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The impact of mindfulness on well-being and performance in the workplace: an inclusive systematic review of the empirical literature

Tim Lomas [a], Juan Carlos Medina [b], Itai Ivtzan [a], Silke Rupprecht [c], Rona Hart [a] and Francisco José Eiroa-Orosa [a,b]

[a]School of Psychology, University of East London, London, UK; [b]Department of Clinical Psychology and Psychobiology, Faculty of Psychology, University of Barcelona, Barcelona, Spain; [c]Institute of Psychology, Leuphana University, Lüneburg, Germany

ABSTRACT

Work can be demanding, imposing challenges that can be detrimental to the physical and mental health of workers. Efforts are therefore underway to develop practices and initiatives that may improve occupational well-being. These include interventions based on mindfulness meditation. This paper offers a systematic review of empirical studies featuring analyses of mindfulness in occupational contexts. Databases were reviewed from the start of records to January 2016. Eligibility criteria included experimental and correlative studies of mindfulness conducted in work settings, with a variety of well-being and performance measures. A total of 153 papers met the eligibility criteria and were included in the systematic review, comprising 12,571 participants. Mindfulness was generally associated with positive outcomes in relation to most measures. However, the quality of the studies was inconsistent, so further research is needed, particularly involving high-quality randomized control trials.

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Mindfulness; meditation; occupation; well-being; systematic review

Introduction

Work appears to be increasingly stressful in the United Kingdom, posing a risk to employees' mental health. This claim is based upon the observation that although the prevalence of mental illness in the general UK population has not significantly increased in the last 20 years (Office for National Statistics 2014), since 2009, the number of sick days lost to stress, depression, and anxiety has increased by 24%, while the number lost to serious mental illness has doubled (Davies, 2014). The annual report by Davies, the UK's Chief Medical Officer, suggests that mental ill health is the leading cause of sickness absence in the United Kingdom, accounting for 70 million sick days (more than half of the 130 million sick days taken every year). Given this context, there are ongoing efforts to develop initiatives to help people deal with the stresses of work, and to protect against or ameliorate work-related mental health issues. In recent years, among the most prominent are programmes based on mindfulness meditation – mindfulness-based interventions (MBIs) – which is the focus of this review.

Mindfulness

Recent decades have seen a burgeoning interest in mindfulness in the West, spanning clinical practice, academia, and society more broadly. Mindfulness is generally regarded as originating in the context of Buddhism around 500 B.C.E., though its roots stretch back even further as part of the Brahmanic traditions in the Indian subcontinent (Cousirs, 1996). It came to prominence in the West through Kabat-Zinn (1982), who harnessed it for an innovative mindfulness-based stress reduction (MBSR) programme (discussed further later) for chronic pain. The term "mindfulness" is polysemous, frequently used to refer to both (1) a state or quality of mind and (2) a form of meditation that enables one to cultivate this. Both uses will be deployed in this review (with the context making clear which is being used). The most prominent operationalization of mindfulness as a state/quality is Kabat-Zinn's (2003, p. 145) definition: "the awareness that arises through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment." Shapiro, Carlson, Astin, and Freedman (2006) formulated a theoretical elucidation of this definition, deconstructing it into three components: intention (motivation for paying attention in this way), attention (cognitive processes through which said attention is enacted), and attitude (the emotional qualities and/or mental stance one adopts with respect to the object of attention, such as compassion or non-judging).

The second main usage of the term mindfulness is for the forms of meditation practice which can facilitate this mindful state. Mindfulness meditation, and meditation more broadly, refers to mental activities which share a common focus on training the self-regulation of attention and awareness (Lomas, Ivtzan, & Fu, 2015), with the goal of enhancing voluntary control of mental processes, thereby increasing well-being (Walsh & Shapiro 2006). Lutz, Slagter, Dunne, and Davidson (2008) suggest most common forms feature either "focused

CONTACT Tim Lomas t.lomas@uel.ac.uk

Practitioner points:
- Understand the value of mindfulness in the workplace.
- Appreciate the strengths and weaknesses of the underlying evidence base.

Supplemental data for this article can be accessed here.

attention" or "open-monitoring" processes. Focused attention can be operationalized in terms of the coordination of various attention networks (Posner & Petersen, 1990), including sustained attention (towards a target, like the breath), executive attention (preventing one's focus from wandering), attention switching (disengaging from distractions), and selective attention and attention reorienting (redirecting focus back to the target). In contrast, open-monitoring refers to a broader receptive capacity to detect events within an unrestricted "field" of awareness (Raffone & Srinivasan, 2010). Mindfulness – both as a practice and as a state/quality – is commonly presented as an example of open-monitoring (Kabat-Zinn, 2003). However, in practice, mindfulness meditation usually involves a combination of both forms, beginning with a period of focused attention on a target, like the breath, in order to focus awareness, followed by a more receptive state of open-monitoring (Chiesa, Calati, & Serretti, 2011).

According to Shapiro et al. (2006), the main significance of mindfulness – as a quality/state and as a practice – is that it involves a meta-mechanism known as reperceiving. The three components of mindfulness (intention, attention, and attitude) combine to generate a "fundamental shift in perspective", in which "rather than being immersed in the personal drama or narrative of our life story, we are able to stand back and witness it" (p. 377). Thus, in practising mindfulness, people are seen as learning how to enter a different *relationship* with their subjectivity: being able to "stand back" and dispassionately view qualia – i.e., the contents of their subjectivity (e.g., thoughts, feelings) – as phenomena passing though their internal world, rather than identifying with and attaching to or becoming averse to such qualia (Bishop et al., 2004). This "standing back" – referred to by Shapiro et al. as "reperceiving" – is also known as "decentring", i.e., "the ability to observe one's thoughts and feelings as temporary, objective events in the mind, as opposed to reflections of the self that are necessarily true" (Fresco et al., 2007, p. 234).

Crucially, Shapiro et al. (2006) theorize reperceiving/decentring as having a positive impact upon well-being. In MBIs, the aim is not to change participants' thoughts/feelings per se, as cognitive therapy might seek to, but to help people "become more aware of, and relate differently to" this content (Shapiro, Astin, Bishop, & Cordova, 2005, p. 165). Thus, MBIs involve "retraining awareness" so that people have greater choice in how they relate and respond to their subjective experience, rather than habitually responding in maladaptive ways (Chambers, Gullone, & Allen, 2009, p. 659). The positive impact of retraining awareness is thought to impact positive on mental health, potentially in the following way: (a) mindfulness involves introspective practices that facilitate the development of attention and awareness skills, (b) development of these skills leads to enhanced emotional regulation (including abilities such as reperceiving), and (c) emotional regulation is a meta-skill that subserves manifold well-being outcomes (while, conversely, poor regulation is a transdiagnostic factor underlying diverse psychopathologies) (Aldao, Nolen-Hoeksema, & Schweizer, 2010).

Mindfulness interventions were initially limited to clinical settings. The first was Kabat-Zinn's (1982) MBSR programme, which was used to treat chronic pain, before being applied in the treatment of other conditions, such as stress and anxiety (Ledesma & Kumano, 2009). MBSR is a group-based programme, typically involving 8–10 weekly meetings delivered by a trained mindfulness teacher, in which participants are offered mindfulness meditation teaching and an opportunity to practise a variety of mindfulness meditative techniques. This is often accompanied by group work and individual support (e.g., opportunities for participants to discuss their experiences with the programme facilitator, and ideally to receive appropriate guidance, encouragement, and emotional support). Importantly, participants are expected to practise mindfulness daily, and are moreover encouraged to continue this after the completion of the training. Subsequently, other clinical interventions adapted the MBSR protocol for the treatment of specific mental health problems, such as mindfulness-based cognitive therapy for recurrent depression (MBCT) (Segal, Williams, & Teasdale, 2002).

However, since the late 1990s, there has been increasing interest in the use of MBIs in occupational contexts, not only for staff who may be suffering with stress and mental health issues but for workers more generally, as a means to improve well-being and performance, as well as a protective measure for building resilience against stress and burnout (Shapiro, Schwartz, & Bonner, 1998). As such, the current paper aims to assess the literature on mindfulness in the workplace. While a number of such reviews have already been conducted, these tend to have fairly narrow remits, focusing exclusively on specific populations, such as school staff (Weare, 2014) or healthcare providers (Lamothe, Rondeau, Malboeuf-Hurtubise, Duval, & Sultan, 2016), or on specific outcomes, such as burnout (Luken & Sammons, 2016), or on specific interventions like MBSR (Chiesa & Serretti, 2009; Lamothe et al., 2016). By contrast, this paper aims for inclusivity, reporting the results of a far broader systematic review, focusing on the impact of mindfulness generally (not limited to any one intervention), on a wide range of well-being and performance outcomes, in workers across all occupational contexts.

