studies should examine possible additional moderators, e.g., variables related to the implementation of the treatment. Finally, the present meta-analysis was restricted to studies that used a version of the BDI or HDRS as outcome measures. Including studies that used other instruments could lead to different findings.

In conclusion, the results of the present meta-analysis show that MBCT is effective in reducing symptoms of current depression and that study findings are stable over time. However, the relatively small number and short time range of the studies included in the analysis require further investigations in the future.

REFERENCES

Abolghasemi, A., Gholami, H., Narimani, M. & Gamji, M. (2015). The effect of beck's cognitive therapy and mindfulness-based cognitive therapy on sociotropic and autonomous personality styles in patients with depression. *Iranian Journal of Psychiatry and Behavioral Sciences*, *9*(4), e3665. https://doi.org/10.17795/ijpbs-3665

Baer, R.A. & Walsh, E. (2016). Treating acute depression with mindfulness-based cognitive therapy. In A. Wells, & P.L. Fisher (Eds.), *Treating depression* (pp. 344–368). New York: Wiley.

Barnhofer, T., Crane, C., Hargus, E., Amarasinghe, M., Winder, R. & Williams, J.M.G. (2009). Mindfulness-based cognitive therapy as a treatment for chronic depression: A preliminary study. *Behaviour Research and Therapy*, *47*, 366–373.

Beck, A.T., Steer, R.A. & Brown, G.K. (1996). *Manual for the Beck Depression Inventory-II*. San Antonio: Psychological Corporation.

Beck, A.T., Ward, C.H., Mendelson, M.M., Mock, J.J. & Erbaugh, J.J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*, 561–571.

Borenstein, M., Hedges, L., Higgins, J. & Rothstein, H. (2017). *Comprehensive Meta-Analysis (version 3)*. Englewood: Biostat.

Chiesa, A., Castagner, V., Andrisano, C., Serretti, A., Mandelli, L., Porcelli, S. & Giommi, F. (2015). Mindfulness-based cognitive therapy vs. Psycho-education for patients with major depression who did not achieve remission following antidepressant treatment. *Psychiatry Research*, *226*, 474–483.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155–159.

Crane, C., Barnhofer, T., Duggan, D.S., Hepburn, S., Fennell, M.V. & Williams, J. (2008). Mindfulness-based cognitive therapy and self-discrepancy in recovered depressed patients with a history of depression and suicidality. *Cognitive Therapy and Research*, *32*, 775–787.

Crane, R. (2009). *Mindfulness-based cognitive therapy: Distinctive features*. London: Routledge.

Cristea, I.A., Stefan, S., Karyotaki, E., David, D., Hollon, S.D. & Cuijpers, P. (2017). The effects of cognitive behavioral therapy are not systematically falling: A revision of Johnsen and Friborg (2015). *Psychological Bulletin*, *143*, 326–340.

Cuijpers, P. (2017). Four decades of outcome research on psychotherapies for adult depression: An overview of a series of meta-analyses. *Canadian Psychology/Psychologie Canadienne*, *58*, 7–19.

Cuijpers, P., Weitz, E., Cristea, I.A. & Twisk, J. (2017). Pre-post effect sizes should be avoided in meta-analyses. *Epidemiology and Psychiatric Sciences*, *26*, 364–368.

De Raedt, R., Baert, S., Demeyer, I., Goeleven, E., Raes, A., Visser, A., *et al*. (2012). Changes in attentional processing of emotional information following mindfulness-based cognitive therapy in people with a history of depression: Towards an open attention for all emotional experiences. *Cognitive Therapy and Research*, *36*, 612–620.

Dobson, K.S. (2016). The efficacy of cognitive-behavioral therapy for depression: Reflections on a critical discussion. *Clinical Psychology: Science and Practice*, *23*, 123–125.

Duval, S. & Tweedie, R. (2000). Trim and fill: A simple funnel-plot–based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*, *56*, 455–463.

Eisendrath, S.J., Delucchi, K., Bitner, R., Fenimore, P., Smit, M. & McLane, M. (2008). Mindfulness-based cognitive therapy for treatment-resistant depression: A pilot study. *Psychotherapy and Psychosomatics*, *77*, 319–320.

