



Mindfulness- and acceptance-based interventions for anxiety disorders: A systematic review and meta-analysis

Jon Vøllestad^{1*}, Morten Birkeland Nielsen²
and Geir Høstmark Nielsen¹

¹Department of Clinical Psychology, University of Bergen, Bergen, Norway

²Department of Psychosocial Science, University of Bergen, Bergen, Norway

Purpose. Mindfulness- and acceptance-based interventions (MABIs) are receiving increasing attention in the treatment of mental disorders. These interventions might be beneficial for patients with anxiety disorders, but no prior reviews have comprehensively investigated the effects of this family of interventions on clinical samples. The aim of this study was to review and synthesize extant research on MABIs for patients with diagnoses of anxiety disorders.

Methods. We conducted a systematic search of relevant databases according to pre-defined criteria. Studies were eligible for inclusion if they employed MABIs for patients diagnosed with anxiety disorders.

Results. Nineteen eligible studies were found. Meta-analysis of within-group pre- to post-treatment effects yielded overall Hedges' *g* effect sizes of 1.08 for anxiety symptoms and 0.85 for depression symptoms. For controlled studies, overall between-group Hedges' *g* was 0.83 for anxiety symptoms and 0.72 for depression symptoms. Moderator analyses examined whether intervention type, design, treatment dosage, or patient sample was associated with systematic variation in effect sizes. No significant moderating effects were found on the variables examined, apart from an observed superiority in effect size for clinical trials on samples of patients with mixed anxiety disorders. However, differential effect sizes indicated benefits of adding specific psychotherapeutic content to mindfulness training, as well as an advantage of individual over group treatment.

Conclusions. MABIs are associated with robust and substantial reductions in symptoms of anxiety and comorbid depressive symptoms. More research is needed to determine the efficacy of MABIs relative to current treatments of choice, and to clarify the contribution of processes of mindfulness and acceptance to observed outcome.

Mindfulness- and acceptance-based interventions (MABIs) are receiving increasing attention as a potential treatment modality for a variety of psychosocial problems (Baer, 2003;

*Correspondence should be addressed to Jon Vøllestad, Department of Clinical Psychology, University of Bergen, P.O. Box 7807, 5020 Bergen, Norway (e-mail: jon.vollestad@psykp.uib.no).

Brown, Ryan, & Creswell, 2007; Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Ludwig & Kabat-Zinn, 2008). These interventions are assumed to decrease distress through a set of interrelated processes facilitating a mode of present-centred awareness wherein the individual relates to experience with acceptance and compassion instead of avoidance, control, or suppression (Hayes, 2004; Williams, 2010). This might be of relevance for the treatment of anxiety disorders, a spectrum of clinical conditions characterized by attentional biases towards threats, repetitive negative thinking, physiological hyperarousal, avoidance behaviours, and deficits in emotion regulation (Amstadter, 2008; Craske *et al.*, 2009; Mathews & MacLeod, 2005). When mindfulness and acceptance are applied to anxiety disorders, the aim is for the individual to be able to observe symptomatic processes without overly identifying with them or without reacting to them in ways that further distress (Roemer, Erisman, & Orsillo, 2008).

Mindfulness and acceptance are cultivated through a variety of exercises requiring the person to attend to present-moment experience in a non-judgmental manner. A common exercise is awareness of breathing, where the task is to maintain awareness of the physical sensation of one's own breath, redirecting attention to the breath whenever attention wanders onto external stimuli or becomes caught up in thinking or emoting. Also often used are exercises emphasizing detailed and non-evaluative attention to bodily sensations in rest or in motion, such as the 'body scan', yoga, or walking meditation (Kabat-Zinn, 1990). These exercises are presented to the client by the therapist/instructor either in an individual or group format, and audio recordings are often used to facilitate mindfulness practice between sessions. In addition, clients are asked to bring the capacity for mindfulness and acceptance that they practice in formal exercises into everyday life, aiming for a non-judging and present-centred attitude to both positive and anxiety-laden experiences. Emphasis is also put on broadening behavioural repertoires in the service of individual values rather than on removing narrowly defined symptoms, encouraging the individual to pursue a meaningful life regardless of how he or she is feeling (Eifert & Forsyth, 2005).

MABIs entail a conceptualization of anxiety and its amelioration that differs somewhat from the current treatment of choice for anxiety disorder, cognitive-behavioural therapy (CBT). In conventional CBT, anxiety is conceptualized as a disturbance in information processing that leads to an overestimation of danger and an associated underestimation of personal ability to cope (Beck, Emery, & Greenberg, 1985). CBT attempts to replace maladaptive cognitions with beneficial cognitions through systematic examination of the patient's distorted thinking, thereby interrupting the recurrent overactivation of the fight-flight-system characteristic for anxiety disorders. In contrast, MABIs do not emphasize identification and modification of the content of cognitions. Instead, the goal is a shift in the patient's relationship to his or her anxiety, and becoming less identified with his or her own thoughts. Another point of distinction concerns the behavioural component of treatment. CBT for anxiety disorders is based on systematic exposure or behavioural experiments as a means to disconfirm pathogenic assumptions or expectations. MABIs either do not contain explicit exposure procedures, or frame exposure in terms of willingness to embrace distress in the service of valued action rather than symptom reduction as such. However, tendencies to avoid experiences are consistently addressed through formal mindfulness exercises, often in the form of an invitation to 'open up to' or 'allow' distress, as opposed to trying to remove it or gain control over it.

The development of MABIs has followed two distinct yet overlapping trajectories. First, a number of mindful-based treatments have been developed since the seminal Mindfulness-Based Stress Reduction (MBSR) programme was introduced by

Jon Kabat-Zinn (1990). MBSR is an 8-weekgroup-based psychoeducational programme where participants practice a variety of mindfulness exercises derived from Buddhist meditation practices, but presented in a secular format. Mindfulness exercises are carried out both in session and as homework between sessions, aided by instructions by the group leader or audio recordings. MBSR has been shown to positively impact stress management, psychiatric symptoms, and quality of life for diverse patient groups as well as non-clinical populations (for reviews, see Baer, 2003; Chiesa & Serretti, 2009; Grossman, Niemann, Schmidt, & Walach, 2004).

Several intervention programmes have used the MBSR programme as a starting point in adapting mindfulness training to specific clinical populations. The most well researched of these is Mindfulness-Based Cognitive Therapy (MBCT), developed by Segal, Williams, and Teasdale (2002) as an intervention intended to reduce the risk for relapse in previously depressed individuals. In addition to a largely identical set of formal mindfulness exercises, MBCT incorporates exercises aimed specifically at enabling awareness of and disengagement from depressogenic cognitive processes. Evidence indicates that MBCT is effective in preventing depressive relapse (Godfrin & van Heeringen, 2010; Kuyken *et al.*, 2008; Ma & Teasdale, 2004; Teasdale *et al.*, 2000). More recently, preliminary evidence has also accrued for MBCT as an intervention for other psychological disorders, such as treatment resistant depression (Kenny & Williams, 2007), insomnia (Heidenreich, Tuin, Pflug, Michal, & Michalak, 2006), and anxiety disorders (Evans *et al.*, 2008; Kim *et al.*, 2009).

MBSR and MBCT use mindfulness training as the main intervention. As a second developmental trajectory, several multi-component treatment packages have integrated interventions from CBT into a conceptual framework of mindfulness and acceptance. This synthesis of models is argued by some to be a novel psychotherapeutic paradigm, constituting a 'third wave' in the historical development of CBT (see Hayes, 2004). The overall goal is to enable clients to relate to a non-identificatory and flexible way to experience, but typically the range of interventions employed in the service of this goal is broader than in the mindfulness-based therapies. Acceptance and Commitment Therapy (ACT) combines principles of mindfulness and acceptance with treatment components from behavioural therapy and experiential psychotherapy (Hayes, Strosahl, & Wilson, 1999). The ACT model holds that psychopathology is due to relating to thoughts as literal truths (cognitive fusion), as well as maladaptive attempts to escape from or control unwanted experience (experiential avoidance)(Hayes, 2004). The strategies in ACT include metaphors, experiential work, exposure in the service of valued goals, as well as traditional mindfulness exercises to promote non-judgmental and non-reactive awareness of internal experiences. In ACT terms, these are all known as 'defusion techniques', aimed at undermining contexts of literality that constrict psychological flexibility (Hayes *et al.*, 2006).

Acceptance-based behaviour therapy (ABBT) is a multi-component intervention augmenting CBT with components from ACT, dialectical behaviour therapy, and MBCT (Roemer & Orsillo, 2009). ABBT has been developed specifically for the treatment of generalized anxiety disorder (GAD), and aims to decrease experiential avoidance through increased awareness and willingness to carry out valued actions in important life domains.