Methods

The literature search was conducted by the first author using the MEDLINE and Scopus electronic databases. The criteria were mindfulness (AND) work OR occupation OR profession OR staff (in all fields in MEDLINE and limited to article title, abstract, and keywords in Scopus). The dates selected were from the start of the database records to 28 January 2016. In terms of participants, interventions, comparisons, outcomes, and study design, the key criteria were (1) participants – current employees of a company or organization; (2) interventions – for the purposes of this review, an MBI was defined as an intervention in which mindfulness meditation was the central component (as indicated by mindfulness either featuring in the title of the intervention or being given prominence in the abstract); (3) outcomes – mindfulness, well-being, and job performance (with well-being used here as an all-encompassing term, spanning physical, and mental health); and (4) study design – any empirical study featuring data collection. Although we were principally interested in studies which tested the efficacy of MBIs, as a secondary concern, we were also interested in non-

intervention studies of mindfulness in the workplace (e.g., regression analyses of the association between trait mindfulness and well-being outcomes). Studies were required to be published (or in press) in a peer-reviewed academic journal, and to be in English. The review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009). The review protocol was registered with the International Prospective Register of Systematic Reviews database on 5 January 2016, registration number: CRD42016032899 (www.crd.york.ac.uk/PROSPERO). The details of the inclusions and rejections at each stage of the winnowing process are shown as a PRISMA flow diagram in Supplementary Figure 1. The papers selected for inclusion by the first author were separately checked by the second and last authors, who confirmed in all cases that their inclusion was warranted.

Inclusion criteria were (1) research undertaken in an occupational setting; (2) empirical assessment of mindfulness, well-being, and/or performance outcomes; (3) quantitative or qualitative analysis; (4) published (or in press) in a peer-reviewed academic journal; and (5) written in English. Regarding point (4), it was deemed necessary to restrict the review in this way, e.g., instead of also exploring the far broader terrain of registered trials and grey literature, to keep the review to a manageable size, as well as to ensure a certain level of quality (i.e., as provided by the peer-review process, which would not necessarily be present with grey literature). Exclusion criteria were (1) theoretical articles or commentaries without statistical or qualitative analyses and (2) interventions in which mindfulness practice is not the central component (even if they incorporate elements of mindfulness practice or theory), such as acceptance and commitment therapy (ACT) (Hayes, Strosahl, & Wilson, 1999). Regarding this latter point (2), interventions like ACT are sometimes described as "incorporating" or being "based on" mindfulness. Thus, ascertaining whether mindfulness is "the central component" of these is a judgement call. However, to keep the review to a manageable scale, the focus here is on interventions that "self-identify" as having mindfulness as their central component (indicated, as noted earlier, by mindfulness either featuring in the title of the intervention or being given prominence in the abstract).

Papers were divided into experimental intervention studies and non-intervention (e.g., correlational) studies. For intervention studies, the following variables were extracted from each paper: type of design (RCT vs. non-randomized samples), occupation of participants, number of experimental and control participants (if applicable), type of MBI, length of MBI, control condition, principle well-being and performance outcomes, and the effect sizes of principle outcomes (and in cases where this information was not available, it was calculated). For non-intervention studies, the following variables were extracted from each paper: type of analysis (quantitative or qualitative), occupation of participants, number of participants, well-being and performance outcomes, and the regression or correlation coefficients of outcomes. The primary measures of interest were mindfulness, mental health (anger, anxiety, burnout, depression, distress, stress, satisfaction, well-being), and physical health (illness, diet, exercise and sleep). Secondary measures of interest were outcomes that *pertain* to well-being (compassion, empathy, emotional intelligence and regulation, resilience and spirituality). Tertiary summary measures of interest were outcomes relating to job performance (often specific to particular occupations). Finally, we sought to classify studies in terms of whether they observed a significant improvement in each outcome in relation to an MBI (or a significant association with mindfulness in the case of non-intervention studies). This classification – e.g., per Table 3 in the results section – was made, where possible, based on effect size (in the case of intervention studies). In that respect, we applied the usual criterion of Cohen's *d*, where $d \geq .20$ indicates a change, and small, medium, and large values of *d* are considered to be .2, .5 and .8, respectively (Cohen, 1988). In terms of data extraction, the second and last author independently checked all the 153 included papers and agreed on the relevant outcomes (as reported in Tables 1 and 2).

The quality assessment tool for quantitative studies (QATQS; National Collaborating Centre for Methods and Tools, 2008) was used to assess the quality of the studies. QATQS assesses methodological rigour in six areas: (a) selection bias, (b) design, (c) confounders, (d) blinding, (e) data collection method, and (f) withdrawals and dropouts. Each area is assessed on a score of 1–3 (1 = strong, 2 = moderate, 3 = weak). If there are no weak ratings, the study is given a global score of 1 (judged as strong), one weak rating leads to a score of 2 (moderate), and two or more weak ratings generates a score of 3 (weak). The QATQS scoring results can be found in Supplementary Table 1, while Supplementary Table 2 provides a summary of the QATQS scoring outcomes for interventions specifically. (All supplementary tables are available online, accessible at the first authors page or www.researchgate.net.) Scoring was conducted by the fourth author and checked by the first author. Any discrepancy was resolved by discussion with agreement reached in all cases.

Results

Following removal of duplicate citations, 721 potentially relevant papers were identified. From the abstract review, 479 papers were excluded. From the full text reviews of 242 papers, 89 further papers were excluded. Thus, a total of 153 papers were included in the systematic analysis (112 intervention studies and 41 non-intervention studies). Eleven of these papers were identified as reporting on five samples of participants: (1) Baltzell and Akhtar (2014) and Baltzell, Caraballo, Chipman, and Hayden (2014); (2) Cohen-Katz et al. (2005) and Cohen-Katz et al. (2005); (3) Grégoire and Lacharce (2015) and Grégoire, Lachance, and Taylor (2015); (4) Shonin and Van Gordon (2015) and Shonin, Van Gordon, Dunn, Singh, and Griffiths (2014); and (5) van Berkel, Boot, Proper, Bongers, and van der Beek (2013, 2014a, 2014b). As such, the 153 papers in the analysis represented results from 147 independent participant samples. These comprised a total of 12,571 participants (discounting participants who were not including in the analyses due to attrition).

There were 5755 participants in the intervention studies, as detailed in Tables 1 (RCT studies) and 2 (non-RCT studies), including 3728 participants undertaking MBIs, and 2027

Table 1. Overview of intervention studies (RCTs).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Aikens et al. (2014)	Dow Chemical employees	34 (44)	32 (45)	Mindfulness programme (specific to study)	7 weeks	Wait-list	PI < (decreases in) mindfulness & awareness (observe, $d = -.20$); and stress & strain (perceived stress, $d = -.25$). PI > (increases in) mindfulness & awareness (describe, $d = .27$; and act aware, $d = .22$). PI >< (no changes in) burnout (physical energy, $d = .04$; cognitive liveliness, $d = -.05$; and emotional energy, $d = -.14$); mindfulness & awareness (non-judging, $d = -.12$; and non-reacting, $d = .07$); and resilience (resilience, $d = -.04$)
Baccarani, Mascherpa, and Minozzo (2013)	University administrators	10	10	Mindfulness programme (specific to study)	4 weeks	NR	Effect size data not available. PI > mindfulness & awareness; and well-being
Burnett and Pettijohn (2015)	Healthcare employees	20 active	18 & 17	MBST	5 weeks	Passive intervention: Abstention from work activity Control: nothing	Passive intervention group: PI >< stress & strain (perceived stress, $d = -.09$). No intervention group: PI < stress & strain (perceived stress, $d = -.70$)
Cohen-Katz, Wiley, Capuano, Baker, and Shapiro (2005)	Nurses	12 (14)	13	MBSR	8 weeks	Wait-list	Effect size data not available. PI < burnout. PI > mindfulness & awareness. PI >< distress & anger
De Vibe et al. (2013)	Trainee doctors	144	144	MBSR adaptation	6 weeks	Nothing	PI < burnout (burnout, $d = -1.5$), distress & anger (distress, $d = -.77$), mindfulness & awareness (non-judging, $d = -.23$), stress & strain (stress, $d = -.27$). PI > mindfulness & awareness (non-reacting, $d = .31$); and well-being (subjective well-being, $d = .43$). PI >< mindfulness & awareness (act aware, $d = -.04$; describe, $d = -.06$; and observe, $d = .18$)
Duchemin et al. (2015)	Intensive care professionals	16	16	Mindfulness programme (specific to study)	8 weeks	Wait-list	Effect size data not available. PI < stress & strain. PI > well-being. PI >< anxiety; burnout; depression; mindfulness & awareness; and stress & strain
Erogul, Singer, McIntyre, and Stefanov (2014)	Trainee doctors	28	30	MBCT	8 weeks	Nothing	PI < stress & strain (perceived stress, $d = -.60$). PI > compassion & empathy (self-compassion, $d = .88$); and resilience ($d = .27$)
Flaxman and Bond (2010)	Government employees	104 (177)	87 (134)	Stress management training	3 × .5 days	Wait-list	PI < distress & anger ($d = -.28$)
Flook et al. (2013)	Teachers	10	8	MBSR adaptation	8 weeks	Wait-list	PI < burnout (emotional exhaustion, $d = -.24$; and personal accomplishment, $d = .94$); and distress & anger (psychological distress, $d = -.51$). PI > compassion & empathy (self-compassion, $d = .24$); job performance (emotional support, $d = .26$; and classroom organization, $d = .27$); mindfulness & awareness (observe, $d = .32$; describe, $d = .23$; act aware, $d = .34$; non-reacting, $d = .47$; and affective attentional bias, $d = -.32$); and stress & strain (morning cortisol, $d = .67$). PI>< burnout (depersonalization, $d = -.03$); job performance (instructional support, $d = -.18$); and mindfulness & awareness (non-judging, $d = .12$; and sustained attention, $d = .00$)
Franco, Mañas, Cangas, Moreno, and Gallego (2010)	Teachers	34	34	Mindfulness programme (specific to study)	10 weeks	Music listening	PI < distress & anger (psychological distress, $d = -1.71$)

