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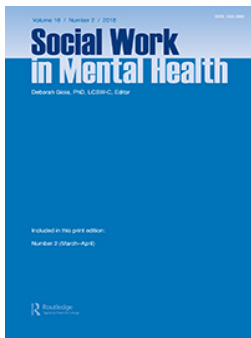
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Relative effectiveness of mindfulness and cognitive behavioral interventions for anxiety disorders: Meta-analytic review

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ABSTRACT

Increasingly popular mindfulness intervention innovations seem demonstrably effective in alleviating anxiety among people with anxiety disorders. However, the basis of such primary and synthetic evidence has, for the most part, been comparisons with non-active comparison conditions such as waiting lists. The longest-standing and strongest evidence-informed practices in this field have been cognitive behavioral interventions (CBI). This meta-analysis synthesized evidence from nine randomized trials of the relative effectiveness of mindfulness interventions compared to CBIs (i.e., active control groups) in treating anxiety disorders. The sample-weighted synthesis found no statistically or practically significant differences between the two groups on anxiety alleviation: Cohen's $d = -0.02$ (95% confidence interval = $-0.16, 0.12$). Both groups enjoyed large clinical benefits. However, because mindfulness methods may require less professional training and take less time for both workers and clients to master, they are probably less expensive to provide. As they are probably less expensive, but equally effective, it seems that, in a cost-beneficial sense, mindfulness interventions may be more practically effective. These review-generated meta-analytic findings and inferences may be best thought of as developed hypotheses for future research testing. These and other future research needs are discussed.

KEYWORDS

Anxiety disorders; cognitive behavioral interventions; meta-analysis; mindfulness; social work practice

Anxiety can be an adaptive emotion that helps one prepare for possible threats. It only becomes maladaptive when the anxiety is chronic, excessive, and uncontrollable (Beidel, Bulik, Stanley, & Anne, 2012; Butcher, Mineka, & Hooley, 2010). These are often associated with work and family life stresses, financial strains, or illnesses (Butcher et al., 2010). With interacting personal and environment determinants, problems with anxiety usually begin in childhood or adolescence (Beidel et al., 2012; Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007). There are 12 categories of anxiety disorders in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders*, the

most common of which are generalized anxiety disorder, panic disorder, and social anxiety disorder (American Psychiatric Association, 2013; Kroenke et al., 2007). Their commonalities are three-fold: physical symptoms (e.g., increased heart rate, sweating, feeling tense), negative cognitions or subjective distress, and behavioral symptoms such as avoidance (Beidel et al., 2012). One can easily intuit the relevance to social work with the relatively greater stresses and strains in the lives of those we often aim to serve, for example, those living in poverty. And even if anxiety is not the primary target of our work one can clearly see how anxiety might exacerbate other personal, familial or even social-structural challenges and could become a robust barrier to our most effective work with such diverse clients.

Anxiety disorders are a public concern as well. In aggregate, they are the second most common mental disorder seen in primary care settings (Ansseau et al., 2004; Kroenke et al., 2007). A systematic review of 50 studies by Somers, Goldner, Waraich, and Hsu (2006) estimated the lifetime prevalence of any anxiety disorder to be 17%. In other words, one of every six people is likely to have an anxiety disorder at some time during their lives. Moreover, many of them (57%) will have a comorbid mental disorder, most likely another anxiety disorder or depression (Beidel et al., 2012). Anxiety has negative consequences for individuals and society. Woodward and Fergusson (2001) found that people living with anxiety have increased risks of academic underachievement, early parenthood, depression, substance abuse, and suicidal behaviors. Given such interrelated sequela, it is not surprising that anxiety disorders also detrimentally affect society through such socioeconomic forces as decreased productivity and increased use of health care services (Wittchen, 2002). In the United States alone, the cost of anxiety disorders is estimated to be more than 40 billion dollars per year (Kroenke et al., 2007).