Eisendrath, S.J., Gillung, E., Delucchi, K., Mathalon, D.H., Yang, T.T., Satre, D.D., *et al*. (2015). A preliminary study: Efficacy of mindfulness-based cognitive therapy versus sertraline as first-line treatments for major depressive disorder. *Mindfulness*, *6*, 475–482.

Farb, N., Anderson, A., Ravindran, A., Hawley, L., Irving, J., Mancuso, E., *et al*. (2018). Prevention of relapse/recurrence in major depressive disorder with either mindfulness-based cognitive therapy or cognitive therapy. *Journal of Consulting and Clinical Psychology*, *86*, 200–204.

Galante, J., Iribarren, S.J. & Pearce, P.F. (2013). Effects of mindfulness-based cognitive therapy on mental disorders: A systematic review and meta-analysis of randomised controlled trials. *Journal of Research in Nursing*, *18*, 133–155.

Geschwind, N., Peeters, F., Drukker, M., Van Os, J. & Wichers, M. (2011). Mindfulness training increases momentary positive emotions and reward experience in adults vulnerable to depression: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *79*, 618–628.

Godfrin, K.A. & van Heeringen, C. (2010). The effects of mindfulness-based cognitive therapy on recurrence of depressive episodes, mental health and quality of life: A randomized controlled study. *Behaviour Research & Therapy*, *48*, 738–746.

Goldberg, S.B., Tucker, R.P., Greene, P.A., Davidson, R.J., Kearney, D.J. & Simpson, T.L. (2019). Mindfulness-based cognitive therapy for the treatment of current depressive symptoms: A meta-analysis. *Cognitive Behavior Therapy*, *48*, 445–462.

Goldberg, S.B., Tucker, R.P., Greene, P.A., Davidson, R.J., Wampold, B.E., Kearney, D.J. & Simpson, T.L. (2018). Mindfulness-based interventions for psychiatric disorders: A systematic review and meta-analysis. *Clinical Psychology Review*, *59*, 52–60.

Goyal, M., Singh, S., Sibinga, E.S., Gould, N.F., Rowland-Seymour, A., Sharma, R., *et al* (2014). Meditation programs for psychological stress and well-being: A systematic review and meta-analysis. *JAMA Internal Medicine*, *174*, 357–368.

Greenberg, J., Shapero, B.G., Mischoulon, D. & Lazar, S.W. (2017). Mindfulness-based cognitive therapy for depressed individuals

improves suppression of irrelevant mental-sets. *European Archives of Psychiatry and Clinical Neuroscience*, *267*, 277–282.

Gu, J., Strauss, C., Bond, R. & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review*, *37*, 1–12.

Hamidian, S., Omidi, A., Mousavinasab, S.M. & Naziri, G. (2013). Comparison of the effect of mindfulness-based cognitive therapy accompanied by pharmacotherapy with pharmacotherapy alone in treating dysthymic patients. *Iranian Red Crescent Medical Journal*, *15*, 239–244.

Hamilton, M. (1960). A rating scale for depression. *Journal of Neurology, Neurosurgery, and Psychiatry*, *23*, 56–62.

Hans, E. & Hiller, W. (2013). Effectiveness of and dropout from outpatient cognitive behavioral therapy for adult unipolar depression: A meta-analysis of nonrandomized effectiveness studies. *Journal of Consulting and Clinical Psychology*, *81*, 75–88.

Hedman-Lagerlöf, M., Hedman-Lagerlöf, E. & Öst, L.-G. (2018). The empirical support for mindfulness-based interventions for common psychiatric disorders: A systematic review and meta-analysis. *Psychological Medicine*, *48*, 2116–2129.

Higgins, J.P.T., Thompson, S.G., Deeks, J.J. & Altman, D.G. (2003). Measuring inconsistency in meta-analyses. *British Medical Journal*, *327*, 557–560.

Hofmann, S.G., Sawyer, A.T., Witt, A.A. & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, *78*, 169–183.

Hosseinian, S., Shahtaheri, E., Ebrahimi, M., Mahdavi, A. & Sepahvandi, M.A. (2016). Effectiveness of mindfulness-based cognitive therapy and metacognition therapy on reduction of symptoms of depression, core self-evaluation and emotion regulation difficulties in pregnant women with depression. *Acta Medica Mediterranea*, *32*, 2033–2037.