(Continued)

Table 1. (Continued).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Frank, Reibel, Broderick, Cantrell, and Metz (2015)	Teachers	18	18	MBSR	8 weeks	Wait-list	PI < mindfulness & awareness (act aware, $d = -.34$). PI > burnout (depersonalization, $d = .26$; and personal accomplishment, $d = -.27$); emotional intelligence & regulation (acceptance, $d = .23$; acknowledgement, $d = .55$; and calmness, $d = .85$); health (sleep impairment, $d = -1.22$); and mindfulness & awareness (observe, $d = .71$; describe, $d = .69$; and non-reacting, $d = .56$). PI >< burnout (emotional exhaustion, $d = -.16$); compassion & empathy (self-compassion, $d = .10$); distress & anger (psychological distress, $d = .02$); emotional intelligence & regulation (present moment, $d = .10$); and mindfulness & awareness (non-judging, $d = -.18$)
Gockel, Burton, James, and Bryer (2013)	Trainee social workers	38	94	MBSR adaptation	10 weeks		Effect size data not available. PI > job performance; and mindfulness & awareness. PI >< mindfulness & awareness
Grégoire and Lachance (2015)	Call-centre employees	18 (24)	25 (25)	Mindfulness programme (specific to study)	5 weeks	Wait-list (counter-balanced)	PI < distress & anger (psychological distress, $d = -.80$); and stress & strain (psychological stress, $d = -.92$). PI > health (fatigue, $d = -.66$); mindfulness & awareness (mindfulness, $d = .20$); and well-being (negative affect, $d = -1.09$)
Grégoire et al. (2015)	Call-centre employees	26 (39)	15 (32)	Mindfulness programme (specific to study)	5 weeks	Wait-list (counter-balanced)	PI < burnout (burnout, $d = -1.48$), distress & anger (psychological distress, $d = -1.22$); & stress & strain (psychological stress, $d = -1.43$). PI > emotional intelligence & regulation (lack of emotional awareness, $d = -.39$; and impulse control difficulties, $d = -.46$); mindfulness & awareness (mindfulness, $d = .78$); and well-being (psychological well-being, $d = 1.33$)
Harris, Jennings, Katz, Abenavoli, and Greenberg (2016)	Teachers	34	29 (30)	CALM	16 weeks	Wait-list	PI < burnout (emotional exhaustion, $d = -.27$; depersonalization, $d = -.37$; and personal accomplishment, $d = .37$); distress & anger (distress tolerance, $d = .42$); and stress & strain (perceived stress, $d = -.21$; diastolic blood pressure, $d = -.54$; and systolic blood pressure, $d = -.47$). PI > emotional intelligence & regulation (expressive suppression, $d = -.24$); health (physical symptoms, $d = -.23$; and sleep-related impairment, $d = -.37$); job performance (classroom management, $d = .38$; and instructional practices, $d = .20$); mindfulness & awareness (observe, $d = .41$; act aware, $d = .23$; and non-reacting, $d = .20$); relationships (teacher–teacher relational trust, $d = .40$); stress & strain (morning cortisol, $d = .61$); and well-being (positive affect, $d = .62$). PI >< emotional intelligence & regulation (cognitive reappraisal, $d = .09$); job performance (student engagement, $d = -.10$); mindfulness & awareness (describe, $d = .10$; and non-judging, $d = .13$); stress & strain (time urgency, $d = -.16$); and well-being (negative affect, $d = -.06$)
Huang et al. (2015)	Factory employees	58 (72)	60 (72)	MBSR adaptation	8 weeks	Wait-list	PI < distress & anger (psychological distress, $d = -.75$); and stress & strain (perceived stress, $d = -.47$). PI > health (fatigue, $d = -.38$); and job performance (job control, $d = .55$; and job demands, $d = -.55$)

(Continued)

Table 1. (Continued).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Hülsheger et al. (2013)	Mixed employees	22 (102)	42 (101)	Mindfulness programme (specific to study)	2 weeks	Wait-list	PI > mindfulness & awareness (mindfulness, d = .39); and well-being (job satisfaction, d = .69). PI >< burnout (emotional exhaustion, d = −.18)
Hülsheger, Feinholdt, and Nübold (2015)	Company employees	67 (75)	73	Mindfulness programme (specific to study)	10 days	Wait-list	PI > health (sleep quality, d = .88). PI >< burnout (psychological detachment, d = .03); and mindfulness & awareness (mindfulness, d = −.14)
Jay et al. (2015)	Laboratory technicians	53 (56)	53 (56)	Mindfulness programme (specific to study)	10 weeks	Company health initiative	Effect size data not available. PI > health. PI >< stress & strain
Jennings, Frank, Snowberg, Coccia, and Greenberg (2013)	Teachers	25 (27)	25 (26)	Cultivating awareness & resilience in education	1 month (2 weekends)	Wait-list	PI < burnout (personal accomplishment, d = .33); depression (depression, d = −.68); and stress & strain (general hurry, d = −.40). PI > emotional intelligence & regulation (cognitive reappraisal, d = .99; and expressive suppression, d = −.27); health (physical symptoms, d = −.87); job performance (students' engagement, d = .46; and instructional practices, d = .31); mindfulness & awareness (observe, d = .61; act aware, d = .26; non-judging, d = .35; and non-reacting, d = .65); and well-being (positive affect, d = .32; and negative affect, d = −.51). PI >< burnout (emotional exhaustion, d = −.05; and depersonalization, d = −.16); job performance (classroom management, d = .13); mindfulness & awareness (describe, d = −.03); and stress & strain (task-related hurry, d = −.18)
John et al. (2012)	Professional shooters	55	55	Mindfulness programme (specific to study)	4 weeks	Wait-list	Mindfulness vs. no intervention: PI > job performance (performance score, d = .86). Mindfulness vs. music therapy: PI >< job performance (performance score, d = −.11)
Klatt, Buckworth, and Malarkey (2009)	University employees	22 (24)	20 (24)	MBSR adaptation	6 weeks	Wait-list	PI < mindfulness & awareness (mindful attention awareness, d = −1.20); and stress & strain (perceived stress, d = −.44). PI > health (sleep impairment, d = −.85)
Klatt, Steinberg, and Duchemin (2015)	Intensive care IC staff	34	34	Mindfulness in motion	8 weeks	N/A	Effect size data not available. PI < burnout. PI > and resilience
Leroy, Anseel, Dimitrova, and Sels (2013)	Mixed employees	76	14	MBSR	8 weeks	Wait-list	Effect size data not available. PI < burnout. PI > mindfulness & awareness; and well-being
Mackenzie, Poulin, and Seidman-Carlson (2006)	Nurses	16	14	MBSR adaptation	4 weeks	Wait-list	PI < burnout (depersonalization, d = −.20; and personal accomplishment, d = 8.27). PI > burnout (emotional exhaustion, d = 3.44); and well-being (relaxation dispositions, d = .24. PI >< well-being (intrinsic job satisfaction, d = .17; satisfaction with life, d = −.13; and sense of coherence, d = .16)
Malarkey, Jarjoura, and Klatt (2013)	University employees	84 (93)	86 (93)	Mindfulness programme (specific to study)	8 weeks	Lifestyle education programme	PI < stress & strain (C-reactive protein, d = −.26). PI >< stress & strain (cortisol day's slope, d = −.08; interleukin-6, d = .14)
Manotas et al. (2014)	Healthcare professionals	40 (66)	43 (65)	MBSR adaptation	4 weeks	NR	PI < distress & anger (distress, d = −.61); mindfulness & awareness (act aware, d = −.29; and describe, d = −.28); and stress & strain (perceived stress, d = −.68). PI > mindfulness & awareness (non-judging, d = .32; and observe, d = .23). PI >< mindfulness & awareness (non-reacting, d = .03); and total mindfulness, d = .07)

(Continued)