Although we recognize that conceptual distinctions may be made between acceptance-based multi-component treatment packages and mindfulness training as a stand-alone intervention, we nevertheless view these as quite subtle in nature. The two types of interventions share overarching principles in their conceptualization of the mind, mental suffering, and psychotherapeutic cure. Their common denominator is an

emphasis on changing the individual's relationship to experience, enabling a present-centred and non-evaluative stance that facilitates valued action in the face of distress. There is also a shared understanding of the tendency of discursive thoughts and linguistic processes to reify experience in ways that contribute to psychological suffering. Rather than changing the content of thoughts or verbal rules, these interventions aim for insight into the transient and non-veridical nature of mental phenomena. We would argue that these interventions share a coherent conceptual and practical foundation that merits a concurrent quantitative review in relation to their potential effect for anxiety disorders. Specifically, the emphasis on cultivating a more gentle and flexible mode of processing seems particularly relevant for these disorders, as they are characterized by a reactive relationship to experience, that is, a tendency to negative self-absorption accompanied by widespread attempts to avoid external and internal events (Baer, 2007; Roemer, Erisman *et al.*, 2008).

Prior reviews

There have been prior reviews and meta-analyses of MABIs in recent years, but none of these have provided a comprehensive overview of extant research on this family of interventions for anxiety disorders. A Cochrane review of randomized controlled trials (RCTs) of meditation therapy for anxiety disorders yielded only two eligible studies (Krisanaprakornit, Sriraj, Piyavhatkul, & Laopaiboon, 2006). Based on just two studies, the authors refrained from any firm conclusions about the effectiveness of meditation therapy for anxiety disorders. Toneatto and Nguyen (2007) reviewed controlled trials of mindfulness meditation for anxiety and mood symptoms. The review was limited to MBSR administered to medical or psychiatric populations. The authors concluded that MBSR appears to have equivocal effects on symptoms on anxiety and depression, and that the benefits of the approach were most clearly observed in studies that did not employ any active control group, suggesting that effects may have been due to variables other than mindfulness training. However, the review limited its search to the MEDLINE database, and no quantitative synthesis of findings was performed. Also, only one of the studies reviewed featured patients diagnosed with anxiety disorders.

The most recent review and meta-analysis examined the effects of mindfulness-based treatment on mood and anxiety symptoms in clinical samples (Hofmann, Sawyer, Witt, & Oh, 2010). These authors reviewed 39 studies of mindfulness training, mainly in the format of MBSR or MBCT, for patients with somatic and psychiatric disorders. In patients with anxiety and mood disorders, meta-analysis yielded within-group effect sizes (Hedges' *g*) of 0.97 and 0.95, respectively. It was concluded that mindfulness-based therapy improves symptoms of anxiety and depression across a relatively wide range of severity, and may be due to therapeutic mechanisms that are not diagnosis-specific but instead targets processes of relevance across disorders (Hofmann *et al.*, 2010). The authors did not include acceptance-based treatments in their review, arguing that mindfulness exercises featured in ACT are rooted in a behavioural analytic model, seen by the authors as a different conceptual framework from mindfulness-based cognitive therapies.

As far as acceptance-based therapies are concerned, two quantitative reviews have been published recently. Powers, Zum Vörde Sive Vörding, and Emmelkamp (2009) found in a meta-analysis of 18 controlled trials that ACT outperformed control conditions on primary and secondary outcomes after treatment and follow-up for

a variety of conditions. These authors reported effect sizes for 0.68 for comparisons against waiting lists/placebo conditions and 0.42 against treatment as usual. There were no significant differences in effect size when comparing ACT to active control conditions, suggesting equal effectiveness relative to established treatments (Powers *et al.*, 2009). Öst (2008) performed a meta-analysis of 'third wave' behavioural therapies, and found an overall effect size of 0.68 for 15 studies of ACT compared to control conditions. Both of these reviews were limited to RCTs, and neither included any studies of acceptance-based therapies for patients fulfilling DSM-IV criteria for anxiety disorders.

Aims of present study

No prior reviews have examined the potential utility of both stand-alone mindfulness interventions and multi-component acceptance-based treatments for patients with clinical levels of anxiety. Consequently, the purpose of this review was to systematically evaluate the effectiveness of MABIs for individuals with anxiety disorders as target complaint; that is, patients suffering from anxiety disorders according to established diagnostic criteria and outcome measures. We have opted for a review of all anxiety disorders, on the grounds that the mental capacities of mindfulness and acceptance can be viewed as counteracting a number of psychopathological processes involved across diagnostic categories (Baer, 2007; Mansell, Harvey, Watkins, & Shafran, 2009).

Mood disorders frequently co-occur with anxiety disorders, with major depressive disorder and dysthymia affecting 20–40% of anxious patients (Huppert, 2008). Both anxiety disorders and mood disorders can be conceptualized as involving similar processes, possibly due to a shared diathesis (Clark & Watson, 1991; Griffith *et al.*, 2010) or common features such as maladaptive cognitive appraisals, deficient emotion regulation, emotional avoidance, and behaving in concordance with disordered emotion (Barlow, Allen, & Choate, 2004). Given this considerable comorbidity and the conceptual overlap between anxiety and depressive disorders, we also chose to include effects on symptoms of depression in our review. We also elected to allow for samples consisting of patients with both anxiety and depression, provided that a subset of the sample had anxiety disorder as a primary diagnosis.

MABIs emphasize broader types of outcome than decreases in symptoms or psychological distress. These interventions frame the therapeutic process within a larger framework of valued action or mindfulness as a way of life (e.g., Hayes, 2004; Kabat-Zinn, 2003). We were uncertain to what extent this aspect of treatments can be assessed by currently available instruments. Nevertheless, an evaluation of this core proposition seemed important, and we chose to do so by computing effect sizes for measures of quality of life for trials that provided such data.

Given the expected heterogeneity of interventions and samples, it is of interest whether variations in treatment programme or sample characteristics are related to outcome in any way. We planned a series of subgroup or moderator analyses to investigate this question. First, we compared the effects of mindfulness training as a stand-alone intervention to the effects of multi-component treatment packages incorporating strategies of mindfulness and acceptance to established CBT interventions. We compared the effects of individual versus group treatment, as well as examining possible moderating effects of diagnosis on outcome. As study quality was expected to vary, we also compared controlled and uncontrolled trials to address whether this aspect of research design could affect outcome.

Our overarching aim was to assess claims that approaches based on mindfulness and acceptance can contribute meaningfully to future treatment of anxiety disorders. Based on prior reviews (Baer, 2003; Hofmann *et al.*, 2010; Powers, *et al.*, 2009), we expected to find moderate to large effect sizes for these treatments. As noted, one question in reviewing the evidence is to what extent mindfulness is effective in its 'pure form', or whether it should be combined with other therapeutic strategies. Adding components does not necessarily increase the effectiveness of treatment, as shown by findings of equivalent efficacy for cognitive and behavioural interventions (e.g., Mitte, 2005a; Powers, Sigmarsson, & Emmelkamp, 2008). However, the evidence is equivocal, as some studies conclude that adding cognitive interventions to exposure procedures entails additional benefits (see McMillan & Lee, 2010). Additionally, it is not certain to what extent findings from dismantling studies assessing the comparative effectiveness of conventional cognitive or behavioural techniques are relevant for MABIs. Mindfulness training is still a novel psychotherapeutic intervention and it is not yet evident that it should be as effective as a solitary treatment component as behaviour therapy or cognitive therapy. Consequently, we expected multi-component treatment packages to perform better than mindfulness training as a stand-alone intervention, given the broader therapeutic armamentarium available in combined treatments.

Another issue concerns the individual versus group format of administration. Meta-analytic evidence indicates that group treatment is often as effective as individual treatment (e.g., McRoberts, Burlingame, & Hoag, 1998). However, other authors have argued that the evidence is not conclusive yet. Tucker and Oei (2007) assessed the comparative effectiveness of group and individual CBT, and found that 61% of the RCTs reviewed show equal treatment effects, while 35% showed superiority for the individual format. We hypothesized that individual treatment would outperform group treatment, as individual treatment allows for a more careful tailoring of the intervention to patients' symptom profiles and personal concerns.

We expected the methodological quality of published research to be inconsistent. As a consequence, we opted for a broad approach to this review, enabling the inclusion of open trials and uncontrolled studies. RCT methodology is clearly superior in clarifying questions of treatment efficacy. However, the field of MABIs is in an early stage in terms of research, and as such broader inclusion criteria will enable us to garner valuable information about the current status of these treatments for the particular set of disorders at question here.

Method

Identification of studies

We searched MEDLINE, ISI Web of Science, PsycInfo and Cochrane Library Databases from inception until July 2010 using the terms 'mindfulness' or 'acceptance' in combination with the terms 'anxiety', 'anxiety disorders', 'treatment', 'intervention', 'program', or 'therapy'. Reference lists of prior reviews and meta-analyses were also searched manually to identify potentially eligible studies. We included in our review (a) reports of clinical trials, (b) where *n* was 10 or more, (c) published in peer-reviewed journals in languages spoken by the reviewers (Norwegian, English, German), (d) that employed mindfulness- or acceptance-based interventions for adult patients with current primary diagnoses of anxiety disorders, (e) where diagnoses were established according to DSM-IV or ICD-10 criteria using a structured clinical interview.