Jadad, A.R., Moore, R.A., Carroll, D., Jenkinson, C., Reynolds, D.J.M., Gavaghan, D.J. & McQuay, H.J. (1996). Assessing the quality of reports of randomized clinical trials: Is blinding necessary? *Controlled Clinical Trials*, *17*, 1–12.

Johnsen, T.J. & Friborg, O. (2015). The effects of cognitive behavioral therapy as an anti-depressive treatment is falling: A meta-analysis. *Psychological Bulletin*, *141*, 747–768.

Johnsen, T.J. & Thimm, J.C. (2018). A meta-analysis of group cognitive–behavioral therapy as an antidepressive treatment: Are we getting better? *Canadian Psychology/Psychologie Canadienne*, *59*, 15–30.

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. New York: Dell Publishing.

Kenny, M.A. & Williams, J.M.G. (2007). Treatment-resistant depressed patients show a good response to mindfulness-based cognitive therapy. *Behaviour Research and Therapy*, *45*, 617–625.

Khoury, B., Lecomte, T., Fortin, G., Masse, M., Therien, P., Bouchard, V., et al. (2013). Mindfulness-based therapy: A comprehensive meta-analysis. *Clinical Psychology Review*, *33*, 763–771.

Kingston, T., Dooley, B., Bates, A., Lawlor, E. & Malone, K. (2007). Mindfulness-based cognitive therapy for residual depressive symptoms. *Psychology and Psychotherapy: Theory, Research and Practice*, *80*, 193–203.

Klainin-Yobas, P., Cho, M.A. & Creedy, D. (2012). Efficacy of mindfulness-based interventions on depressive symptoms among people with mental disorders: A meta-analysis. *International Journal of Nursing Studies*, *49*, 109–121.

Kühberger, A., Fritz, A. & Scherndl, T. (2014). Publication bias in psychology: A diagnosis based on the correlation between effect size and sample size. *PLoS ONE*, *9*, e105825.

Kuyken, W., Hayes, R., Barrett, B., Byng, R., Dalgleish, T., Kessler, D., *et al*. (2015). Effectiveness and cost-effectiveness of mindfulness-based cognitive therapy compared with maintenance antidepressant treatment in the prevention of depressive relapse or recurrence (PREVENT): A randomised controlled trial. *Lancet*, *386*, 63–73.

Kuyken, W., Warren, F.C., Taylor, R.S., Whalley, B., Crane, C., Bondolfi, G., et al. (2016). Efficacy of mindfulness-based cognitive therapy in prevention of depressive relapse: An individual patient data meta-analysis from randomized trials. *JAMA Psychiatry*, *73*, 565–574.

Lau, M. (2016). The theory underlying mindfulness-based cognitive therapy as a relapse prevention approach to depression. In A. Wells, & P.L. Fisher (Eds.), *Treating depression* (pp. 194–200). New York: Wiley.

Lau, M.A., Segal, Z.V. & Williams, J.M.G. (2004). Teasdale's differential activation hypothesis: Implications for mechanisms of depressive relapse and suicidal behaviour. *Behaviour Research and Therapy*, *42*, 1001–1017.

Lenz, A.S., Hall, J. & Bailey Smith, L. (2016). Meta-analysis of group mindfulness-based cognitive therapy for decreasing symptoms of acute depression. *Journal for Specialists in Group Work*, *41*, 44–70.

Manicavasgar, V., Parker, G. & Perich, T. (2011). Mindfulness-based cognitive therapy vs cognitive behaviour therapy as a treatment for non-melancholic depression. *Journal of Affective Disorders*, *130*, 138–144.

Mann, J., Kuyken, W., O'Mahen, H., Ukoumunne, O.C., Evans, A. & Ford, T. (2016). Manual development and pilot randomised controlled trial of mindfulness-based cognitive therapy versus usual care for parents with a history of depression. *Mindfulness*, *7*(5), 1024–1033.

McCarney, R.W., Schulz, J. & Grey, A.R. (2012). Effectiveness of mindfulness-based therapies in reducing symptoms of depression: A meta-analysis. *European Journal of Psychotherapy & Counselling*, *14*, 279–299.

McCrae, R.R. (2008). A note on some measures of profile agreement. *Journal of Personality Assessment*, *90*, 105–109.