The most common treatments for anxiety disorders are cognitive behavioral interventions (CBIs). CBIs were first developed by Aaron Beck and his colleagues (Beck, Rush, Shaw, & Emery, 1979) for the treatment of depression. Many studies, however, have found CBIs to be effective treatments of anxiety disorders (e.g., Barlow, Allen, & Basden, 2007; DeRubeis & Crits-Christoph, 1998). The average recovery rate, indicative of clinically significant anxiety alleviation, for CBIs across all anxiety disorders is about 70% (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Beidel et al., 2012). CBIs are based on the idea that cognitive and behavioral factors influence emotional dominance (Beck & Emery, 2005). Cognitive-behavioral therapists believe that problems result from biased processing of stimuli. These biases distort individuals' experiences and create realities that are filled with cognitive errors (Beck & Emery, 2005). The primary goal of CBIs is to reduce anxiety by identifying cognitive distortions and replacing them with adaptive ones. There are numerous types of CBI, the most common of which is cognitive restructuring.

Mindfulness is a new form of treatment that has become increasingly popular over the past decade or so. However, the concept of mindfulness is over 2000 years old. It originates from Buddhist traditions, where it is important in the practice of attaining enlightenment (Snyder & Lopez, 2011). Mindfulness was first introduced into Western medicine by Kabat-Zinn (2003) during the 1980s for the management of chronic pain. It was found to be successful and expanded to other disorders, such as depression and anxiety during the 1990s. The definition of mindfulness involves the awareness that emerges through purposefully paying attention to the present moment and, without prejudice, observing the unfolding experience a moment at a time (Snyder & Lopez, 2011). Mindfulness interventions are based on learning skills that allow one to disengage from dysfunctional cognitive routines by paying attention to the present moment on purpose and without judgement (Kabat-Zinn, 2003; Segal, Williams, & Teasdale, 2002). There are numerous types of mindfulness interventions: mindfulness-based cognitive therapy, mindfulness-based stress reduction, acceptance therapy, yoga-based therapy, relaxation therapy, and others.

Mindfulness interventions have been increasingly integrated into mental and physical health practices over the past 10 to 15 years. Developmental studies have demonstrated their effectiveness, but have typically used comparisons to non-active comparison or control groups such as those composed of participants on waiting lists (Craigie, Rees, Marsh, & Nathan, 2008; Hoge et al., 2013; Houghton, 2008). Several generally relevant systematic reviews and meta-analyses have been accomplished in diverse contexts, ranging from social work practice and allied mental health, including psychological practice to primary care and diverse specialized medical practices (De Vibe, Bjørndal, Tipton, Hammerstrøm, & Kowalski, 2012; Gotink et al., 2015; Rhodes, 2014). They also consistently found that mindfulness interventions could largely alleviate the symptoms of anxiety disorders and their damaging sequela, but they were also most typically based on non-active comparison conditions. Recent narrative and systematic reviews have recorded contemporary inroads of mindfulness interventions into diverse social work fields of practice from, for example, practices with addicts to culturally adapted practices with Hispanic immigrants (Escobar & Gorey, 2017; Garland, 2013; Trowbridge & Lawson, 2016). Garland concluded that they are a “natural fit,” mindfulness methods being highly congruent with strengths-based, empowerment methods of social work practice.

This synthetic study is a more controlled meta-analysis of the effectiveness of mindfulness interventions compared to CBIs (i.e., active control groups) in treating anxiety disorders. In that mindfulness innovations will be compared to this field’s most prevalently offered CBIs we think that this synthesis will begin to better inform cost-benefit decisions than previous ones. Given previous primary and synthetic research suggestions about the general

effectiveness of mindfulness interventions as well as their seeming colloquial and professional popularity, we explored the hypothesis that mindfulness interventions are more effective than CBIs for people with anxiety disorders.

Methods

Sample of studies

Searches of the following research databases were conducted until March of 2017: *Social Work Abstracts*, *Social Service Abstracts*, *PsycINFO*, *PubMed*, *Web of Science*, *CINAHL Complete*, *Cochrane Library*, *ProQuest Dissertations and Theses* and *Google Scholar* (De Smidt & Gorey, 1997; Torgerson, 2006). The following keywords were used to search the databases (cognitive behav* or cognitive-behav* therapy, treatment or intervention, CBT, or CBI) and (mindfulness or mindfulness-based stress reduction or MBSR or mindfulness-based cognitive therapy or MBCT) and (anxi* or anxiety disorder or generalized anxiety disorder or GAD or panic attack or panic disorder or PD or social anxiety or social anxiety disorder or SAD or separation anxiety or phobia) and (experiment or randomized controlled trial or RCT) (see table footnotes for explanation of acronyms). Nine RCTs that independently compared mindfulness with CBIs immediately post-intervention on a validated measure of anxiety were selected. They are noted in the references section with an asterisk. RCTs were selected for their high internal validity. Immediate post-intervention data were analyzed because all the studies made such reports, while only a few made longer follow-up reports.

