Running head: MINDFULNESS IN THE WORKPLACE

Title

The impact of mindfulness on wellbeing and performance in the workplace: An inclusive systematic review of the empirical literature.

European Journal of Work and Organizational Psychology, 2017

Authors

Tim Lomas[1†], Juan Carlos Medina[2], Itai Ivtzan[1], Silke Rupprecht[3], Rona Hart[1,] Francisco Eiroa-Orosa[1]

[1] School of Psychology, University of East London, Arthur Edwards Building, Water Lane, London, E15 4LZ, United Kingdom

[2] Faculty of Psychology, University of Barcelona, Passeig de la Vall d'Hebron, 08035 Barcelona, Spain

[3] Leuphana University, Scharnhorststraße 1, 21335 Lüneburg, Germany

[†] Author responsible for correspondence:

Email: t.lomas@uel.ac.uk

Note: This article may not exactly replicate the final published version. It is not the copy of record.

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 wellbeing. 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 wellbeing and performance measures. 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 randomised control trials.

Practitioner points:

- Understand the value of mindfulness in the workplace

- Appreciate the strengths and weaknesses of the underlying evidence base

Introduction

Work appears to be increasingly stressful in the UK, 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 twenty 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 mental ill health is the leading cause of sickness absence in the UK, 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 (Cousins, 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 below) 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 operationalisation 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 wellbeing (Walsh & Shapiro, 2006). Lutz,

Slagter, Dunne, and Davidson (2008) suggest most common forms feature either 'focused

attention' or 'open-monitoring' processes. Focused attention can be operationalised in terms

of the co-ordination 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 re-orienting (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 more receptive 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) theorise reperceiving/decentring as having a positive impact upon wellbeing. 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 wellbeing 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 program, 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 practice 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 practice mindfulness daily and 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 wellbeing 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 current 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 et al., 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 wellbeing 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 28th January 2016. In terms of PICOS (participants, interventions, comparisons, outcomes and study design), the key criteria were: participants – current employees of a company or organisation; 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); outcomes – mindfulness, wellbeing, and job performance (with wellbeing used here as an all-encompassing term, spanning physical and mental health); and 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 health and wellbeing 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 (PROSPERO) database on 5th 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, wellbeing, 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 above, 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 versus non-randomised samples); occupation of participants; number of experimental and control participants (if applicable); type of MBI; length of MBI; control condition; principle wellbeing and performance outcomes; and the effect sizes of

8

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;

wellbeing 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, wellbeing), and physical health (illness, diet,

exercise, and sleep). Secondary measures of interest were outcomes that *pertain* to wellbeing

(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 0.2, 0.5, and 0.8 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 rigor in six areas: (a) selection bias; (b) design; (c)

confounders; (d) blinding; (e) data collection method; and (f) withdrawals and drop-outs.

Each area is assessed on a score of 1 to 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 on www.researchgate.net.) Scoring was conducted by the fourth author, and checked by the first author. Any discrepancies were 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, Wiley, Capuano, Baker, Deitrick, et al. (2005) and Cohen-Katz, Wiley, Capuano, Baker, Kimmel, et al. (2005); (3) Grégoire and Lachance (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, and 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 5,755 participants in the intervention studies, as detailed below in tables 1 (RCT studies) and 2 (non-RCT studies), including 3,728 participants undertaking MBIs, and 2,027 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 6,816 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 ($n = 1$), and mixed

(non-specific) contexts (18). Of the 112 intervention studies, 48 were randomised controlled

trials, 64 were non-randomised samples. Overall, data on effect sizes was 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

standardised assessment measures (2 articles). An overview of the findings is shown in table

3 below. 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).

[Please insert table 1 about here]

[Please insert table 2 about here]

[Please insert table 3 about here]

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 summarised 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 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 were 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 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 above, which means that the studies lack parity in their design. We shall return to these issues below, in our recommendations for future research. With those issues in mind, we can turn to the outcomes themselves.

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 nine, with eight finding significant improvement in at least some aspects of mindfulness, and one 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 et al. (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, four 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 et al., 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 et al., 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 depersonalisation), 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 et al., 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 this 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.