In line with these criteria, we excluded studies investigating the effects of MABIs on anxiety symptoms in non-clinical samples, in samples recruited on the basis of somatic disorders, or in samples where anxiety symptomatology was assessed only through self-report. We did include studies on samples featuring patients with depression as a primary diagnosis, provided that a subset of the sample had anxiety as a primary diagnosis and that anxiety symptoms were used as outcome measure. Studies allowing for concurrent psychopharmacological treatment were included, but not studies allowing for concurrent psychotherapeutic treatment.

Other forms of meditation employed clinically typically rely on concentrative forms of meditation, that is, the focusing of attention on a given object (such as the breath or a verbal mantra) to the exclusion of other aspects of experience. Mindfulness as taught in MABIs typically incorporate both exercises requiring focused attention and exercises requiring open, non-judgmental monitoring of awareness – with an increasing emphasis on the latter over time (see Lutz, Slagter, Dunne, & Davidson, 2008). This non-directive aspect of mindfulness training sets it apart from other types of meditation, and is of particular relevance for the reactive modes of mind associated with anxiety disorders. On the basis of this conceptual and practical distinction, we excluded studies employing other forms of meditation than mindfulness meditation. We expected the number of eligible studies to be limited, so we chose to include both controlled and uncontrolled studies in this review.

A total of 526 potentially relevant articles were identified, retrieved, and screened for potential inclusion. After removing duplicates, 434 studies remained. Two reviewers (JV and GHN) reviewed all the abstracts and excluded any study that did not clearly meet our inclusion criteria. Disagreement between reviewers was resolved by discussion. We excluded 304 articles that did not focus on MABIs. A further 111 studies were excluded because (a) samples were not diagnosed with anxiety disorders (i.e., non-clinical samples or samples of patients with somatic disorders) ($n = 80$), (b) patients had only sub-clinical manifestations of anxiety ($n = 3$), (c) study design was laboratory investigation of acceptance ($n = 13$), (d) only qualitative or case study methodology was employed ($n = 11$), or (e) sample consisted of children or adolescents ($n = 4$). One study (Goldin & Gross, 2010) was excluded because the outcome data had been previously reported (Goldin, Ramel, & Gross, 2009). Nineteen eligible studies remained, and are presented in Table 1.

Estimation of effect sizes

For all studies, we calculated the Hedges' g within-group effect sizes for measures of anxiety and depression. Hedges' g is a variation on Cohen's d that corrects for biases due to small sample sizes (Hedges & Olkin, 1985). For the studies that included control groups, we calculated Hedges' g for differences in treatment effects between group-based mindfulness interventions and control conditions.

Some studies report more than one outcome measure for a given construct. In these cases, effect sizes for each measure were calculated first. We then calculated an average Hedge's g effect size for studies that included multiple measures of anxiety and/or depression. Effect size estimates were combined across studies to obtain a summary statistic for pre- to post-treatment change on measures of anxiety and depression severity, respectively.

To assess the heterogeneity of studies, the Q-statistic was used. A significant Q-value rejects the null hypothesis of homogeneity. An I^2 -statistic was computed as an indicator

Table 1. Characteristics of studies included in review and meta-analysis

Author	Diagnosis	Intervention	Study design	No. of subjects (% female)	No. of sessions/length (min)	Time for latest follow-up	Measures of anxiety	Measures of quality of life	Attrition %
Bögels et al. (2006)	SAD	MBCT + TCT	Uncontrolled clinical trial	10 (30)	9 (45–60)	2 months	SPAI, FNE		10
Craigie, Rees, and Marsh (2008)	GAD	MBCT	Uncontrolled clinical trial	23 (74)	8 (120)	3 months	BAI, DASS, PSWQ	Q-LES-Q	13
Dalrymple and Herbert (2007)	SAD	ACT	Uncontrolled clinical trial	19 (53)	12 (60)	3 months	SPAI, LSAS, FNE	QOLI	10.5
Evans et al. (2008)	GAD	MBCT	Uncontrolled clinical trial	12 (55)	8 (not reported)	Only post-treatment	BAI, PSWQ		9
Finucane and Mercer (2006)	Depression and anxiety	MBCT	Uncontrolled clinical trial	13 (46)	8 (not reported)	3 months	BAI		31
Goldin et al. (2009)	SAD	MBSR	Uncontrolled clinical trial	16 (56)	8 (150)	Only post-treatment	LSAS, STAI-S		0
Kabat-Zinn et al. (1992)	Mixed anxiety (PD, GAD)	MBSR	Uncontrolled clinical trial	22 (77)	8 (150)	3 months	BAI, FS, MI		8
Kim et al. (2009)	Mixed anxiety (PD, GAD)	MBCT	RCT	46 (37)	8 (90)	Only post-treatment	HAM-A, BAI, SCL-90-A		0
Kim et al. (2010)	PD	MBCT	Uncontrolled clinical trial	23 (43)	8 (90)	12 months	HAM-A, PDDS, BAI, APPQ		0
Kocovski et al. (2009)	SAD	MAGT	Uncontrolled clinical trial	42 (69)	12 (120)	3 months	LSAS, SPS, SIAS, SPIN		31
Koszycki et al. (2007)	SAD	MBSR	RCT	53 (53)	8 (150)	Only post-treatment	SIAS, SPS	QOLI	23.1
Lee et al. (2007)	Mixed anxiety (PD, GAD)	MBSM	RCT	46 (35)	8 (not reported)	Only post-treatment	HAM-A, STAI		12.5

Continued

Table 1. Continued

Author	Diagnosis	Intervention	Study design	No. of subjects (% female)	No. of sessions/length (min)	Time for latest follow-up	Measures of anxiety	Measures of quality of life	Attrition %
Ossman, Wilson, Storaasli, & McNeill (2006)	SAD	ACT	Uncontrolled clinical trial	22 (50)	10 (120)	3 months	SPAI		45.5
Piet et al. (2010)	SAD	MBCT	RCT	26 (69)	8 (120)	12 months	SIAS, LSAS, SPS, BAI		21.4
Ramel et al. (2004)	Depression and anxiety	MBSR	Uncontrolled clinical trial	23 (35)	8 (120)	Only post-treatment	BAI, STAI		26.1
Ree and Craigie (2007)	Depression and anxiety	MBCT	Uncontrolled clinical trial	26 (77)	8 (150)	3 months	DASS		12
Roemer and Orsillo (2009)	GAD	ABBT	Uncontrolled clinical trial	19 (56)	16 (60–90)	3 months	PSWQ, DASS	QOLI	16
Roemer, Orsillo et al. (2008)	GAD	ABBT	RCT	31 (71)	16 (60–90)	9 months	PSWQ, DASS	QOLI	23
Yook et al. (2008)	Mixed anxiety (PD, GAD)	MBCT	Uncontrolled clinical trial	19 (41)	8 (120)	Only post-treatment	HAM-A, PSWQ		0

Note. GAD, generalized anxiety disorder; SAD, social anxiety disorder; PD, panic disorder; MBCT, mindfulness-based cognitive therapy; TCT, task concentration training; MBSR, mindfulness-based stress reduction; MAGT, mindfulness- and acceptance-based group therapy; MBSM, mindfulness-based stress management; APPQ, Albany panic and phobia questionnaire; BAI, Beck anxiety inventory; DASS, depression anxiety stress scales; FNE, fear of negative evaluation scale; FS, fear survey; HAM-A, Hamilton rating scale for anxiety; LSAS, Liebowitz social anxiety scale; MI, mobility inventory; PDDS, panic disorder severity scale; PSWQ, Penn state worry questionnaire; SCL-90-A, symptom checklist 90 anxiety subscale; SIAS, social interaction anxiety scale; SPAI, social phobia and anxiety inventory; SPIN, social phobia inventory; SPS, social phobia scale; STAI, state trait anxiety inventory; Q-LESQ, quality of life enjoyment and satisfaction questionnaire; QOLI, quality of life inventory.

of heterogeneity in percentages. Increasing values show increasing heterogeneity, with values of 0% indicating no heterogeneity, 50% indicating moderate heterogeneity, and 75% indicating high heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003). As considerable heterogeneity between studies was expected, we calculated the pooled mean effect size using the random effects model. Random effects models are recommended when accumulating data from a series where it is assumed that the effect size varies from one study to the next, and where it is unlikely that studies are functionally equivalent (Borenstein, Hedges, & Rothstein, 2007; Hedges & Vevea, 1998). Furthermore, random effects models allow statistical inferences to a population of studies beyond those included in the meta-analysis (Berkeljon & Baldwin, 2009). As an aid in interpreting effect sizes, Cohen (1988) provided the following guidelines: A value of 0.2 represents a small effect, 0.5 a medium effect, and 0.8 a large effect.

To investigate potential moderator effects, we used a procedure proposed by Hedges and Olkin (1985). According to this approach, meta-analytic evidence for the presence of moderators requires that effect size estimates are different in the categories formed by the potential moderator variable, and that these estimates are significantly heterogeneous (Borenstein, Hedges, Higgins, & Rothstein, 2005). The degree of variability of the effect size estimates across studies is measured by separating studies according to study-level variables, and then conducting a pooling of effect sizes separately for each subgroup. In order to assess the presence of a significant difference between groups, the between-group heterogeneity statistic Q_B was computed. The presence of a moderator is indicated by a statistically significant Q_B , which suggests a difference between the mean effect sizes across groups. As the number of length of sessions for the included studies differed, we assessed whether there might be a dose-response relationship by way of a meta-regression of total treatment duration (number of sessions \times session length) on Hedges' g .