Meta-analysis

Findings of the nine experimental studies were synthesized by means of a meta-analysis. Meta-analyses use quantitative and standardized measures of intervention effect size, allowing one to move beyond simplistic statistical questions such as whether a given intervention seems to work. Effect size metrics allow one to estimate how much better a new treatment innovation is than an established or more traditional treatment in achieving a desired goal, in this instance, anxiety alleviation (Coe, 2002; Cooper, Hedges, & Valentine, 2009). They tend to put the focus on practical, clinical or policy, significance rather than on mere statistical significance.

Cohen's (1988) *d*-index served as this study's central meta-analytic effect size statistic. Allowing for the translation of the primary studies' diverse statistical outcomes into a common metric, it aids in making between-study comparisons. It can be calculated directly from study group means and standard deviations ($d = M_1 - M_2 / (SD_1 + SD_2) / 2$) or can be derived from a host of parametric or nonparametric statistics (chi-square [χ^2], *t*-test, *F*-ratio and others; Chinn, 2000;

Cooper, 2017). To aid practical interpretations, clinically and statistically significant d s were converted to Cohen's U_3 statistics (1988). U_3 is intuitively appealing because it compares all the participants' scores in one study group with the median or typical participant's score in another. It practically assists interpretations by putting the emphasis on people rather than on statistics. For example, a hypothetically supportive study d of 1.00 is equivalent to a U_3 of 84%. If it resulted from the post-test comparison of respective groups of clients who experienced mindfulness or CBIs on a continuous measure of anxiety, it could be interpreted as follows; More than 80% or approximately 17 of every 20 of the clients who experienced the mindfulness intervention scored lower on the anxiety measure at post-test than did the typical client in the CBI control group. Given adequate experimental samples, one can assume that the groups were equivalent on anxiety at pre-test. It should be noted that hypothetically supportive and counter-hypothetical effects will be reported, respectively, as positive and negative d s. Fixed individual study effects (d s) were weighted by their inverse variances so that larger, more precise studies influenced the synthesis more than smaller studies and the pooled d 's combined statistical significance was estimated with a 95% confidence interval [CI] (Chinn, 2000; Cooper, 2017; Greenland, 1987). A 95% CI that includes the null value of 0.00 indicates that the aggregate difference between the two study groups was not statistically significant.

The effect distribution was then tested for heterogeneity with Cochran's Q statistic (Cooper, 2017; Fleiss, Levin, & Paik, 2003; Hedges, 1994). With a chi square (χ^2) distribution, it tests if the variability of effects is greater than expected by sampling error. Potential sources of variability or effect moderations were explored. One such source, the difference between published and unpublished study effects, an indicator of potential publication bias, was tested with Cochran's Q_b statistic. It is a function of Q and again, distributed as χ^2 . Outliers were also explored. For instance, Lauren Drvaric (2013) studied very brief, one-hour interventions. Her estimated effect was compared to that of the eight studies of much more extended interventions. Also, there was only one study of mindfulness-based cognitive therapy which incorporates aspects of mindfulness and CBIs (Piet, Hougaard, Hecksher, & Rosenberg, 2010). Its effect was compared to that of the eight studies of mindfulness-specific interventions. All analyses were replicated with 100% agreement between two meta-analysts, this study's co-authors.