Table 1. (Continued).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Martín-Asuero et al. (2014)	Healthcare professionals	43	25	MBSR adaptation	8 weeks	Wait-list	PI < burnout (emotional exhaustion, $d = -7.20$; depersonalization, $d = -1.80$; and personal accomplishment, $d = 1.40$); and distress & anger (distress, $d = -.83$). PI > compassion & empathy (physician empathy, $d = .40$); and mindfulness & awareness (non-reacting, $d = 1.21$; non-judging, $d = .49$; act aware, $d = .84$; describe, $d = .44$; and observe, $d = 1.27$)
McConachie, McKenzie, Morris, and Walley (2014)	Support staff	66	54	Acceptance and mindfulness workshop	1.5 days	Wait-list	PI < distress & anger (distress, $d = -.35$). PI >< well-being (mental well-being, $d = .17$)
Mealer et al. (2014)	Intensive care nurses	13	14	Resilience training programme*	12 weeks	Nothing	Effect size data not available. PI < anxiety; depression; and stress & strain. PI > resilience. PI >< anxiety; and burnout
Moody et al. (2013)	Paediatric oncology staff	24	23	Mindfulness programme (specific to study)	8 weeks	Nothing	Effect size data not available. PI >< burnout; depression; and stress & strain
Pidgeon, Ford, and Klaassen (2014)	Human service professionals	14 (22)	21 (22)	Mindfulness retreat (specific to study)	2.5 days	Nothing	Effect size data not available. PI > compassion & empathy; mindfulness & awareness; and resilience
Pipe et al. (2009)	Nurses	15	17	MBSR adaptation	4 weeks	Wait-list	PI < anxiety ($d = -.21$), depression ($d = -.54$); distress & anger (psychological distress, $d = -.39$). PI > job performance (caring efficacy, $d = .48$); and relationships (interpersonal sensitivity, $d = -.38$)
Ramsey and Jones (2015)	Teachers	13 (22)	24 (29)	Mindfulness workshop (specific to study)	1 day	NR	Effect size data not available. PI > relationships
Roëser et al. (2013)	Teachers	54	59	Mindfulness Training	8 weeks	Wait-list	PI < anxiety (anxiety state, $d = -.69$); burnout (burnout, $d = -.80$); depression (depression, $d = -1.03$); and stress & strain (occupational stress, $d = -.56$; and morning cortisol, $d = -.20$). PI > compassion & awareness (self-compassion, $d = .84$); job performance (absences from work, $d = -.34$); and mindfulness & awareness (working memory capacity stringent, $d = .27$; errors on math distractor problems, $d = .32$; observe, $d = .81$; act aware, $d = .54$; and non-reacting, $d = .75$). PI >< mindfulness & awareness (working memory capacity total, $d = .15$; describe, $d = .01$; and non-judging, $d = .13$); and stress & strain (systolic blood pressure, $d = .05$; and diastolic blood pressure, $d = .15$)
Shapiro et al. (1998)	Trainee doctors	37	36	Stress reduction and relaxation	7 weeks	Wait-list	PI < anxiety (state, $d = -.46$; and trait, $d = -.59$); depression (depression, $d = -.46$); and distress & anger (psychological distress, $d = -.69$). PI > compassion & empathy (empathy, $d = .47$); and well-being (spirituality, $d = .32$)
Shapiro et al. (2005)	Healthcare professionals	10 (18)	18 (20)	MBSR	8 weeks	Wait-list	PI < burnout (emotional exhaustion, $d = -2.10$; depersonalization, $d = -3.38$; and personal accomplishment, $d = 3.38$). PI >< compassion & empathy (self-compassion, $d = .02$); distress & anger (distress, $d = -.07$); stress & strain (perceived stress, $d = -.15$); and well-being (satisfaction with life, $d = .15$)
Shonin et al. (2014)	Office middle managers	68 (76)	65 (76)	Meditation awareness training	8 weeks	CBT education class	PI < distress & anger (psychological distress, $d = -2.14$); and stress & strain (work-related stress, $d = -1.75$). PI > job performance (work performance, $d = 1.39$); and well-being (job satisfaction, $d = 1.63$)
Shonin and Van Gordon (2015)	Office middle managers	68	65	Meditation awareness training	8 weeks	CBT education class	Qualitative interviews: PI > job performance; and well-being

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Table 1. (Continued).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Song and Lindquist (2015)	Trainee nurses	21 (25)	23 (25)	MBSR	8 weeks	Wait-list	PI < anxiety (d = –.50) depression (d = –.70); and stress & strain (stress, d = –.85). PI >< mindfulness & awareness (mindful attention awareness, d = .13)
Sood et al. (2014)	Radiologists	11 (13)	11 (13)	Stress management and resiliency training	1 day	Wait-list	PI < anxiety (anxiety, d = –.54); stress & strain (perceived stress, d = –.45). PI > mindfulness & awareness (mindfulness, d = .90). PI >< resilience (resilience, d = –.17); and well-being (quality of life, d = .00)
Taylor et al. (2016)	Teachers	26	30	SMART	8 weeks	Wait-list	PI < stress & strain (occupational stress, d = –.89). PI > compassion & empathy (dispositional compassion, d = .21; and tendency to forgive, d = .66)
van Berkel et al. (2013)	Mixed employees	121 (129)	114 (128)	Mindful vitality in practice	8 weeks	NR	NA
van Berkel et al. (2014a)	Mixed employees	121 (129)	114 (128)	Mindful vitality in practice	8 weeks	NR	PI < health (physical activity, d = –.34). PI > health (health enhancing physical activity, d = .25)
van Berkel et al. (2014b)	Mixed employees	121 (129)	114 (128)	Mindful vitality in practice	8 weeks	NR	PI >< burnout (need for recovery, d = –.04), health (mental health, d = .02); job performance (work engagement, d = .00); and mindfulness & awareness (d = .00)
West et al. (2014)	Physicians	35 (37)	37	Small group curriculum*	10 weeks	Nothing	PI >< compassion & empathy (physician empathy, d = –.05); stress & strain (perceived stress, d = .13); and well-being (job satisfaction, d = –.14)
Walach et al. (2007)	High-stress professionals	12	11 (17)	MBSR	8 weeks	Wait-list	PI < stress & strain (positive coping strategies, d = .87). PI >< stress & strain (negative coping strategies, d = –.03)
Wolever et al. (2012)	Insurance employees	82 (96)	47 (53, wait) & 76 (90, yoga)	Mindfulness at work	12 weeks	Wait-list, & Viniyoga stress reduction programme	Mindfulness vs. wait-list: PI < stress & strain (perceived stress, d = –4.76; systolic blood pressure, d = –1.71; diastolic blood pressure, d = –.87; breathing rate, d = –2.72; heart rate coherence, d = –.99; and time between heart beats, d = –.84). PI > depression (depression, d = .43); health (sleep quality, d = –.80); job performance (work limitations, d = –1.43); and mindfulness & awareness (mindfulness, d = 2.42). Mindfulness vs. yoga: PI < health (sleep quality, d = 1.49); and stress & strain (perceived stress, d = –1.35). PI > job performance (work limitations, d = –.73); mindfulness & awareness (mindfulness, d = .42); and stress & strain (systolic blood pressure, d = 1.11; diastolic blood pressure, d = 1.25; heart rate coherence, d = .45; and time between heart beats, d = 1.01). PI >< depression (depression, d = –.07); and stress & strain (breathing rate, d = –.06)

All reported results significant to $p < .05$ (or lower). ↓ decreases in; ↑ increases in; >< no change in; ↑ mindfulness associated with measured outcome; expt. experimental group; con. control group; PI: post intervention; NR: not-reported; MBCT: mindfulness-based cognitive therapy; MBSR: mindfulness-based stress reduction; MBST: mindfulness-based stress reduction therapy. CALM: community approach to learning mindfully. CARE: cultivating awareness and resilience in education. SMART: stress management and relaxation training. MM: mindfulness meditation; NCC: neural correlates of consciousness; NR: not recorded; N/A: not applicable; NA: not available; RCT: randomized controlled trial. *Number in parenthesis is the initial sample size (if different from sample size featured in analysis).

Table 2. Overview of intervention studies (non-randomized samples).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Aggs and Bambling (2010)	Psychotherapists	47	–	Mindful therapy	8 weeks	N/A	Effect size data not available. PI < stress & strain. PI > mindfulness & awareness
Barbosa et al. (2013)	Healthcare graduates	13 (16)	15	MBSR	8 weeks	Nothing	PI < burnout (emotional exhaustion, $d = -.41$; personal accomplishment, $d = .29$; and depersonalization, $d = -.26$); and compassion & empathy (physician empathy, $d = -.77$). PI >< anxiety ($d = -.09$)
Baltzell and Akhtar (2014)	Football players	19	23	Mindfulness meditation training for sports	12 sessions	Nothing	PI < well-being (positive affect, $d = -.20$; and satisfaction with life, $d = -.43$). PI > mindfulness & awareness (mindfulness, $d = .41$); well-being (negative affect, $d = -.86$; and well-being, $d = .60$)
Baltzell et al. (2014)	Football players	7	–	Mindfulness meditation training for sports	12 sessions	Nothing	Qualitative interview: PI > emotional intelligence & regulation; health; and mindfulness & awareness
Bazarko, Cate, Azocar, and Kreitzer (2013)	Nurses (corporate)	36 (41)	–	MBSR adaptation (6 sessions by telephone)	8 weeks	N/A	PI < burnout (personal burnout, $d = -.97$; work-related burnout, $d = -.67$; and client-related burnout, $d = -.30$); health (physical health, $d = -.38$); and stress & strain (perceived stress, $d = -1.21$). PI > compassion & empathy (physician empathy, $d = .76$; and self-compassion, $d = 1.25$); health (*mental health*, $d = 1.40$); and well-being (serenity, $d = 1.48$)
Beckman et al. (2012)	Primary care physicians	20	–	Programme in mindful communication	52 h	N/A	Qualitative interviews: PI > mindfulness & awareness; and relationships
Beddoe and Murphy (2004)	Trainee nurses	16 (23)*	–	MBSR	8 weeks	N/A	Effect size data not available. PI < stress & strain. PI >< compassion & empathy
Beshai, McAlpine, Weare, and Kuyken (2016)	Teachers	49	40	.b Foundations course	9 session	Wait-list	PI < stress & strain (perceived stress, $d = -.48$). PI > compassion & empathy (self-compassion, $d = .74$); mindfulness & awareness (observe, $d = .97$; describe, $d = .51$; non-judging, $d = .27$; and non-reacting, $d = .32$); and well-being (mental well-being, $d = .70$). PI >< mindfulness & awareness (act aware, $d = -.10$)
Birnbaum (2008)	Trainee social workers	7	–	Mindfulness programme (specific to study)	8 weeks	N/A	Qualitative interviews: PI > emotional intelligence & regulation; and mindfulness & awareness
Bond et al. (2013)	Trainee doctors	24 (27)	–	Mind-body course	11 weeks	N/A	PI >< Compassion & empathy (self-compassion, $d = .17$; and physician empathy, $d = .09$); emotional intelligence & regulation (self-regulation, $d = .01$); and stress & strain (perceived stress, $d = -.03$)
Bonifas and Napoli (2014)	Trainee social workers	77	–	Mindfulness curriculum (specific to study)	16 weeks	N/A	PI > well-being (quality of life, $d = .88$). PI >< stress & strain (perceived stress, $d = .06$)
Brady, O'Connor, Burgermeister, and Hanson (2012)	Psychiatric ward professionals	16 (23)	–	MBSR adaptation	4 weeks	N/A	PI < burnout (emotional exhaustion, $d = -.50$; depersonalization, $d = -.23$; and personal accomplishment, $d = .29$); and stress & strain (stress, $d = -.70$). PI > mindfulness & awareness (mindfulness, $d = .64$; and intrapersonal presence, $d = .54$)
Brooker et al. (2013)	Disability professionals	34 (36)	–	Occupational mindfulness training programme	8 weeks	N/A	Effect size data not available. PI > mindfulness & awareness; and well-being. PI >< anxiety; burnout; compassion & empathy; depression; stress & strain; and well-being
Brooker et al. (2014)	Disability professionals	12	–	Occupational mindfulness training programme	8 weeks	N/A	Effect size data not available. PI > job performance
Christopher, Christopher, Dunnagan, and Schure (2006)	Trainee counsellors	11	–	Mindfulness curriculum (specific to study)	1 term	N/A	Qualitative interviews: PI < burnout; and stress & strain