A potential shortcoming of meta-analyses is the fact that overall effect sizes may be overestimated due to a publication bias in favour of significant findings. One approach to this so-called 'file drawer problem' is the calculation of the fail-safe N , reflecting the number of studies reporting null results that would be required to reduce the overall effect to non-significance. We also inspected funnel plots to assess potential biases in the distribution of effects. Funnel plots are scatter plots of treatment effects (horizontal axis) against a measure of study size (vertical axis). This visual inspection technique is based on the assumption that the precision of estimation of the treatment effect increases as the sample size of component studies increases (Sterne & Harbord, 2004). In the absence of bias, small studies will scatter more widely towards the bottom of the plot, while the spread will be narrower towards the top. Publication bias and other types of bias will be discernible in the form of asymmetrical funnel plots.

All meta-analyses and publication bias analyses were carried out with the Comprehensive Meta-Analysis (version 2) software developed by Biostat (Borenstein *et al.*, 2005).

Results

Review of treatment outcome studies

The 19 studies that met the inclusion criteria had an aggregated number of $N = 491$ participants. Treatment group size ranged from 11 to 63 participants (mean = 25.8, $SD = 12.33$). Subjects' mean age ranged from 22 to 51 years, with a mean of 38.5 ($SD = 6.66$). All samples were diagnosed according to DSM-IV criteria, with the majority

($n = 11$) using SCID-I as diagnostic tool. The most frequently studied disorder was social anxiety disorder (SAD) ($n = 7$), followed by GAD ($n = 4$). Four studies featured samples with different primary anxiety disorders, while three studies featured patients with anxiety and/or depression. Only one study focused solely on panic disorder (PD) (Kim *et al.*, 2010). We found no clinical trials investigating MABIs for simple phobia, obsessive-compulsive disorder or post-traumatic stress disorder meeting our inclusion criteria.

In terms of study design, the majority ($n = 13$) were uncontrolled studies. Two studies used an active control group (Koszyki, Benger, Shlik, & Bradwejn, 2007; Piet, Hougaard, Hecksher, & Rosenberg, 2010), and two studies used placebo control (Kim *et al.*, 2009; Lee *et al.*, 2007). One study randomized participants to treatment and waitlist control (Roemer, Orsillo, & Salters-Pedneault, 2008), while another used a waitlist control group matched on relevant demographic and baseline variables (Ramel, Goldin, Carmona, & McQuaid, 2004).

MBCT was the most frequent intervention ($n = 8$), followed by MBSR ($n = 4$), ACT ($n = 2$), and ABBT ($n = 2$). One study (Kocovski, Fleming, & Rector, 2009) investigated Mindfulness- and Acceptance-based Group therapy (MAGT), a combination of mindfulness training, acceptance exercises, and exposure strategies based in large measure on ACT, but with an enhanced component of mindfulness training adapted from MBCT. The majority of the trials investigated group-based interventions, only four examined individual therapy modalities (Bögels, Sijbers, & Voncken, 2006; Dalrymple & Herbert, 2007; Roemer & Orsillo, 2009; Roemer, Orsillo *et al.*, 2008). Most of the studies ($n = 16$) allowed participants to be on concurrent medication. Rates of attrition ranged between 0 and 46%, with a mean of 15.4% ($SD = 12.44$).

Meta-analysis

One study (Kim *et al.*, 2010) was deemed to be an outlier, as it deviated from the observed pooled mean for anxiety symptoms in the positive direction by more than 3 *SDs*. We chose to eliminate this study from the subsequent analyses, in order to avoid overestimation of effects. Post-treatment effect sizes for anxiety symptoms for individual studies are displayed in Figure 1. Pre- to post-treatment effect sizes for anxiety symptoms ranged from 0.29 to 2.39. The overall within-group Hedges' *g* for anxiety at post-treatment was 1.08 ($p = .00$, 95% confidence interval [CI] = 0.81–1.34). This effect size is in the large range, indicating that at post-treatment, patients who participated in MABIs averaged 1.08 standard deviations above their pre-treatment scores on outcome measures. Heterogeneity was moderate to high ($Q = 43.99$, $p = .00$, $I^2 = 61.35$).

Pre- to post-treatment effect sizes for depression symptoms ranged from 0.43 to 1.49. The overall within-group Hedges' *g* for depression symptoms was 0.85 ($p = .00$, 95% CI = 0.66–1.03). Thus, the overall effect size for MABIs was in the large range also for depression symptoms. Heterogeneity was low ($Q = 16.94$, $p = .26$, $I^2 = 17.36$). Pre- to post-treatment effect sizes for depression symptoms for individual studies are displayed in Figure 2. Five studies provided data on quality of life. Pre- to post-treatment effect sizes for quality of life ranged from 0.54 to 0.56. The overall within-group Hedges' *g* for quality of life was 0.65 ($p = .00$, 95% CI = 0.36–0.93), that is, an effect size in the medium range. Heterogeneity was low ($Q = 1.26$, $p = .87$, $I^2 = 0.00$) (see Figure 3).

For controlled studies, the overall between-group Hedges' *g* for anxiety symptoms at post-treatment was -0.83 ($p = .04$, 95% CI = -1.62 to -0.04). Heterogeneity was high ($Q = 37.99$, $p = .00$, $I^2 = 86.84$). For depression symptoms, the overall

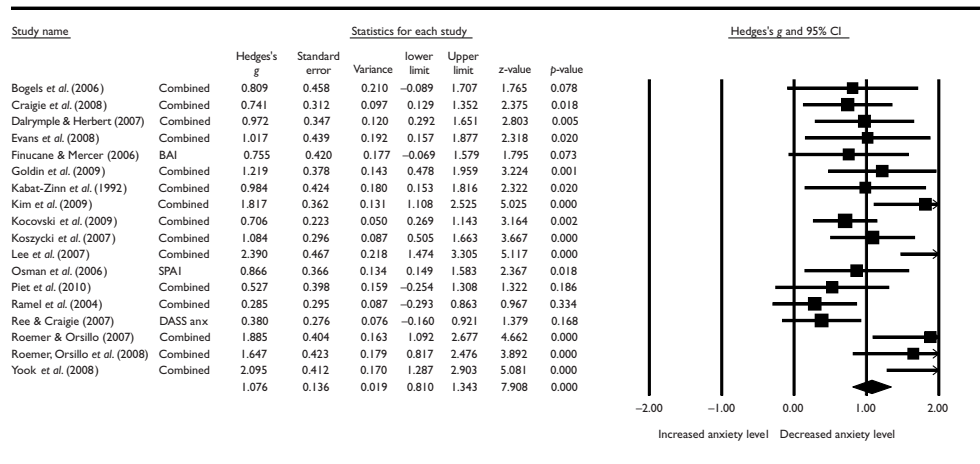


Figure 1. Mindfulness- and acceptance-based interventions pre- to post-treatment change in anxiety symptoms.

Note. BAI, Beck anxiety inventory; DASS anx, anxiety subscale of depression anxiety and stress scale; SPAI, social phobia and anxiety inventory.

between-group Hedges' g for controlled studies was -0.72 ($p = .00$, 95% CI = -1.20 to -0.24). Heterogeneity was moderate ($Q = 15.06$, $p = .01$, $I^2 = 66.71$).

Seven studies included follow-up assessment 3 months after end of treatment. Effect sizes indicated a marginally positive but non-significant effect for anxiety from post-treatment to follow-up (Hedges' $g = 0.19$, 95% CI = -0.06 - 0.43). There was no change in depression symptoms (Hedges' $g = -0.03$, 95% CI = -0.29 - 0.24). These findings of no change from post-treatment to follow-up indicate that treatment gains were maintained.

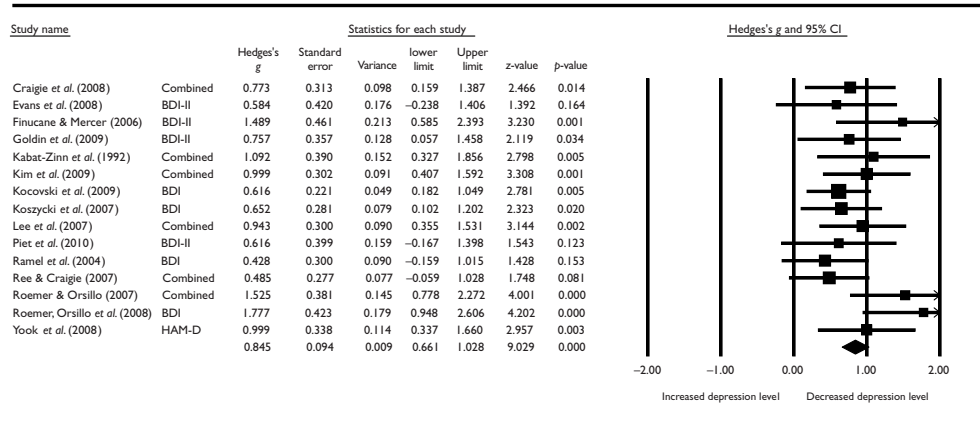


Figure 2. Mindfulness- and acceptance-based interventions pre- to post-treatment change in depression symptoms.