Results

Sample description

Characteristics of the 739 participants and nine randomized trials are displayed in Table 1. First, the trials may not be very well controlled as the

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

Citation	Piet et al. (2010)	Faucher et al. (2016)	Kocovski et al. (2013)	Goldin et al. (2016)	Drvaric (2013)	Arch et al. (2013a)	Arch et al. (2013b)	Sundquist et al. (2015)	Arch et al. (2012)
Type of Anxiety	Social Phobia	SAD	SAD	SAD	GAD	Mixed	Mixed	Mixed	Mixed
Mdn Age Range	18–25	37	18–62	33	16–65	46	47	42	38
Gender (% female)	56	54	54	57	76	22–78	18–75	20–64	19–60
Comorbid (%)	42	nd	47	24	57	68	nd	nd	nd
Race (%):									
White ^a	nd	85	62	44	nd	70	68	nd	67
Hispanic			4	9		9	10		12
Black ^b		8	4			6	4		8
Asian		7	20	39		8	7		8
Other			10	8		7	11		5
Samples:									
Mindfulness	14	14	53	36	15	45	32	110	38
CBI	12	13	53	36	15	60	39	105	49
Cohen's <i>d</i>	-0.17	-0.27	0.01	0.33	-1.02	0.03	0.00	0.05	-0.17
LFU (%):									
Mindfulness	21	nd	30	3	0	55	0	25	0
CBI	8		40	3	0	43	0	18	0
Op Def:	MBCT:	MBSR:	MAGT:	MBSR:	Mindfulness	MBSR:	MBSR:	Mindfulness:	ACT:
Mindfulness	Segal et al. (2002)	Kabat-Zinn et al. (1993; 2003)	Fleming & Kocovski (2009)	Kabat-Zinn & Santorelli (1993)	Kabat-Zinn (2003)	Arch et al. (2013)	Arch et al. (2013)	Kabat-Zinn (2003)	Eifert & Forsyth (2005)
CBI	Hougaard (2006)	Heimberg & Becker (2002)	Heimberg & Becker (2002)	Heimberg & Becker (2002)	Heimberg & Becker (2002)	Craske (2005)	Craske (2005)	Heimberg & Becker (2002)	Forsyth (2005)
Duration	8 weeks	8 weeks	12 weeks	12 weeks	1 hour	10 weeks	10 weeks	8 weeks	12 weeks
Mindfulness	16 hours	20 hours	24 hours	30 hours		15 hours ^b	15 hours	16 hours	24 hours
CBI	14 weeks	12 weeks	12 weeks	12 weeks	1 hour	10 weeks	10 weeks	6 weeks	12 weeks
	28 hours	30 hours	24 hours	24 hours		25 hours	25 hours	12 hours	24 hours

ACT = acceptance and commitment therapy, CBI = cognitive behavioral intervention, comorbid = significant mental or physical comorbid disorders or illnesses, duration = duration of intervention, GAD = generalized anxiety disorder, LFU = loss to follow-up or drop-out, MAGT = mindfulness and acceptance-based group therapy, MBCT = mindfulness-based cognitive therapy, MBSR = mindfulness-based stress reduction, mdn = median, mindfulness = mindfulness intervention, nd = no data, op def = operational definition of interventions, SAD = social anxiety disorder.

^a Non-Hispanic. ^b Plus an additional 3-hour retreat.

median or most typical mindfulness intervention only had 36 completers, the typical CBI, 39. Moreover, there seemed to have been significant losses of study participants in three or four of the studies. Next, most of them were adults, ranging from 18 to 65 or so, tending to cluster most between 35 and 45. One study was of younger adults between the ages of 18 and 25. Five studies had gender-balanced samples, while two studies each had samples dominated by women or men. The aggregate sample had slightly more women than men (54% vs. 46%). When reported, nearly three-quarters of the study completers were non-Hispanic white people. In nearly all instances any minority ethnic/racial subsample was 10% or less of its study total. One study focused on people with generalized anxiety disorders, four on social anxiety, and the others included people with a variety of anxiety disorders. Finally, the five studies reporting comorbidities suggested that about half of their participants had such mental or physical disorders or illnesses.