Wellbeing 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 above, 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 wellbeing (i.e., outcomes whose *absence* is indicative of adaptive function), but also on more positive measures of wellbeing and functioning (e.g., job performance). Compared to the outcomes reviewed above, 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' wellbeing (supplementary table 12), with a majority observing positive 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 wellbeing (de Vibe et al., 2013). That said, three HQTs reported no significant improvement in relation to wellbeing (van Berkel et al., 2014b), self-regard (Sood et al., 2014), and meaning in life (West et al., 2014). The data was 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 et al., 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 wellbeing, 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 above 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 organisations 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 wellbeing (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 was fairly encouraging, with four HQTs finding a significant improvement, and only one reporting no impact. Lastly, there were a disparate range of 26 different measures of job performace (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-base on mindfulness in workplace settings is gradually accumulating, with 153 papers included in this review, comprising 12,571 participants. Together, these studies suggest mindfulness can potentially reduce mental health issues (e.g., stress), enhance wellbeing-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 above. In that regard, based on the critiques and research gaps identified above, the following recommendations can be made vis-à-vis future work in this area. Points one and two 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 investigated. 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 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 standardised systems of training and accreditation, such efforts are in their infancy (Adams et al., 2016), and so organisations 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 organisations 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 organisations with a strong incentive to implement such MBIs. Unfortunately, Edwards, Bryning, and Crane (2015) suggest 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 organising' 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 organisational '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.

References

Adams, J., Brewer, S., Chapman-Clarke, M., Chaskalson, M., Furr, M., Gibbs, P., . . . Watt, T. (2016). *Building the Case for Mindfulness in the Workplace*. London: The Mindfulness Initiative.

Aggs, C., & Bambling, M. (2010). Teaching mindfulness to psychotherapists in clinical practice: The mindful therapy programme. *Counselling and Psychotherapy Research*, 10(4), 278–286. doi: 10.1080/14733145.2010.485690

Aikens, K. A., Astin, J., Pelletier, K. R., Levanovich, K., Baase, C. M., Park, Y. Y., & Bodnar, C. M. (2014). Mindfulness goes to work: Impact of an online workplace intervention. *Journal of Occupational and Environmental Medicine, 56*(7), 721-731. doi: 10.1097/jom.0000000000000209

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review, 30*(2), 217-237. doi: 10.1016/j.cpr.2009.11.004

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27-45. doi: 10.1177/1073191105283504

Baccarani, C., Mascherpa, V., & Minozzo, M. (2013). Zen and well-being at the workplace. *TQM Journal*, 25(6), 606–624. doi: 10.1108/TQM-07-2013-0077

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27-45.

Baltzell, A., & Akhtar, V. L. (2014). Mindfulness Meditation Training for Sport (MMTS) intervention: Impact of MMTS with Division I female athletes. *The Journal of Happiness and Wellbeing, 2*(2), 160-173.

Baltzell, A., Caraballo, N., Chipman, K., & Hayden, L. (2014). A qualitative study of the mindfulness meditation training for sport: Division i female soccer players' experience. *Journal of Clinical Sport Psychology, 8*(3), 221-244. doi: 10.1123/jcsp.2014-0030

Barbosa, P., Raymond, G., Zlotnick, C., Wilk, J., Toomey, I. R., & Mitchell, I. J. (2013). Mindfulness-based stress reduction training is associated with greater empathy and reduced anxiety for graduate healthcare students. *Education for Health: Change in Learning and Practice, 26*(1), 9-14. doi: 10.4103/1357-6283.112794

Bazarko, D., Cate, R. A., Azocar, F., & Kreitzer, M. J. (2013). The impact of an innovative mindfulness-based stress reduction program on the health and well-being of nurses employed in a corporate setting. *Journal of Workplace Behavioral Health*, 28(2), 107–133.

Beckman, H. B., Wendland, M., Mooney, C., Krasner, M. S., Quill, T. E., Suchman, A. L., & Epstein, R. M. (2012). The impact of a program in mindful communication on primary care physicians. *Academic Medicine*, 87(6), 815–819. doi: 10.1097/ACM.0b013e318253d3b2

Beddoe, A. E., & Murphy, S. O. (2004). Does mindfulness decrease stress and foster empathy among nursing students? *Journal of Nursing Education*, 43(7), 305–312.

Beshai, S., McAlpine, L., Weare, K., & Kuyken, W. (2016). A non-randomised feasibility trial assessing the efficacy of a mindfulness-based intervention for teachers to reduce stress and improve well-being. *Mindfulness*, 7(1), 198–208. doi: 10.1007/s12671-015-0436-1

Birnbaum, L. (2008). The use of mindfulness training to create an "accompanying place" for social work students. *Social Work Education*, 27(8), 837–852. doi: 10.1080/02615470701538330

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., . . . Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*(3), 230-241. doi: 10.1093/clipsy.bph077