Note. BDI II, Beck depression inventory; HAM-D, Hamilton depression rating scale. There are fewer studies in Figure 2 than Figure 1, as three studies (Bögels et al., 2006; Dalrymple & Herbert, 2007; Osman et al., 2008) did not report depression symptoms.

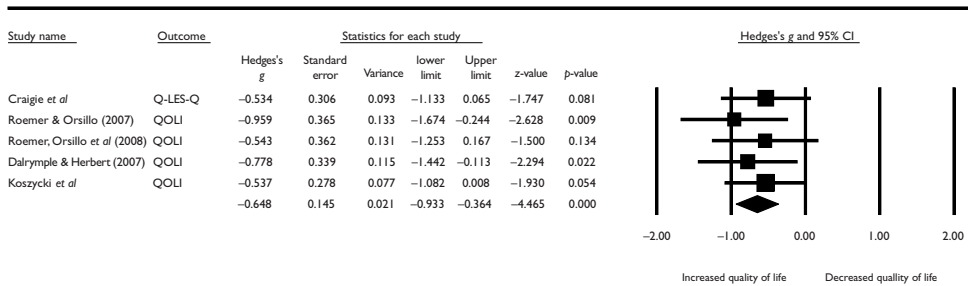


Figure 3. Mindfulness- and acceptance-based interventions pre- to post-treatment change in quality of life.

Note: Q-LES-Q, quality of life enjoyment and satisfaction questionnaire; QOLI, quality of life inventory.

Moderator analyses

We found no significant differences in mean effect sizes for anxiety symptoms when comparing group-based interventions (Hedges' $g = 1.01$, 95% CI = 0.71–1.32) to individual therapy modalities (Hedges' $g = 1.33$, 95% CI = 0.82–1.83) ($Q_B = 1.086$, $df = 1$, $p = .297$). Neither was there a significant difference between pure mindfulness training (Hedges' $g = 0.96$, 95% CI = 0.63–1.30) and multi-component treatment packages such as ACT or ABBT (Hedges' $g = 1.27$, 95% CI = 0.81–1.73) ($Q_B = 1.118$, $df = 1$, $p = .290$). As MBSR and MBCT were the most frequent interventions, we decided to compare the relative efficacy of these. We did observe a numerical advantage for MBCT (Hedges' $g = 1.03$, 95% CI = 0.54–1.52) over MBSR (Hedges' $g = 0.86$, 95% CI = 0.41–1.31), but this finding was also non-significant ($Q_B = 0.238$, $df = 1$, $p = .626$). There was no significant difference between randomized controlled studies (Hedges' $g = 1.46$, 95% CI = 0.88–2.04) and studies without a control group (Hedges' $g = 0.93$, 95% CI = 0.66–1.20), indicating that this aspect of study design did not impact observed effect sizes ($Q_B = 2.642$, $df = 1$, $p = .104$). The subgroup analysis by diagnosis revealed that the trials for patient samples with different primary anxiety disorders (i.e., PD and GAD) yielded a significantly higher effect size (Hedges' $g = 1.85$, 95% CI = 1.29–2.41) than trials for samples of GAD only, SAD only, or depression and/or anxiety ($Q_B = 19.71$, $df = 3$, $p = .00$). The meta-regression of total treatment duration (number of sessions \times session length) on Hedges' g found no evidence for a dose-response relationship on effect size on measures of anxiety ($\beta = -0.00$, $p = .08$), depression ($\beta = -0.00$, $p = .23$), or quality of life ($\beta = 0.00$, $p = .70$).

Publication bias

The effect sizes obtained for measures of anxiety symptoms corresponded to a z value of 12.55. It would require 721 studies with null results for the combined two-tailed p value to exceed .05. For depression symptoms, the observed z value was 10.18, indicating that it would take 390 studies with null results to bring the two-tailed p -value to non-significance. These Fail-safe N estimates indicate that the effect sizes observed in the present meta-analysis are likely to be robust. Neither did inspection of the funnel plot for precision indicate presence of systematic biases in publishing (Figures 4–6).

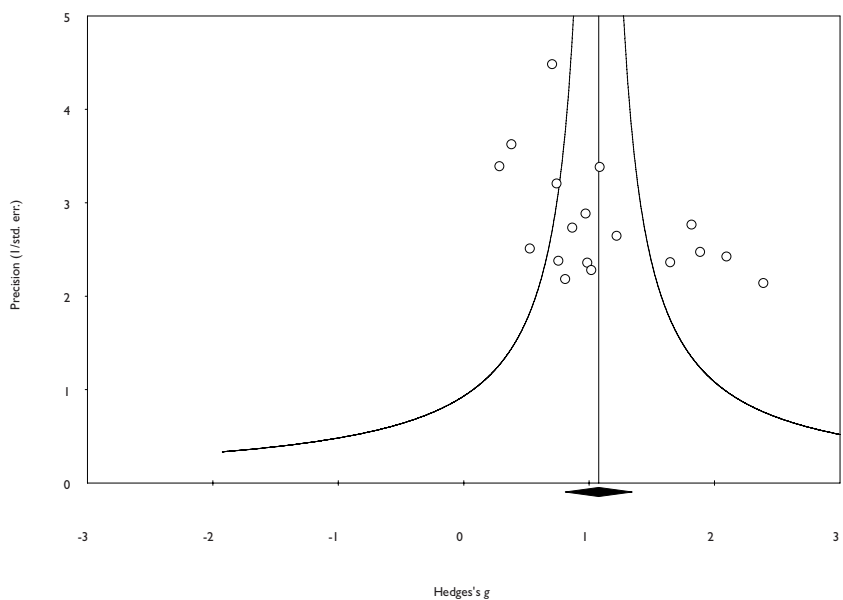


Figure 4. Funnel plot of precision by Hedges' g for measures of anxiety.

Discussion

MABIs constitute a family of interventions with a shared emphasis on strategies that alter an individual's relationship to his or her internal experience, rather than strategies that aim to directly alter the content of these experiences. The aim of the present review was to identify clinical trials of MABIs for patient samples with anxiety disorders.

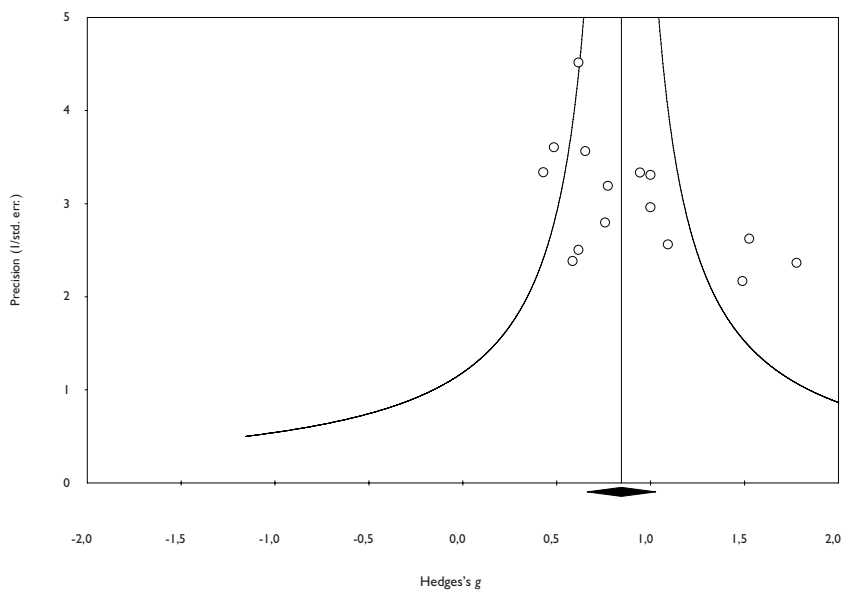


Figure 5. Funnel plot of precision by Hedges' g for measures of depression.

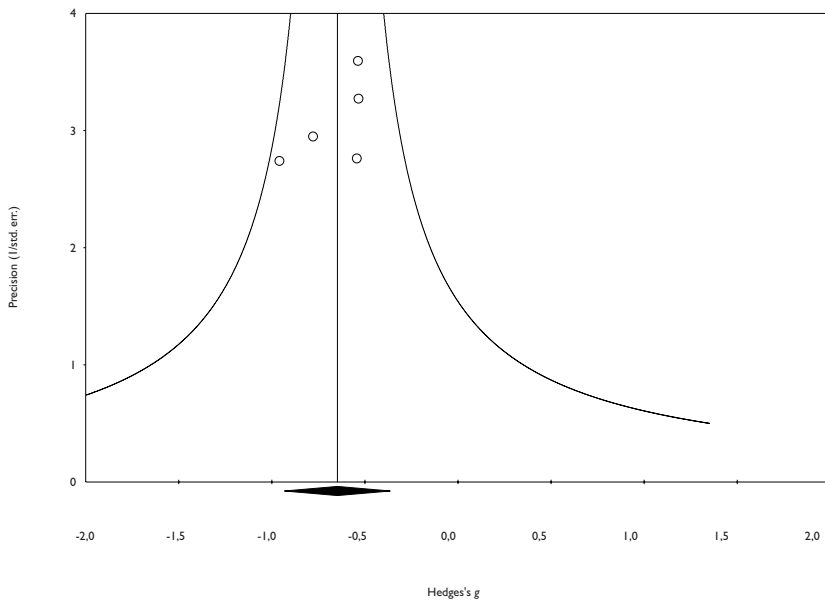


Figure 6. Funnel plot of precision by Hedges' g for measures of quality of life.