Seven of the studies were accomplished in North America, four in the United States, three in Canada, and two in Northern Europe (Denmark and Sweden). All were quite contemporary, published between 2010 and 2016. As anticipated the mindfulness interventions were diverse, four used mindfulness-based stress reduction. The other five used different mindfulness methods, ranging from mindfulness-based cognitive therapy to acceptance and commitment therapy or mindfulness and acceptance-based group therapy. In fact, seven were group and two were individual-level interventions. The CBI groups consisted of six to eight participants, while the mindfulness based groups consisted of twelve to fourteen participants. Similarly, the CBIs were based on treatment manuals produced by three different practice-research groups. Except for the previously mentioned outlier, intervention durations ranged from 15 to 30 total hours over 8 to 14 weeks. Finally, only three studies followed their participants beyond the immediate three-month, post-intervention period.

Meta-analytic findings

In Table 1, note that four of the study effect sizes or Cohen's d -indexes were zero or very close to zero and four others were quite small. The sample-weighted d was also essentially zero - 0.02 (95% CI = - 0.16, 0.12). The fact that the 95% CI includes the null value of 0.00 indicates that the aggregated difference between all the mindfulness and CBI participants in these nine studies was not statistically significant. Moreover, the study effects were no more heterogeneous than could be explained by sampling error; $\chi^2(8) = 9.94$, NS. Therefore, our hypothesis that mindfulness interventions may be more effective than CBIs in alleviating anxiety among people with anxiety disorders was not supported. In fact, the two types of interventions seemed equally effective. The recovery or remission rates for both clustered around 75%. The

outlying study of one-hour interventions ($d = -1.02$, $U_3 = 85\%$) did have a counter-hypothetical effect that was significantly different than that of the eight other studies (weight $d = -0.01$); $\chi^2(1) = 6.40$, $p < .05$. Hence, for this very brief intervention 85% of the CBI participants scored lower on anxiety at post-test than did the typical mindfulness intervention participant. No other characteristic of the participants, contexts, or research designs, outlying or otherwise, significantly moderated the overall meta-analytic effect or mindfulness-CBI difference.

Discussion

This meta-analysis synthesized evidence from nine randomized trials of mindfulness and CBIs for work with people with anxiety disorders. Based on their prevalence, popularity, and strong suggestions of relative effectiveness, we hypothesized that mindfulness methods are more effective than CBIs. However, the meta-analytic findings, practical and statistical, indicated that mindfulness interventions were not more effective than CBIs. In fact, both sets of intervention methods seemed to be quite effective in alleviating anxiety. This “nonsignificant” between-group synthetic finding, however, may ultimately be quite significant in clinical and policy matters. Furthermore, our central null finding, in concert with our finding of no significant difference between the outcomes of articles published in peer-reviewed journals and an unpublished thesis effectively rules out publication bias as a potent confound in this meta-analysis.

Mindfulness methods have been shown to be more cost effective than other treatment methods in other clinical contexts (Hofmann & DiBartolo, 2014; Knight, Bean, Wilton, & Lin, 2015). In this context, because they tend to have a more generalist stance and a somewhat less task-centered focus, mindfulness methods may require less professional and field training to provide effectively (Snyder & Lopez, 2011). As mindfulness techniques probably take less time and training to master than cognitive behavioral techniques, mindfulness interventions are probably also less expensive to provide. Furthermore, they may be easier to incorporate into clients' daily lives as there are diverse ways to practice mindfulness techniques in very brief sessions of only ten minutes or so (Chiesa & Serretti, 2010; Moore, Gruber, Derose, & Malinowski, 2012). Therefore, on cost-effectiveness or efficiency one could fairly conclude that mindfulness interventions are more effective than CBIs. As they are probably less expensive, but equally effective, it seems that, in a cost-beneficial sense, mindfulness interventions may be more practically effective (Piet et al., 2010). It is important to note though that these meta-analytic findings, as are all such review-generated findings, are correlational and tentative. At this point they may be best thought of as developed hypotheses for future research testing.

Future direction

One study included in this meta-analysis was distinctly counter-hypothetical, that is, its cognitive behavioral participants did much better than its mindfulness participants. It was a tentative outlying study of mere one-hour interventions that had only 15 participants per study group. Still its finding stood in provocative contrast to our central meta-analytic finding. Frankly, we are not certain why such a brief CBI would be more effective than a similarly brief mindfulness intervention. Perhaps there is a steeper initial client learning curve for certain Buddhist and Eastern philosophy-based, mindfulness methods in the West. Narrative study of the experiences of such clients will probably be needed to advance our practical knowledge about which specific methods, cognitive behavioral or mindfulness, are most likely to work best in relatively brief to more extended intervention contexts.