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Table 2. (Continued).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Cohen and Miller (2009)	Trainee clinical psychologists	21 (28)	–	Interpersonal mindfulness training	6 weeks	N/A	PI < anxiety (d = –.46); stress & strain (perceived stress, d = –.52); and well-being (searching of meaning in life, d = –.35). PI > emotional intelligence & regulation (emotional intelligence, d = .39); mindfulness & awareness (mindful attention awareness, d = .48); relationships (social connectedness, d = 57); and well-being (life satisfaction, d = .43). PI >< depression (d = –.11); and well-being (presence of meaning in life, d = .12)
Cohen-Katz et al. (2005)	Nurses	25	–	MBSR	8 weeks	N/A	Qualitative interviews: PI > compassion & empathy; emotional intelligence & regulation; health; mindfulness & awareness; and relationships
Dobie, Tucker, Ferrari, and Rogers (2016)	Mental health professionals	9	–	MBSR adaptation	8 weeks	N/A	PI < anxiety (d = –.86); depression (d = –.44); and stress & strain (stress, d = –.96). PI > mindfulness & awareness (mindfulness, d = .41)
De Zoysa, Ruths, Walsh, and Hutton (2014)	Mental health professionals	7	–	MBCT	8 weeks	N/A	Qualitative interviews: PI > emotional intelligence & regulation
Dorian and Killebrew (2014)	Trainee psychotherapists	21	–	Mindfulness curriculum (specific to study)	10 weeks	N/A	Qualitative interviews: PI < distress & anger. PI > compassion & empathy; emotional intelligence & regulation; and mindfulness & awareness
Felton, Coates, and Christopher (2015)	Trainee counsellors			Mindfulness curriculum (specific to study)	15 weeks	N/A	Qualitative interviews: PI < stress & strain. PI > compassion & empathy; emotional intelligence & regulation; and mindfulness & awareness
Fisher and Hemanth (2015)	Clinical psychologists	8	–	Mindfulness programme (specific to study)	10 weeks	N/A	Qualitative interviews: PI > emotional intelligence & regulation; mindfulness & awareness
Fortney, Luchterhand, Zakletskaia, Zgierska, and Rakel (2013)	Primary care clinicians	28 (30)	–	MBSR adaptation	18 h (over 5 sessions)	N/A	PI < anxiety (d = –.47); burnout (emotional exhaustion, d = –.31; depersonalization, d = –22; and personal accomplishment, d = .50); depression (depression, d = –.54); and stress & strain (perceived stress, d = –.54; and stress, d = –.31). PI >< compassion & empathy (compassion, d = –.04); resilience (resilience, d = .17)
Foureur, Besley, Burton, Yu, and Crisp (2013)	Nurses & midwives	28 (40)		MBSR adaptation	1 day (& 8 weeks practice)		PI < anxiety (d = –.28); depression (d = –.33); distress & anger (distress, d = –.59); and stress & strain (stress, d = –.65). PI > well-being (sense of coherence, d = .73)
Galantino, Baime, Maguire, Szapary, and Farrar (2005)	Healthcare professionals	84	–	Mindfulness programme (specific to study)	8 weeks	N/A	Effect size data not available. PI < anxiety; burnout; depression; and distress & anger. PI >< compassion & empathy; and stress & strain
Gauthier, Meyer, Grefe, and Gold (2015)	Paediatric ICU nurses	42 (45)	–	Mindfulness programme (specific to study)	30 days	N/A	PI < stress & strain (stress, d = –.40). PI > compassion & empathy (self-compassion, d = .23). PI >< burnout (emotional exhaustion, d = –.18; depersonalization, d = –.13; and personal accomplishment, d = .12); and mindfulness & awareness (mindful attention awareness, d = .07)
Gold et al (2010)	Teachers and assistants	11		MBSR	8 weeks	N/A	PI < anxiety (anxiety, d = –.58); depression (depression, d = –1.53); and stress & strain (stress, d = –1.15). PI > mindfulness & awareness (mindfulness, d = .55)

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Table 2. (Continued).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Goodman and Schorling (2012)	Healthcare professionals	73 (93)	–	Mindfulness for healthcare providers	8 weeks	N/A	Physicians sample: PI < burnout (emotional exhaustion, $d = -.72$; depersonalization, $d = -.44$; and personal accomplishment, $d = .60$. PI > health (mental health, $d = 1.00$). PI >< health (physical health, $d = -.16$). Other healthcare providers sample: PI < burnout (emotional exhaustion, $d = -.29$; depersonalization, $d = -.27$; and personal accomplishment, $d = .44$). PI > health (mental health, $d = .78$). PI >< health (physical health, $d = -.02$)
Gregory (2015)	Social workers	5	6	Mindfulness programme (specific to study)	3 weeks	Nothing	Effect size data not available. PI > compassion & empathy. PI >< burnout; and stress & strain
Grepmair, Mitterlehner, Loew, and Nickel (2007)	Trainee psychotherapists	58	55 (same as expt.)	Mindfulness programme (specific to study)	9 weeks	Pre-training	PI > job performance (patients' distress, $d = -.93$)
Hallman, O'Connor, Hasenau, and Brady (2014)	Psychiatric service professionals	12 (13)	–	MBSR	8 weeks	N/A	PI < stress & strain (perceived stress, $d = -.20$). PI > mindfulness & awareness (mindfulness, $d = .68$)
Hemanth and Fisher (2015)	Clinical psychology trainees	10	–	Mindfulness programme (specific to study)	10 weeks	N/A	Qualitative interviews: PI > compassion & empathy; emotional intelligence & regulation; job performance; and relationships
Hopkins and Proeve (2013)	Trainee psychologists	11 (12)	–	MBCT	8 weeks	N/A	PI < Compassion & empathy (emotional concern, $d = -.40$; perspective taking, $d = -.37$; personal distress, $d = -.23$; and fantasy, $d = -.30$); and stress & strain (perceived stress, $d = -.67$). PI > mindfulness & awareness (non-reacting, $d = .77$; observe, $d = .43$; non-judging, $d = 1.27$. PI >< mindfulness & awareness (act aware, $d = .11$; and describe, $d = .18$)
Horner, Piercy, Eure, and Woodard (2014)	Nurses	31 (46)	12 (28)	Mindfulness programme (specific to study)	10 weeks	Nothing	Effect size data not available. PI >< burnout; compassion & empathy; mindfulness & awareness; stress & strain; and well-being
Hue and Lau (2015)	Trainee teachers	35 (78)	35	Mindfulness programme (specific to study)	6 weeks	Nothing	PI < anxiety (anxiety, $d = -.25$); and depression (depression, $d = -.33$). PI > mindfulness & awareness (mindfulness, $d = .22$); stress & strain (perceived stress, $d = .34$; and stress, $d = .31$); and well-being (well-being, $d = .43$). PI >< mindfulness & awareness (mindful attention awareness, $d = .07$)
Jennings, Snowberg, Coccia, and Greenberg (2011)	Study 1: Teachers	29 (31)	–	Cultivating awareness & resilience in education	1 month (2 weekends)	N/A	PI < depression (depression, $d = -.22$); and stress & strain (task-related hurry, $d = -.23$; and general hurry, $d = -.25$). PI > job performance (instructional practices, $d = .43$; and classroom management, $d = .34$); mindfulness & awareness (observe, $d = 1.02$; describe, $d = .34$; act aware, $d = .21$; non-judging, $d = .44$; non-reacting, $d = .88$; and interpersonal mindfulness in teaching, $d = .56$); and well-being (negative affect, $d = -.22$). PI >< health (physical symptoms, $d = -.10$); job performance (promoting intrinsic motivation, $d = .01$; and students' engagement, $d = .16$); and well-being (positive affect, $d = .00$)