We found that MABIs have been employed in clinical trials for PD, SAD, and GAD, for samples of mixed anxiety disorders, and for samples with anxiety and depression. The pre- to post-treatment effect sizes obtained show that MABIs are associated with substantial reductions in symptoms of anxiety and in comorbid depressive symptoms. Post-treatment to follow-up effect sizes indicated that these gains were maintained over time. It has been argued that MABIs might be more attractive to patients due to their emphasis on wider life concerns than mere symptom removal. We decided to assess this claim by computing effect sizes for measures of quality of life, and found pre- to post-treatment effects sizes in the medium range. This provides some indication that MABIs do contribute to types of outcome over and above reductions in psychological distress. It must be noted that the within-group effect size of 0.65 found in the present review indicates that the studies of MABIs assessing quality of life do not yield superior results to CBT. Despite a paucity of studies examining the effect of treatment on quality of life in the anxiety disorders, recent meta-analyses of CBT for PD and GAD report between-group effect sizes of 0.85 and 0.86 compared to no-treatment control, respectively (Mitte 2005a, 2005b).

The majority of the trials were uncontrolled, precluding definite conclusions about the role of mindfulness or acceptance interventions as such in bringing about the observed changes. However, the four trials employing proper randomization procedures indicate that MABIs outperform waitlist (Roemer *et al.*, 2008) and placebo controls (Kim *et al.*, 2009; Lee *et al.*, 2007), and either perform as well as (Piet *et al.*, 2010) or slightly poorer than established treatments (Koszycski, Benger, Shlik, & Bradwejn, 2007).

The present study adds to a growing body of evidence indicating that MABIs are associated with decreases in a broad range of symptom measures for a variety of disorders and conditions, including anxiety and depression (Brown *et al.*, 2007; Hayes *et al.*, 2006; Hofmann *et al.*, 2010). This study supplements and expands on prior reviews by identifying and synthesizing studies exclusively on samples diagnosed with anxiety

disorders. Available research thus suggests that therapeutic strategies aimed at fostering a stance of mindfulness and acceptance are effective in reducing distress associated with anxiety disorders. This is notable, given that these approaches put less emphasis on the removal of symptoms as such, and more emphasis on cultivating a different relationships to distressing thoughts, feelings, and behavioural impulses. It seems that this strategy paradoxically could lead to less distress.

How do the effects of MABIs compare to the evidence base for the treatment of choice for anxiety disorders, CBT? A recent meta-analysis of RCTs for disorder-specific CBT for anxiety disorders yielded a pre- to post-treatment effect size of 1.58 (Norton & Price, 2007). The within-group effect size for randomized controlled studies from this meta-analysis was 1.46, comparing well to the effect size reported by Norton and Price (2007). The same is the case for the within-group effect size for multi-component MABIs (1.27). The average between-group effect size for RCTs in the current study was 0.83, which compares favourably to the effect size of 0.73 reported by Hofmann and Smits (2008) for placebo-controlled trials of CBT. Comparing to findings for depression, Oei and Dingle (2008) reported average effect sizes for group cognitive behaviour therapy of 1.11 for controlled studies and 1.30 for pre- to post-treatment comparisons (uncontrolled studies).

Caution should be exercised in comparing effect sizes for MABIs with those found for disorder-specific CBT, as the latter are computed on the basis of a far greater number of trials of a higher methodological quality. It is reasonable to conclude that given the current evidence base, disorder-specific CBT remains the first-line treatment of anxiety disorders for most patients. However, the findings from the present meta-analysis are promising and warrant further investigation of MABIs as a treatment for this class of disorders.

The observed heterogeneity indicates that the studies under review are not functionally equivalent, that is, that effect sizes vary from study to study. Potential sources of heterogeneity in the current studies could be variations in interventions, study design, or patient samples. The moderator analyses examined whether intervention type (group vs. individual, mindfulness training vs. multi-component treatment, group vs. individual treatment, MBSR vs. MBCT), design (RCT vs. uncontrolled studies), or patient sample (type of disorder) were associated with systematic variation in effect sizes. We also assessed the potential impact of treatment dosage on effect size. No significant moderating effects were found on the variables examined, apart from an observed superiority in effect size for clinical trials on samples of patients with mixed anxiety disorders (i.e., including patients with both a primary diagnosis of PD and with a primary diagnosis of GAD). This finding could be an indication that treating samples of patients with heterogeneous anxiety disorders confers an advantage, potentially related to MABIs as transdiagnostic approach. However, we are reluctant to draw any firm conclusions on the grounds that this category contained only four studies.

Of particular note is the fact that no significant differences emerged between stand-alone mindfulness interventions and multi-component treatment packages such as ACT and ABBT. This finding can be seen as supporting our initial assumption that these approaches constitute a family of treatments that pursue slightly different pathways to a common goal. A note of caution must be added, as the number of studies of MABIs for anxiety disorders is still small. Due to the relatively low number of trials, there is a possibility for committing type II errors (i.e., saying there is no difference when in fact a difference does exist). Although non-significant findings should not be over-interpreted, they should also not be ignored when the magnitude of effect is substantial.

In the present moderator analyses, we found substantial numerical differences between (a) multi-component treatments over pure mindfulness training (within-group effect sizes of 1.27 vs. 0.96), and (b) MBCT over MBSR (within-group effect sizes of 1.03 vs. 0.86). Both patterns of findings indicate that the addition of specific psychotherapeutic content to mindfulness training is likely to be beneficial for people with anxiety disorders. Thus, multi-component treatments may be more efficacious, but further research is needed to determine whether this is really the case.

We also observed a parallel non-significant yet substantial difference in effect sizes when comparing individual interventions to group interventions (within-group effect sizes of 1.31 vs. 1.01), making worthwhile a further empirical investigation of our hypothesis that the individual administration of MABIs might incur benefits for patients with anxiety disorders.

Methodological limitations

Despite our systematic search strategy, we cannot rule out that we might have failed to include studies meeting the inclusion criteria. However, the publication bias analysis suggests that it is unlikely that a 'file drawer effect' should influence the results. Another limitation of the present meta-analysis is the methodological quality of the studies we found. The majority of studies included in this review were uncontrolled trials. Although results suggest that MABIs show promise in the treatment and/or management of anxiety disorders, the evidence at present precludes any definite conclusions about the relative contribution of mindfulness practice or acceptance exercises as such to outcome. Awaiting replication in more well-designed studies, this family of treatments should be seen as a promising approach that merits further attention, but which at present has not been shown to perform as well as the most established treatments for anxiety disorders.

Most trials to date are characterized by single group pre-post research designs and a small number of participants. Assessment of outcome is limited by a reliance on subjective end-point data, lack of ratings of clinical severity, and infrequent estimation of the clinical significance of findings. Measures of adherence or competence have not been included, making treatment integrity an open question. Almost all studies permitted the concurrent use of antidepressants or anxiolytic medication, thereby undermining any definite claim about the psychotherapeutic features of MABIs being the cause of the observed outcome.

It can be argued that the main challenge in research on these interventions is to clarify whether there are specific treatment effects due to the unique components of MABIs. A number of instruments have been developed to measure the capacity for mindfulness and acceptance, making it possible to assess the potential mediating role of these variables in determining outcome. Only one study under review included a preliminary investigation of mindfulness as a possible mediator, but did not examine the variable further as it did not demonstrate significant change by mid-treatment (Kocovski *et al.*, 2009). In the absence of such evidence, it cannot be ruled out that the effects of mindfulness-based treatment could be due to 'non-specific' factors such as social support, group cohesion, relaxation, increased self-efficacy, and a number of other factors. The evidence is somewhat more promising for measures of acceptance, as three studies utilizing the Acceptance and Action Questionnaire (AAQ) (Hayes *et al.*, 2004) to assess the level of experiential avoidance found evidence of change in AAQ scores predicting changes in symptom severity and post-treatment responder status (Dalrymple & Herbert, 2007; Hayes, Orsillo, & Roemer, 2010; Kocovski *et al.*, 2009). Given that we now know that

MABIs are associated with symptom improvement for patients with anxiety disorders, it would be useful for future research to address how outcome is brought about by way of methodologically more robust tests for mediation.