The major limitation of the studies included in this meta-analysis was their small samples. Typical study group samples of 35 to 40 suggested that this field's studies have been generally under-powered. Future randomized trials ought to be better controlled, statistically powered by ample samples sufficient to allow the detection of modest, but clinically significant, between-group differences with confidence. For example, using standard statistical criteria (1-tailed $\alpha = 0.05$; power_{1- β} = 0.80), samples of between 150 and 300 mindfulness and CBI participants each would be required to detect differences characterized by *ds* of 0.20 to 0.30 (Faul, Erdfelder, Lang, & Buchner, 2007; Fleiss et al., 2003). Such larger trials also ought to be amply funded, allowing for the staffing, training and procedural supports needed to ensure high completion rates and longer term, post-intervention follow-up periods.

Relatedly, this synthetic study lacked the meta-analytic power necessary to confidently test mindfulness-CBI differences much beyond an overall main intervention effect. As described in the introduction, there are numerous types of mindfulness interventions not to mention CBI variations. For example, mindfulness interventions in this field range from the incorporation of various mindfulness methods with cognitive behavioral methods to yoga-based therapies. Yet there are not enough individual or comparative studies of specific mindfulness methods to be able to confidently synthesize or meta-analytically test them. Studies of such diverse mindfulness interventions compared to similarly diverse CBIs will be needed in this field's next generation. A research agenda comprised of a series of mindfulness-CBI comparative studies, preferentially randomized controlled trials, will help us to better understand what works best with whom, and under what circumstances. Furthermore, this field has yet to systematically pose and answer questions about the importance of gender, ethnicity, specific diagnoses and comorbidities. If future studies included ample samples of women and men, diverse peoples of color and non-Hispanic white people, people with specific

anxiety disorders and other conditions such as depression and substance abuse disorders, and reported subsample-specific findings, that would go a long way toward advancing this aggregate field's validity, both internal and external.

Finally, though the client participants in the nine trials and the interventions were generally well described, the therapists were not. Psychologists were most prevalent, but social workers and psychiatrists, all ranging from “inexperienced students” to “experienced therapists” were also represented. Beyond that we know little about their general training or trial-specific training in cognitive behavioral or mindfulness methods. But consistent with our developing hypothesis about the relative efficiency of mindfulness interventions, one study claimed effective mindfulness training over only one week, and another reported “certified yoga instructor” as its trained therapist criterion, a credential gained far more expeditiously than a professional degree in social work, psychology, or medicine (Faucher, Koszycki, Bradwejn, Merali, & Bielajew, 2016; Sundquist et al., 2015). All of the trials used treatment manuals and the majority used supervision as intervention fidelity assurances, but only three used standardized fidelity measures to assess therapists' behaviors. Those inferred a high degree of treatment integrity. We do not think our synthesis fatally confounded by this lack—six studies using non-standardized or no fidelity measures versus the three that did—as it did not significantly moderate the overall meta-analytic effect. But given this potential limitation we cannot completely rule-out therapy contamination as a possible alternative explanation for our synthetic findings. Other syntheses of more than 100 studies have noted this limitation across social work and allied mental health interventions and suggested the consistent use of validated treatment fidelity measures in future research (Maynard, Peters, Vaughn, & Sarteschi, 2013; Naleppa & Cagle, 2010). We concur. Additionally, we think that qualitative study of therapists, helping us to better understand their rich narrative experiences, would complement the confident, but often reduced knowledge gained from RCTs. Such mixed-methods studies could aid in planning this field's future research agenda, at once testing existing theories, while developing perhaps more eclectic theories for future research testing.

Conclusions

Our central finding was that mindfulness and cognitive behavioral intervention methods are equally and largely effective for work with people with anxiety disorders. However, because mindfulness methods are probably less expensive in certain contexts, in a cost-beneficial sense, they may be more practically effective in those contexts. These review-generated meta-analytic

findings are best thought of as developed hypotheses for future research testing.

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