Michalak, J., Schultze, M., Heidenreich, T. & Schramm, E. (2015). A randomized controlled trial on the efficacy of mindfulness-based cognitive therapy and a group version of cognitive behavioral analysis system of psychotherapy for chronically depressed patients. *Journal of Consulting and Clinical Psychology*, *83*, 951–963.

Piet, J. & Hougaard, E. (2011). The effect of mindfulness-based cognitive therapy for prevention of relapse in recurrent major depressive disorder: A systematic review and meta-analysis. *Clinical Psychology Review*, *31*, 1032–1040.

Rosenthal, R. (1993). *Meta-analytic procedures for social research*. Newbury Park: Sage.

Segal, Z.V., Williams, M. & Teasdale, J.D. (2002). *Mindfulness-based cognitive therapy for depression*. New York: Guilford.

Segal, Z.V., Williams, M., Teasdale, J.D. & Kabat-Zinn, J. (2013). *Mindfulness-based cognitive therapy for depression*. New York: Guilford.

Steinert, C., Hofmann, M., Kruse, J. & Leichsenring, F. (2014). The prospective long-term course of adult depression in general practice and the community. A systematic literature review. *Journal of Affective Disorders*, *152–154*, 65–75.

Strauss, C., Cavanagh, K., Oliver, A. & Pettman, D. (2014). Mindfulness-based interventions for people diagnosed with a current episode of an anxiety or depressive disorder: A meta-analysis of randomised controlled trials. *PLoS ONE*, *9*, e96110.

Teasdale, J.D., Segal, Z.V., Williams, J., Ridgeway, V.A., Soulsby, J.M. & Lau, M.A. (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of Consulting and Clinical Psychology*, *68*, 615–623.

van Aalderen, J., Donders, A., Giommi, F., Spinhoven, P., Barendregt, H. & Speckens, A. (2012). The efficacy of mindfulness-based cognitive therapy in recurrent depressed patients with and without a current depressive episode: A randomized controlled trial. *Psychological Medicine*, *42*, 989–1001.

van Erp, S., Verhagen, J., Grasman, R.P.P.P. & Wagenmakers, E.-J. (2017). Estimates of between-study heterogeneity for 705 meta-analyses reported in *Psychological Bulletin* from 1990–2013. *Journal of Open Psychology Data*, *5*, 4.

Verhoeven, J.E., Vrijsen, J.N., van Oostrom, I., Speckens, A.E. & Rinck, M. (2014). Attention effects of mindfulness-based cognitive therapy in

formerly depressed patients. *Journal of Experimental Psychopathology*, *5*, 414–424.
Waltman, S.H., Creed, T.A. & Beck, A.T. (2016). Are the effects of cognitive behavior therapy for depression falling? Review and critique of the evidence. *Clinical Psychology: Science and Practice*, *23*, 113–122.
Wampold, B.E. & Imel, Z.E. (2015). *The great psychotherapy debate*. New York: Routledge.
Wang, Y.-Y., Li, X.-H., Zheng, W., Xu, Z.-Y., Ng, C.H., Ungvari, G.S., Xiang, Y.-T. (2018). Mindfulness-based interventions for major depressive disorder: A comprehensive meta-analysis of randomized controlled trials. *Journal of Affective Disorders*, *229*, 429–436.
Whiteford, H.A., Degenhardt, L., Rehm, J., Baxter, A.J., Ferrari, A.J., Erskine, H.E., Vos, T. (2013). Global burden of disease attributable to mental and substance use disorders: Findings from the global burden of disease study 2010. *The Lancet*, *382*, 1575–1586.
World Health Organization (2017). *Depression and other common mental disorders: Global health estimates*. Geneve: World Health Organzation.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Fig S1. Funnel plot for observed and imputed between-group studies using the BDI and no-treatment control groups.
Fig S2. Funnel plot for observed and imputed between-group studies using the BDI and active treatment control groups.
Fig S3. Funnel plot for observed and imputed between-group studies using the HDRS and no-treatment control groups.
Fig S4. Funnel plot for observed and imputed between-group studies using the HDRS and active treatment control groups.
Fig S5. Funnel plot for observed and imputed within-group studies using the BDI.

Received 16 April 2019, accepted 26 February 2020