Future directions

Results from this review and meta-analysis indicate that a continuing investigation of MABIs for patients with anxiety disorders is warranted. Further randomized controlled studies are needed, in which MABIs are compared to current treatments of choice for anxiety disorders. It remains important to further investigate both the comparative efficacy and the therapeutic processes involved in MABIs versus CBT for anxiety disorders. There is some debate as to whether MABIs should be seen as a qualitatively novel 'third wave' within CBT, or whether these approaches are better viewed as an extension of the CBT framework (see Arch & Craske, 2008; Hofmann & Asmundson, 2008). In our view, an integration of these approaches is possible and even desirable, but we would nonetheless argue against conflating the therapeutic strategies advocated by the two approaches in the absence of careful theoretical and empirical investigation.

As noted, future studies would also benefit from more robust investigation of the role of mindfulness and acceptance as statistical mediators of the effects of MABIs for anxiety disorders. As indicated by differential (although non-significant) effect sizes in the present moderator analyses, the issues of individual versus group administration and the potential benefits of combining mindfulness with other treatment components merit further investigation. It also seems relevant for studies of MABIs to measure non-specific factors that could lead to improved outcome that are not related to the hypothesized mechanisms of actions of these interventions.

Investigations of MABIs would further benefit from including measures of clinical severity, as well as assessing the clinical significance of outcomes. As the field matures, it will also be necessary to develop ways of assessing the fidelity of instructors or therapists to treatment programmes as well as their competence. A relevant question in this regard is that of the personal mindfulness practice of the professional delivering these interventions. MBSR and MBCT require instructors to practice mindfulness themselves, in order to be able to teach others in an authentic way (Kabat-Zinn, 2003). However, little is empirically known about the effects of such practice on the quality of the service provided. Future trials should consider these issues in order to clarify the potential of MABIs in relation to anxiety disorders.

References

- [Studies included in the meta-analysis are indicated by an asterisk]
- Amstadter, A. (2008). Emotion regulation and anxiety disorders. *Journal of Anxiety Disorders*, 22, 211–221. doi:10.1016/j.janxdis.2007.02.004
- Baer, R. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Research and Practice*, 10, 125–143. doi:10.1093/clipsy.bpg015
- Baer, R. A. (2007). Mindfulness, assessment, and transdiagnostic processes. *Psychological Inquiry*, 18, 238–271. doi:10.1080/10478400701598306
- Barlow, D. H., Allen, L. B., & Choate, M. L. (2004). Toward a unified treatment for emotional disorders. *Behavior Therapy*, 35, 205–230. doi:10.1016/S0005-7894(04)80036-4
- Beck, A. T., Emery, G., & Greenberg, R. L. (1985). *Anxiety disorders and phobias: A cognitive perspective*. New York: Basic Books.

- Berkeljon, A., & Baldwin, S. A. (2009). An introduction to meta-analysis for psychotherapy outcome research. *Psychotherapy Research*, 19, 511–518. doi:10.1080/10503300802621172
- *Bögels, S. M., Sijbers, G. F. V. M., & Voncken, M. (2006). Mindfulness and task concentration training for social phobia: A pilot study. *Journal of Cognitive Psychotherapy*, 20, 33–44. doi:10.1891/jcop.20.1.33
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2005). *Comprehensive meta-analysis version 2*. Englewood, NJ: Biostat.
- Borenstein, M., Hedges, L. V., & Rothstein, H. R. (2007). *Meta-analysis. Fixed effects vs random effects*. Englewood, NJ: Biostat.
- Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, 18, 211–237. doi:10.1080/10478400701598298
- Chiesa, A., & Serretti, A. (2009). Mindfulness-based stress reduction for stress management in healthy people: A review and meta-analysis. *Journal of Alternative and Complementary Medicine*, 15, 593–600. doi:10.1089/acm.2008.0495
- Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology*, 100, 316–336. doi:10.1037//0021-843X.100.3.316
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- *Craigie, M. A., Rees, C. S., & Marsh, A. (2008). Mindfulness-based cognitive therapy for generalized anxiety disorder: A preliminary evaluation. *Behavioral and Cognitive Psychotherapy*, 36, 553–568. doi:10.1017/S135246580800458X
- Craske, M. G., Rauch, S. L., Ursano, R., Prenoveau, J., Pine, D. S., & Zinbarg, R. E. (2009). What is an anxiety disorder? *Depression and Anxiety*, 26, 1066–1085. doi:10.1002/da.20633
- *Dalrymple, K. L., & Herbert, J. D. (2007). Acceptance and commitment therapy for generalized social anxiety disorder – a pilot study. *Behavior Modification*, 31, 543–568. doi:10.1177/0145445507302037
- Eifert, G. H., & Forsyth, J. P. (2005). *Acceptance and commitment therapy for anxiety disorders: A practitioner's treatment guide to using mindfulness, acceptance, and value-based behavior change strategies*. Oakland, CA: New Harbinger Publications.
- *Evans, S., Ferrando, S., Findler, M., Stowell, C., Smart, C., & Haglin, D. (2008). Mindfulness-based cognitive therapy for generalized anxiety disorder. *Journal of Anxiety Disorders*, 22, 716–721. doi:10.1016/j.janxdis.2007.07.005
- *Finucane, A., & Mercer, S. W. (2006). An exploratory mixed methods study of the acceptability and effectiveness of mindfulness-based cognitive therapy for patients with active depression and anxiety in primary care. *BMC Psychiatry*, 6. Retrieved from <http://www.biomedcentral.com/1471-344X/6/14>
- 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 and Therapy*, 48, 738–746. doi:10.1016/j.brat.2010.04.006
- Goldin, P. R., & Gross, J. J. (2010). Effects of mindfulness-based stress reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion*, 10, 83–91. doi:10.1037/a0018441
- *Goldin, P. R., Ramel, W., & Gross, J. J. (2009). Mindfulness meditation training and self-referential processing in social anxiety disorders: Behavioral and neural effects. *Journal of Cognitive Psychotherapy*, 23, 242–257. doi:10.1891/0889-8391.23.3.242
- Griffith, J. W., Zinbarg, R. E., Craske, M. G., Mineka, S., Rose, R. D., Waters, A. M., & Sutton, J. M. (2010). Neuroticism as a common dimension in the internalizing disorders. *Psychological Medicine*, 40, 1125–1136. doi:10.1017/S0033291709991449
- Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research*, 57, 35–43. doi:10.1016/S0022-3999(03)00573-7

- Hayes, S. A., Orsillo, S. M., & Roemer, L. (2010). Changes in proposed mechanisms of action during an acceptance-based behavioral therapy for generalized anxiety disorder. *Behaviour Research and Therapy*, 48, 238–245. doi:10.1016/j.brat.2009.11.006
- Hayes, S. C. (2004). Acceptance and commitment therapy, relational frame theory, and the third wave of behavioral and cognitive therapies. *Behavior Therapy*, 35, 639–665. doi:10.1016/S0005-7894(04)80013-3
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes, and outcomes. *Behaviour Research and Therapy*, 44, 1–25. doi:10.1016/j.brat.2005.06.006
- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy. An experiential approach to behavior change*. New York: Guilford Press.
- Hayes, S. C., Strosahl, K. D., Wilson, K. G., Bissett, R. T., Pistorello, J., Toramino, D., . . . McCurry, S. M. (2004). Measuring experiential avoidance: A preliminary test of a working model. *Psychological Record*, 54, 553–578.
- Hedges, L. V., & Olkin, I. (1985). *Statistical models for meta-analysis*. New York: Academic Press.
- Hedges, L. V., & Vevea, J. L. (1998). Fixed- and random-effects models in meta-analysis. *Psychological Methods*, 3, 486–584. doi:10.1037//1082-989X.3.4.486
- Heidenreich, T., Tuin, I., Pflug, B., Michal, M., & Michalak, J. (2006). Mindfulness-based cognitive therapy for persistent insomnia: A pilot study. *Psychotherapy and Psychosomatics*, 75, 188–189. doi:10.1159/000091778
- Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistencies in meta-analyses. *British Medical Journal*, 327, 557–560.
- Hofmann, S. G., & Asmundson, G. J. G. (2008). Acceptance and mindfulness-based therapy: New wave or old hat? *Clinical Psychology Review*, 28, 1–16. doi:10.1016/j.cpr.2007.09.003
- 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. doi:10.1037/a0018555
- Hofmann, S. G., & Smits, J. A. (2008). Cognitive-behavioral therapy for adult anxiety disorders: A meta-analysis of randomized placebo-controlled trials. *Journal of Clinical Psychiatry*, 69, 621–632.
- Huppert, J. D. (2008). Anxiety disorders and depression comorbidity. In M. M. Antony & M. B. Stein (Eds.), *Oxford handbook of anxiety and related disorders* (pp. 576–586). Oxford: Oxford University Press.
- Kabat-Zinn, J. (1990). *Full catastrophe living. Using the wisdom of your body and mind to face stress, pain, and illness*. New York: Bantam.
- Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Research and Practice*, 10, 144–156. doi:10.1093/clipsy.bpg016
- *Kabat-Zinn, J., Massion, A. O., Kristeller, J., Peterson, L., Fletcher, K. E., Pbert, L., . . . Santorelli, S. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *American Journal of Psychiatry*, 149, 936–943.
- Kenny, M. A., & Williams, J. M. G. (2007). Treatment-resistant depressed patients show a good response to mindfulness-based cognitive therapy. *Behavior Research and Therapy*, 45, 617–625. doi:10.1016/j.brat.2006.04.008
- *Kim, Y. W., Lee, S., Choi, T. K., Young, S. Y., Kim, B., Kim, C. M., . . . Yook, K. (2009). Effectiveness of mindfulness-based cognitive therapy as an adjunct to pharmacotherapy in patients with panic disorder or generalized anxiety disorder. *Depression and Anxiety*, 26, 601–606. doi:10.1002/da.20552
- *Kim, B., Lee, S., Kim, Y. W., Choi, T. K., Yook, K., Suh, S. Y., . . . Yook, K. (2010). Effectiveness of a mindfulness-based cognitive therapy program as an adjunct to pharmacotherapy in patients with panic disorder. *Journal of Anxiety Disorders*, 24, 590–595. doi:10.1016/j.janxdis.2010.03.019