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Table 2. (Continued).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
	Study 2: Teachers	17 (21)	22	Cultivating awareness & resilience in education	1 month (2 weekends)	Wait-list	PI < stress & strain (general hurry, $d = -.37$). PI > job performance (motivation, $d = .63$; and instructional practices, $d = .26$); mindfulness & awareness (act aware, $d = .21$); and well-being (negative affect, $d = -.43$). PI >< depression (depression, $d = -.09$); health (physical symptoms, $d = .05$); job performance (student engagement, $d = .07$; classroom management, $d = .19$); mindfulness & awareness (observe, $d = .19$; describe, $d = .11$; non-judging, $d = .09$; and non-reacting, $d = .08$); stress & strain (task-related hurry, $d = .02$); well-being (positive affect, $d = .11$)
Johnson, Emmons, Rivard, Griffin, and Dusek (2015)	Healthcare professionals	18 (20)	19 (20)	Resilience training	8 weeks	Wait-list	PI < anxiety (state, $d = -1.02$; and trait, $d = -1.41$); depression (depression with the CESD-10, $d = -1.50$; and depression with the PHQ-9, $d = -1.56$); and stress & strain (perceived stress, $d = -1.30$). PI > health (health responsibility, $d = .96$; interpersonal relations, $d = 1.40$; nutrition, $d = .34$; physical activity, $d = .81$; spiritual growth, $d = .99$; stress management, $d = 1.17$; absenteeism, $d = -.50$; activity impairment, $d = -1.23$; presenteeism, $d = -1.28$; and work productivity loss, $d = -1.38$)
Jouper and Johansson (2013)	Administrative employee	1	–	Mindfulness programme (specific to study)	12 weeks	N/A	Qualitative interviews: PI < stress & strain. PI > mindfulness & awareness; and well-being
Kemper and Khirallah (2015)	Health professionals	112 one module and 102 the other	–	Mindfulness in daily life	1 h	N/A	PI > mindfulness & awareness (cognitive and affective mindfulness, $d = .24$; and mindful attention awareness, $d = .20$); and resilience ($d = .21$)
Krasner et al. (2009)	Primary care physicians	59 (70)	–	Mindfulness programme (specific to study)	8 weeks	N/A	PI < burnout (emotional exhaustion, $d = -.37$); and distress & anger (distress, $d = -.47$). PI > compassion & empathy (physician empathy, $d = .36$), and mindfulness & awareness (mindfulness, $d = .86$). PI >< burnout (depersonalization, $d = -.19$; and personal accomplishment, $d = .15$)
Martín-Asuero and–García-Banda (2010)	Healthcare professionals	29	–	MBSR adaptation	8 weeks	N/A	PI < distress & anger (psychological distress, $d = -.59$); and stress & strain (daily stress, $d = -.39$). PI > well-being (negative affect, $d = -.26$). PI >< emotional intelligence & regulation (rumination, $d = -.19$)
McGarrigle and Walsh (2011)	Human service workers	12	–	Mindfulness programme (specific to study)	8 weeks	N/A	PI < stress & strain (perceived stress, $d = -.83$). PI > mindfulness & awareness (mindfulness, $d = 1.05$)
Moore (2008)	Trainee clinical psychologists	16 (23)	–	Mindfulness programme (specific to study)	4 weeks	N/A	Effect size data not available. PI > mindfulness & awareness. PI >< compassion & empathy; and stress & strain
Napoli and Bonifas (2011)	Trainee social workers	31 (46)	–	Mindfulness programme (specific to study)	16 weeks	N/A	PI > mindfulness & awareness (mindfulness, $d = .64$)
Newsome, Christopher, Dahlen, and Christopher (2006)	Counsellors	33	–	Mindfulness curriculum (specific to study)	15 weeks	N/A	Qualitative interviews: PI > emotional intelligence & regulation; health; mindfulness & awareness; relationships; and well-being
Newsome, Waldo, and Gruszka (2012)	Trainee helping professionals	31	–	Mindfulness programme (specific to study)	6 weeks	N/A	PI < stress & strain (perceived stress, $d = -1.01$). PI > compassion & empathy (self-compassion, $d = 1.13$), mindfulness & awareness (mindful attention awareness, $d = .91$)
Noone and Hastings (2010)	Disability support workers	34	–	Promotion of acceptance in carers and teachers	1.5 days	N/A	PI < distress & anger (distress, $d = -.54$). PI >< stress & strain (stress, $d = -.13$)

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Table 2. (Continued).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Pflugeisen, Drummond, Ebersole, Mundell, and Chen (2016)	Physicians	19 (23)	–	MBSR adaptation	8 weeks	N/A	PI < burnout (emotional exhaustion, d = –.46; depersonalization, d = –.32; and personal accomplishment, d = .56); and stress & strain (perceived stress, d = –.87). PI > mindfulness & awareness (mindfulness skills, d = .84)
Poulin, Makenzie, Soloway, and Karayolas (2008)	Study 1: Nurses	16	10 & 14	MBSR adaptation	4 weeks	Imagery & progressive muscle relaxation, & wait-list.	Mindfulness vs. imagery & progressive muscle relaxation: PI < burnout (personal accomplishment, d = .73); and well-being (relaxation, d = –.63). PI >< burnout (emotional exhaustion, d = –.07; and depersonalization, d = –.16); and well-being (satisfaction with life, d = .15). Mindfulness vs. wait-list: PI < burnout (personal accomplishment, d = 1.32). PI > burnout (emotional exhaustion, d = .22); and well-being (relaxation, d = .24). PI >< burnout (depersonalization, d = .00); and well-being (satisfaction with life, d = –.07)
	Study 2: Teachers	28	16	Mindfulness-based well-being education	8 weeks	Nothing	PI > job performance (students' engagement, d = .46; and classroom management, d = .20). PI >< distress & anger (distress, d = .04); job performance (instructional practices, d = .12); mindfulness & awareness (mindfulness, d = .15); and well-being (satisfaction with life, d = .09)
Phang, Chiang, Ng, Keng, and Oei (2016)	Trainee doctors	123 (135)	–	MBCT adaptation	4 weeks	N/A	PI < distress & anger (distress, d = –.76); and stress & strain (perceived stress, d = –.57). PI > mindfulness & awareness (mindfulness, d = .57)
Raab, Sogge, Parker, and Flament (2015)	Mental health professionals	22	–	MBSR	8 weeks	N/A	PI < burnout (emotional exhaustion, d = –.20; and personal accomplishment, d = .20). PI > compassion & empathy (self-compassion, d = .48). PI >< burnout (depersonalization, d = –.11); and well-being (quality of life, d = .02)
Reingold (2015)	Radiologic technicians	42	–	MBSR adaptation	6 weeks	N/A	Effect size data not available. PI < stress & strain
Rimes and Wingrove (2011)	Trainee clinical psychologists	20	–	MBCT	8 weeks	N/A	PI < depression (rumination, d = –.57); and stress & strain (perceived stress, d = –.23). PI > anxiety (d = .26); compassion & empathy (fantasy, d = .52; and self-compassion, d = .48); and mindfulness & awareness (non-reacting, d = .59; non-judging, d = .52; describe, d = .31; and observe, d = .38). PI >< compassion & empathy (empathic concern, d = .00; personal distress, d = –.06; and perspective taking, d = –.03); depression (d = .00); and mindfulness & awareness (act aware, d = .10)
Rocco, Dempsey, and Hartman (2012)	Mental health professionals	16	–	Calm abiding meditation	8 weeks	N/A	Qualitative interviews: PI > emotional intelligence & regulation; health; and mindfulness & awareness
Ruths et al. (2013)	Mental health professionals	27	–	MBCT	8 weeks	N/A	Effect size data not available. PI < distress & anger. PI > mindfulness & awareness. PI >< anxiety; distress & anger; and well-being
Schussler, Jennings, Sharp, and Frank (2016)	Teachers	50	–	CARE	6 weeks	N/A	Qualitative focus groups. PI > emotional intelligence & regulation

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Table 2. (Continued).

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
Shapiro, Brown, and Biegel (2007)	Trainee psychotherapists	22	32 (42)	MBSR	8 weeks	Psychology course	PI < anxiety (state, d = –.55; and trait, d = –.91); depression (rumination, d = –.41); and stress & strain (perceived stress, d = –.67). PI > compassion & empathy (self-compassion, d = .42); mindfulness & awareness (mindful attention awareness, d = .36); and well-being (positive affect, d = .57; and negative affect, d = –.46)
Shonin, Van Gordon, and Griffiths (2014)	Technology employee	1	–	Meditation awareness training	8 weeks	N/A	Case report: PI < distress & anger. PI > health
Singh et al. (2015)	Disability professionals	9	–	Mindfulness-based positive behavioural support	7 days	N/A	PI < stress & strain (perceived stress, d = –3.89)
Singh, Singh, Sabaawi, Myers, and Wahler (2006)	Psychiatric staff	18 (3 teams)	18 (same as expt. group)	Mindfulness-based mentoring	11, 8, or 6 sessions	Control within & between teams	Effect size data not available. PI > job performance; and well-being
Stew (2011)	Trainee occ. therapists	12	–	MBSR adaptation	4 weeks	N/A	Qualitative interviews: PI > emotional intelligence & regulation; and mindfulness & awareness
Tarrasch (2014)	Trainee counsellors and support staff	19	–	Mindfulness curriculum (specific to study)	2 terms	N/A	Qualitative interview: PI > emotional intelligence & regulation; and mindfulness & awareness
Thomley, Ray, Cha, and Bauer (2011)	Mixed employees	37 (50)	–	Yoga-based wellness programme	6 weeks	N/A	PI < stress & strain (diastolic blood pressure, d = –.24). PI > well-being (well-being, d = .39). PI >< stress & strain (systolic blood pressure, d = –.14)
van der Riet, Rossiter, Kirby, Dluzewska, and Harmon (2015)	Trainee nurses	14	–	Mindfulness programme (specific to study)	7 weeks	N/A	Qualitative analysis: PI < stress & strain. PI > emotional intelligence & regulation; mindfulness & awareness; and relationships