- *Kocovski, N. L., Fleming, J. E., & Rector, N. A. (2009). Mindfulness and acceptance-based group therapy for social anxiety disorder: An open trial. *Cognitive and Behavioral Practice*, 16, 276–289. doi:10.1016/j.cbpra.2008.12.004
- *Koszycki, D., Benger, M., Shlik, J., & Bradwejn, J. (2007). Randomized trial of a meditation-based stress reduction program and cognitive behavior therapy in generalized social anxiety disorder. *Behavior Research and Therapy*, 45, 2518–2526. doi:10.1016/j.brat.2007.04.011
- Krisanaprakornit, T., Sriraj, W., Piyavhatkul, N., & Laopaiboon, M. (2006). Meditation therapy for anxiety disorders. *Cochrane Database of Systematic Reviews* 2006, Issue 1. Art. No.: CD004998. doi: 10.1002/14651858.CD004998.pub2.
- Kuyken, W., Byford, S., Taylor, R. S., Watkins, E., Holden, E., White, K., . . . Teasdale, J. (2008). Mindfulness-cognitive therapy to prevent relapse in recurrent depression. *Journal of Consulting and Clinical Psychology*, 76, 966–978. doi:10.1037/a0013786
- *Lee, S. H., Ahn, S. C., Lee, Y. J., Choi, T. K., Yook, K. H., & Suh, S. Y. (2007). Effectiveness of a meditation-based stress management program as an adjunct to pharmacotherapy in patients with anxiety disorder. *Journal of Psychosomatic Research*, 62, 189–195. doi:10.1016/j.jpsychores.2006.09.009
- Ludwig, D. S., & Kabat-Zinn, J. (2008). Mindfulness in medicine. *Journal of the American Medical Association*, 300, 1350–1352. doi:10.1001/jama.300.11.1350
- Ma, S., & Teasdale, J. (2004). Mindfulness-based cognitive therapy for depression: Replication and exploration of differential relapse prevention effects. *Journal of Consulting and Clinical Psychology*, 72, 31–40. doi:10.1037/0022-006X.72.1.31
- Mansell, W., Harvey, A., Watkins, E., & Shafran, R. (2009). Conceptual foundations of the transdiagnostic approach to CBT. *Journal of Cognitive Psychotherapy*, 23, 6–19. doi:10.1891/0889-8391.23.1.6
- Mathews, A., & MacLeod, C. (2005). Cognitive vulnerability to emotional disorders. *Annual Review of Clinical Psychology*, 1, 167–195. doi:10.1146/annurev.clinpsy.1.102803.143916
- McMillan, D., & Lee, R. (2010). A systematic review of behavioral experiments vs. exposure in the treatment of anxiety disorders: A case of exposure while wearing the emperor's new clothes? *Clinical Psychology Review*, 30, 467–478. doi:10.1016/j.cpr.2010.01.003
- McRoberts, C., Burlingame, G. M., & Hoag, M. J. (1998). Comparative efficacy of individual and group psychotherapy: A meta-analytic perspective. *Group Dynamics: Theory, Research, and Practice*, 2, 101–117. doi:10.1037/1089-2699.2.2.101
- Mitte, K. (2005a). A meta-analysis of the efficacy of psycho- and pharmacotherapy in panic disorder with and without agoraphobia. *Journal of Affective Disorders*, 88, 27–45. doi:10.1016/j.jad.2005.05.003
- Mitte, K. (2005b). Meta-analysis of cognitive-behavioral treatments for Generalized Anxiety Disorder: A comparison with pharmacotherapy. *Psychological Bulletin*, 131, 785–795. doi:10.1037/0033-2909.131.5.785
- Norton, P. J., & Price, E. M. (2007). A meta-analytic review of adult cognitive-behavioral treatment outcome across the anxiety disorders. *Journal of Nervous and Mental Disease*, 195, 521–531. doi:10.1097/01.nmd.0000253843.70149.9a
- Oei, T. P. S., & Dingle, G. (2008). The effectiveness of group cognitive therapy for unipolar depressive disorders. *Journal of Affective Disorders*, 107, 5–21. doi:10.1016/j.jad.2007.07.018
- *Ossman, W. A., Wilson, K. G., Soraasli, R. D., & McNeill, J. W. (2006). A preliminary investigation of the use of acceptance and commitment therapy in group treatment for social phobia. *International Journal of Psychology and Psychological Therapy*, 6, 397–416.
- Öst, L. G. (2008). Efficacy of the third wave of behavioral therapies: A systematic review and meta-analysis. *Behavior Research and Therapy*, 46, 296–321. doi:10.1016/j.brat.2007.12.005
- *Piet, J., Hougaard, E., Hecksher, M. S., & Rosenberg, N. K. (2010). A randomized pilot study of mindfulness-based cognitive therapy and group cognitive-behavioral therapy for young adults with social phobia. *Scandinavian Journal of Psychology*, 51. Retrieved from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9450.2009.00801.x/pdf>

- Powers, M. B., Sigmarsson, S. R., & Emmelkamp, P. M. G. (2008). A meta-analytic review of psychological treatments for social anxiety disorder. *International Journal of Cognitive Therapy, 1*, 94–113. doi:10.1521/ijct.2008.1.2.94
- Powers, M. B., Zum Vörde Sive Vörding, M. B., & Emmelkamp, P. M. G. (2009). Acceptance and commitment therapy: A meta-analytic review. *Psychotherapy and Psychosomatics, 78*, 73–80. doi:10.1159/000190790
- *Ramel, W., Goldin, P. R., Carmona, P. E., & McQuaid, J. R. (2004). The effects of mindfulness meditation on cognitive processes and affect in patients with past depression. *Cognitive Therapy and Research, 28*, 433–455. doi:10.1023/B:COTR.0000045557.15923.96
- *Ree, M. J., & Craigie, M. A. (2007). Outcomes following mindfulness-based cognitive therapy in a heterogeneous sample of adult outpatients. *Behavior Change, 24*, 70–86. doi:10.1375/bech.24.2.70
- Roemer, L., Erisman, S. M., & Orsillo, S. M. (2008). Mindfulness and acceptance-based treatments for anxiety disorders. In M. M. Antony & M. B. Stein (Eds.), *Oxford handbook of anxiety and related disorders* (pp. 476–487). Oxford: Oxford University Press.
- Roemer, L., & Orsillo, S. M. (2009). *Mindfulness- and acceptance-based behavioral therapies in practice*. New York: Guilford Press.
- *Roemer L., Orsillo, S. M., Saltners-Pedneault, K. (2008). Efficacy of an acceptance-based behavior therapy for generalized anxiety disorder: Evaluation in a randomized controlled trial. *Journal of Consulting and Clinical Psychology, 76*, 1083–1089. doi:10.1037/a0012720
- Segal, Z. V., Williams, J. M. G. & Teasdale, J. D. (2002). *Mindfulness-based cognitive therapy for depression. A new approach to preventing relapse*. New York: Guilford Press.
- Sterne, J. A. C., & Harbord, R. M. (2004). Funnel plots in meta-analysis. *Stata Journal, 4*, 127–141.
- Teasdale, J. D., Segal, Z. V., Williams, J. M. G., 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. doi:10.1037//0022-006X.68.4.615
- Toneatto, T., & Nguyen, L. (2007). Does mindfulness meditation improve anxiety and mood symptoms? A review of the controlled research. *Canadian Journal of Psychiatry, 52*, 260–266.
- Tucker, M., & Oei, T. P. S. (2007). Is group more cost effective than individual cognitive behavior therapy? The evidence is not solid yet. *Behavioural and Cognitive Psychotherapy, 35*, 77–91. doi:10.1017/S1352465806003134
- Williams, J. M. G. (2010). Mindfulness and psychological process. *Emotion, 10*, 1–7. doi:10.1037/a0018360
- *Yook, K., Lee, S., Ryu, M., Kim, K., Choi, K. C., Suh, S. Y., . . . Kim, M. (2008). Usefulness of mindfulness-based cognitive therapy for treating insomnia in patients with anxiety disorders. *Journal of Nervous and Mental Disease, 196*, 501–503. doi:10.1097/NMD.0b013e31817762ac

Received 12 November 2010; revised version received 6 June 2011