All reported results significant to $p < .05$ (or lower). ≤ decreases in; ≥ increases in; >≤ no change in; !: mindfulness associated with worsened outcome; expt.: experimental group; cnt.: control group; PI: post-intervention; NR: not-reported; MBCT: mindfulness-based cognitive therapy; MBSR: mindfulness-based stress reduction; MBST: mindfulness-based stress reduction therapy. CALM: community approach to learning mindfully. CARE: cultivating awareness and resilience in education. SMART: stress management and relaxation training. MM: mindfulness meditation; NCC: neural correlates of consciousness; NR: not recorded; N/A: not applicable; NA: not available; RCT: randomized controlled trial. *Number in parenthesis is the initial sample size (if different from sample size featured in analysis); **mindfulness just one component of broader intervention.

separate control participants (excluding $n = 3$ studies in which participants acted as their own controls). These tables report statistical significance and effect sizes (where available): in studies featuring a control group, post-intervention between-group differences are reported, whereas with single group studies, pre–post changes are reported. In addition, there were 6816 participants in non-intervention studies, as detailed in Supplementary Tables 3 (regression/correlation analyses) and 4 (qualitative studies). Overall, the studies covered a range of occupations, including physicians ($n = 10$), nurses (16), disability professionals (4), therapists, psychologists and counsellors (24), mixed (non-specific) mental health professionals (8), mixed (non-specific) healthcare professionals (20), social workers (9), teachers (16), sportspeople (2), technicians (3), service personnel (4), legal profession (1), firefighters (1), and police (1), as well as people employed by a university (3), business (7), factory (1), government (1), administrative occupation (1), call centre (1), and mixed (non-specific) contexts (18). Of the 112 intervention studies, 48 were randomized controlled trials, 64 were non-randomized samples. Overall, data on effect sizes were not available for 22 studies. The reasons for this lack of information were non-reporting of means and standard deviations, and/or not replying to our request for such data (20 articles), and not using standardized assessment measures (2 articles). An overview of the findings is shown in Table 3. This shows whether outcomes were either (a) improved in relation to an MBI; (b) did not change in relation to an MBI; (c) in exceptional cases, changed in a "negative" direction; and (d) associated with mindfulness (in non-intervention studies).

Discussion

Overall, MBIs had a generally positive impact upon all outcome measures. However, before discussing the main findings, it is worth first highlighting some issues afflicting the research base, which will be important to bear in mind when appraising the results.

Research issues

First, the quality of the studies is relatively poor overall (as detailed in Supplementary Table 1 and summarized with respect to intervention studies in Supplementary Table 2). Only 22.1% of intervention studies scored the highest rating, with many studies providing a poor level of detail regarding their design (e.g., the precise nature of the MBI). Moreover, only 44% of intervention studies featured an RCT design (with the percentage of these RCTs rated as 1 being 39.5%). The relatively poor quality of many studies limits the conclusions that can be drawn. We shall return to this issue of quality at the end of the discussion, where we offer recommendations for future research. That said, there are some exemplary studies (e.g. Aikens et al., 2014), which provide a high standard for future research to emulate. Moreover, there are sufficient numbers of high-quality studies – with 21 intervention studies scoring 1 on QATQS – to permit the drawing of tentative conclusions. As such, these 21 studies will be prioritized in the discussion below, where they are referred to as HQTs (high-quality trials).

A second key issue is the considerable heterogeneity in the design of the studies, particularly in terms of the type of intervention, and the outcome measures assessed. Regarding the intervention, there was a great range deployed across the studies (as detailed in Supplementary Table 5). Only 14.4% of interventions used what could be regarded as the two most established MBIs, namely MBSR (9.9%) and MBCT (5.4%), with a further 18% using a bespoke MBSR adaptation (e.g., varying the number of weeks, or mode of delivery, or content of the sessions). Added to these, 27.9% used a less well-established MBI (of which there were 25 different types), while the largest percentage of studies (39.6%) used an idiosyncratic intervention or curriculum that appears specific to that study. Added

Table 3. Summary of common outcomes across all studies.

Outcome	Number of studies assessing	Improvement related to mindfulness intervention	No change in relation to mindfulness intervention	Worsening related to mindfulness intervention	Association (benign) with mindfulness in non-intervention studies
Anxiety	25	17	5	1	2
Burnout	57	33	11	3	10
Compassion & empathy	40	24	10	2	4
Depression	30	13	5	1	4
Distress & anger	35	28	4	0	4
Emotional intelligence & regulation	40	23	3	0	10
Health	29	19	3	3	4
Job performance	60	37	6	0	17
Mindfulness & awareness	76	60	6	4	6
Relationships	23	16	0	0	7
Resilience	9	6	3	0	0
Stress & strain	63	33	15	5	8
Well-being	66	40	10	2	14

to this variability, there was considerable heterogeneity in the outcome measures, not only in terms of outcomes (e.g., anxiety, depression, satisfaction) but also the scales used to assess these. For instance, 10 different scales were used to gauge mindfulness alone. While a diversity of outcomes is welcome, the diversity of tools is less so, as it makes comparative assessment (e.g., meta-analyses) difficult. This difficulty is then compounded by the heterogeneity in interventions noted earlier, which means that the studies lack parity in their design. We shall return to these issues later, in our recommendations for future research. With those issues in mind, we can turn to the outcomes ourselves.

Mindfulness and mental health outcomes

We can begin by observing that the MBIs appeared effective at facilitating the development of mindfulness, which was assessed by 64 intervention studies, of which the majority found increased mindfulness in relation to the MBI (as detailed in Supplementary Table 6). There was a decent showing of HQTs: of these 21, mindfulness outcomes were reported by 9, with 8 finding significant improvement in at least some aspects of mindfulness, and 1 reporting no change. However, as alluded to in the previous sentence, most of these HQTs did not find a uniformly positive improvement in mindfulness, but only in facets of it, which shows the importance of analysing its various components separately (which many studies did, e.g., deploying Baer et al.'s (2006) Five Facets of Mindfulness Scale). Thus, for instance, although De Vibe et al. (2013) observed a small-to-moderate effect size in the "non-reacting" component (d = .31), no improvements were found with the others, namely, "non-judging" (d = .0), "act aware" (d = .04), "describe" (d = .06), and "observe" (d = .18). Conversely, Manotas, Segura, Eraso, Oggins, and McGovern (2014) found no improvement on non-reacting (d = .03) but did in relation to non-judging (d = .32) and observing (d = .23). However, they unexpectedly observed a decrease in the final two components, act aware (d = −.29) and describe (d = −.28). Such findings show the need to avoid simplistic statements about MBIs improving mindfulness, without at least clarifying which aspect or type of mindfulness one is referring to.

Turning to the specific outcomes, first, mindfulness appears to have an overall beneficial impact upon mental health, although the pattern of results can by no means be regarded as conclusive. The results were fairly favourable for anxiety, stress and distress/anger. With anxiety (Supplementary Table 7), of the 21 HQTs, 4 found an improvement in relation to an MBI – mostly with moderate effect sizes – compared to two which found no effect. Given the high prevalence and burden of occupational anxiety, particularly in some especially challenging professions, such as healthcare (Firth-Cozens, 2003), these improvements in anxiety linked to mindfulness are noteworthy. The results for stress (Supplementary Table 8) were similarly favourable: eight HQTs observed a positive impact of the intervention, whereas only two found no impact, although one found worsening in relation to the MBI (Flook, Goldberg, Pinger, Bonus, & Davidson, 2013). Again, such findings are welcome, given that Firth-Cozens (2003) reported that the proportion of healthcare professionals experiencing clinically significant levels of stress is consistently around 28% in most empirical studies, compared with about 18% in the general working population. Indeed, a recent survey of NHS staff found that 61% reporting feeling stress all or most of the time, and 59% stating that the stress is worse this year than last year (Dudman, Isaac, & Johnson, 2015). Likewise, the results were favourable with respect to distress and anger (Supplementary Table 9), where all HQTs assessing this (n = 4) found a significant improvement.

The results for depression and burnout were somewhat more equivocal. With depression (Supplementary Table 10), although the large majority of studies overall found an improvement in relation to an MBI, while four of the HQTs did, three found no such improvement. However, such results are perhaps understandable, given that MBIs such as MBCT are primarily targeted at people who are at risk of *relapse* to depression, rather than people who are actually currently depressed (and indeed, MBIs are generally *contraindicated* in such instance; Dobkin, Irving, & Amar, 2012). The results for burnout (Supplementary Table 11) were even poorer: while a slight majority of studies found that MBIs had a positive effect, only one HQT did, while six found no significant impact, and one (Hülsheger, Alberts, Feinholdt, & Lang, 2013) found a worsening effect. One possible explanation for these results may lie in the relatively small sample sizes of many studies. Some of the MBIs that failed to observe a significant improvement in burnout certainly observed trends in the predicted direction (e.g., Mealer et al., 2014 among the HQTs). The use of larger sample sizes may allow any impact of MBIs on burnout to be clearer. Another possible explanation is the multifaceted nature of the burnout construct. The dominant psychometric measure used was the Maslach Burnout Inventory (Maslach, Jackson, & Leiter, 1986), which has three dimensions: emotional exhaustion, cynicism (or depersonalization), and professional efficacy (or accomplishment). Numerous studies found that MBIs tended to have a stronger positive effect (albeit still non-significant) on emotional exhaustion than the other components (e.g., Duchemin, Steinberg, Marks, Vanover, & Klatt, 2015, among the HQTs). On that note, it is interesting that some scholars (e.g., Demerouti & Bakker, 2008) argue that personal efficacy/accomplishment should not be regarded as a core component of burnout (but rather as one of its outcomes). It is therefore possible that the presence of this factor in the Maslach Burnout Inventory may be diluting the impact of the MBIs (if burnout is analysed globally), and that other measures of burnout which exclude the factor, such as the Oldenburg Burnout Inventory (Demerouti & Bakker, 2008), might prove to be more precisely targeted in this respect.

Well-being and performance outcomes

An important aspect of the current review was an effort towards inclusivity, especially with respect to outcomes. Most studies and reviews of MBIs tend to focus mainly on the kind of mental health outcomes reviewed earlier, which is perhaps understandable given the origins of the MBI paradigm in treating physical and mental illness (Kabat-Zinn, 1982). However, it is increasingly common to find studies not only reporting on these "negative" indicators of well-being

(i.e., outcomes whose *absence* is indicative of adaptive function) but also on more positive measures of well-being and functioning (e.g., job performance). Compared to the outcomes reviewed earlier, there was far greater heterogeneity with respect to such measures, which renders the process of making meaningful comparisons and assessment more difficult. Nevertheless, it is still instructive to consider the scope of the emerging work in this area. To begin with, mindfulness was associated with 31 different measures of "positive" well-being (Supplementary Table 12), with a majority observing beneficial outcomes in relation to an MBI, including four HQTs, which reported on outcomes including spiritual experiences (Shapiro et al., 1998), job satisfaction (Hülsheger et al., 2013), professional quality of life (Duchemin et al., 2015), and subjective well-being (De Vibe et al., 2013). That said, three HQTs reported no significant improvement in relation to well-being (van Berkel et al., 2014b), self-regard (Sood, Sharma, Schroeder, & Gorman, 2014), and meaning in life (West et al., 2014). The data were slightly stronger regarding physical health (Supplementary Table 13); here, the four HQTs assessing such outcomes observed a positive impact, with measures including individual strength (Huang, Li, Huang, & Tang, 2015), sleep quality (Wolever et al., 2012), pain (Jay et al., 2015), and health-enhancing physical activity (Van Berkel et al., 2014a), although the latter study also found worsening outcomes in relation to physical activity.

Studies also analysed outcomes that could be regarded as aspects or facets of well-being, including resilience (Supplementary Table 14), relationships (Supplementary Table 15), and emotional intelligence (Supplementary Table 16). Although there were relatively few studies assessing these outcomes, the pattern of findings was generally favourable in terms of the effectiveness of MBIs, although obviously the small number of relevant studies means that any conclusions drawn are tentative, and further work is required to substantiate these points. Resilience was only analysed by nine studies, although these included four HQTs, three of which reported a positive improvement (while one found no improvement). A larger number of studies (n = 23) examined relationships, with these unanimously finding either a significant improvement related to an MBI (including one HQT). A still larger number of articles (n = 40) considered emotional intelligence or regulation (albeit no HQTs), with most studies finding an improvement relating to an MBI (although a handful found no significant impact). This latter outcome is particularly interesting, as from a theoretical perspective it provides one of the strongest potential mechanisms by which the positive outcomes adumbrated earlier may be mediated. As outlined in the introduction, according to Shapiro et al. (2006), the key mechanism through which mindfulness exerts its positive effects is "reperceiving", whereby people are better able to detach themselves from distressing qualia that might otherwise precipitate stress etc. Reperceiving could be regarded as an aspect of a more general capacity of emotion regulation. For instance, Walsh and Shapiro (2006) define meditation as "a family of self-regulation practices that focus on training attention and awareness in order to bring mental processes under greater voluntary control and thereby foster general mental well-being" (pp. 228–229).

Finally, mindfulness was associated with various aspects of job performance. Again, there was great heterogeneity in this regard, which makes the drawing of comparisons and conclusions difficult. Nevertheless, one imagines that organizations themselves would be keen to note any improvement in occupational functioning related to an intervention such as mindfulness. Numerous studies analysed compassion and empathy (Supplementary Table 17). Although these qualities can also be considered facets of well-being (Gilbert, 2009), their analysis in studies here was mainly in relation to healthcare professions, where these are deemed indicative of professional competence and efficacy. In this respect, the data were fairly encouraging, with four HQTs finding a significant improvement, and only one reporting no impact. Lastly, there was a disparate range of 26 different measures of job performance (Supplementary Table 18), which were mostly specific to particular occupational domains, ranging from competition performance among professional athletes (John, Kumar, & Lal, 2012) to restraint of patients within psychiatric settings (Brooker et al., 2014). Again, the findings were generally positive, including four HQTs finding a significant improvement, against two which observed no impact.

Future directions

Overall, MBIs had a generally positive impact upon most outcome measures (although some outcome measures returned rather equivocal results, particularly burnout and depression). Moreover, a fairly large evidence based on mindfulness in workplace settings is gradually accumulating, with 153 papers included in this review, comprising 12,571 participants. Together, these studies suggest that mindfulness can potentially reduce mental health issues (e.g., stress), enhance well-being-related outcomes (e.g., job satisfaction), and improve aspects of job performance. However, as argued at the start of this section, there are numerous issues with the research base which limits the conclusions that can be drawn. Thus, as promising as the findings are, there is still much work to be done in terms of substantiating the positive results reported earlier. In that regard, based on the critiques and research gaps identified earlier, the following recommendations can be made vis-à-vis future work in this area. Points 1 and 2 pertain to all types of research (interventions and non-interventions), while the remainder focus specifically on intervention studies.

First, there will ideally be a diversification of the occupations and workplaces that are studied. There is a preponderance of research into healthcare-related occupations, and while this research is valuable, it will be instructive to expand the diversity of occupations examined, with a particular need to look at corporate settings (in which many people work, and which seem particularly under-represented here). Second, it would likewise be good to see a diversification of outcome measures, with studies not only addressing mental health outcomes, but also more "positive" non-clinical outcomes, such as work engagement and life satisfaction (which, although analysed by some studies, certainly constitute a minority here), and also outcomes which are similarly desirable in many occupational settings, but which did not feature

in *any* studies here (such as creativity). Third, where possible, intervention studies should implement an RCT design, with large sample sizes (ideally determined by a priori power calculations drawing on estimated effect size). Fourth, in addition to the standard passive control group deployed in most intervention studies (e.g., wait list), it would be useful for trials to also include an active control group (a good example of which is Wolever et al. (2012), which included yoga as an active control). This will better enable any positive effects to be ascribed to mindfulness per se (i.e., rather than participants simply being involved in an absorbing group activity). Fifth, where possible, trials should involve established MBIs (rather than bespoke adaptations), to better enable comparison and aggregation across studies. At the same time though, there is also value in moving beyond MBIs that were developed for clinical contexts (e.g., MBSR), and exploring MBIs created specifically for the workplace. Sixth, MBIs should always be delivered by an accredited mindfulness practitioner – as was the case in many studies here (although such details were not unanimously reported) – since it requires training to teach mindfulness skilfully and safely. That said, although efforts are being made towards developing standardized systems of training and accreditation, such efforts are in their infancy (Adams et al., 2016), and so organizations looking to implement good practice are advised to check the latest guidance by leading bodies such as the Oxford Mindfulness Centre.

Finally, the case for mindfulness will be strengthened – certainly from the perspective of organizations themselves – through cost–benefit analyses. Ultimately, corporations are generally driven by (and indeed are legally mandated to focus on) their profitability; while this fact may feel somewhat dispiriting from certain standpoints, it means that if MBIs are shown to produce an overall net gain (where rewards outweigh the costs), this then provides organizations with a strong incentive to implement such MBIs. Unfortunately, Edwards, Bryning, and Crane (2015) suggest that there are currently few such cost–benefit analyses, not only in occupational settings, but in all contexts. There are some exceptions. For instance, Aikens et al. (2014) conducted a cost–benefit analysis based on rates of self-reported burnout, concluding that the findings were suggestive of a 20% increase in worker productivity, potentially representing employer savings of up to $22,580 per employee year. Equally striking was an analysis of intensive care units across three large hospitals by Vogus, Cooil, Sitterding, and Everett (2014), who calculated that the impact of engaging in "mindful organizing" was a 13.6% decrease in turnover, representing an average hospital saving of between $169,000 and $1,014,560. Such analyses will be useful going forward in terms of generating managerial and organizational "buy in" to the potential value of mindfulness, thus helping facilitate the further research that is needed to fully substantiate the promise of the research reviewed here. Nevertheless, even as it stands, the research base supports the contention that mindfulness certainly has a positive role to play in occupational contexts.

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ORCID

Tim Lomas http://orcid.org/0000-0001-9458-6185
Juan Carlos Medina http://orcid.org/0000-0002-4550-2157
Itai Ivtzan http://orcid.org/0000-0002-2253-210X
Francisco José Eiroa-Orosa http://orcid.org/0000-0002-4163-6545

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