Bond, A. R., Mason, H. F., Lemaster, C. M., Shaw, S. E., Mullin, C. S., Holick, E. A., & Saper, R. B. (2013). Embodied health: The effects of a mind-body course for medical students. *Medical Education Online*, 18, 1–8. doi: 10.3402/meo.v18i0.20699

Bonifas, R. P., & Napoli, M. (2014). Mindfully increasing quality of life: A promising curriculum for MSW students. *Social Work Education*, 33(4), 469–484. doi: 10.1080/02615479.2013.838215

Borton, J. L. S., Markowitz, L. J., & Dieterich, J. (2005). Effects of suppressing negative self–referent thoughts on mood and self–esteem. *Journal of Social and Clinical Psychology*, 24(2), 172-190. doi: 10.1521/jscp.24.2.172.62269

Brady, S., O'Connor, N., Burgermeister, D., & Hanson, P. (2012). The impact of mindfulness meditation in promoting a culture of safety on an acute psychiatric unit. *Perspectives in Psychiatric Care, 48*(3), 129-137. doi: 10.1111/j.1744-6163.2011.00315.x

Brooker, J. E., Julian, J., Webber, L., Chan, J., Shawyer, F., & Meadows, G. (2013). Evaluation of an occupational mindfulness program for staff employed in the disability sector in Australia. *Mindfulness, 4*(2), 122-136. doi: 10.1007/s12671-012-0112-7

Brooker, J. E., Webber, L., Julian, J., Shawyer, F., Graham, A. L., Chan, J., & Meadows, G. (2014). Mindfulness-based training shows promise in assisting staff to reduce their use of restrictive interventions in residential services. *Mindfulness, 5*(5), 598-603. doi: 10.1007/s12671-014-0306-2

Burnett, M., & Pettijohn, C. (2015). Investigating the efficacy of mind-body therapies and emotional intelligence on worker stress in an organizational setting: An experimental

approach. *Journal of Organizational Culture, Communications and Conflict*, 19(1), 146–158.

Chambers, R., Gullone, E., & Allen, N. B. (2009). Mindful emotion regulation: An integrative review. *Clinical Psychology Review, 29*(6), 560-572. doi: 10.1016/j.cpr.2009.06.005

Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychological Review, 31*(3), 449-464. doi: 10.1016/j.cpr.2010.11.003

Chiesa, A., & Serretti, A. (2009). Mindfulness-based stress reduction for stress management in healthy people: A review and meta-analysis. *The Journal of Alternative and Complementary Medicine, 15*(5), 593-600. doi: 10.1089=acm.2008.0495

Christopher, J. C., Christopher, S. E., Dunnagan, T., & Schure, M. (2006). Teaching self-care through mindfulness practices: The application of Yoga, meditation, and Qigong to counselor training. *Journal of Humanistic Psychology*, 46(4), 494–509. doi: 10.1177/0022167806290215

Cohen-Katz, J., Wiley, S., Capuano, T., Baker, D. M., Deitrick, L., & Shapiro, S. (2005). The effects of mindfulness-based stress reduction on nurse stress and burnout: a qualitative and quantitative study, part III. *Holistic Nursing Practice, 19*(2), 78-86.

Cohen-Katz, J., Wiley, S. D., Capuano, T., Baker, D. M., Kimmel, S., & Shapiro, S. (2005). The effects of mindfulness-based stress reduction on nurse stress and burnout, Part II: A quantitative and qualitative study. *Holistic Nursing Practice, 19*(1), 26-35.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Cohen, J. S., & Miller, L. J. (2009). Interpersonal mindfulness training for well-being: A pilot study with psychology graduate students. *Teachers College Record, 111*(12), 2760-2774.

Cousins, L. S. (1996). The dating of the historical Buddha: A review article. *Journal of the Royal Asiatic Society (Third Series), 6*(1), 57-63. doi: 10.1017/S1356186300014760

Davies, S. (2014). *Annual Report of the Chief Medical Officer 2013, Public Mental Health Priorities: Investing in the Evidence*. London: Department of Health.

De Vibe, M., Solhaug, I., Tyssen, R., Friborg, O., Rosenvinge, J. H., Sørlie, T., & Bjørndal, A. (2013). Mindfulness training for stress management: A randomised controlled study of medical and psychology students. *BMC Medical Education, 13*(1). doi: 10.1186/1472-6920-13-107

De Zoysa, N., Ruths, F. A., Walsh, J., & Hutton, J. (2014). Mindfulness Based Cognitive Therapy for mental health professionals: A long-term qualitative follow-up study. *Mindfulness*, 5(1), 10–17. doi: 10.1007/s12671-012-0141-2

Demerouti, E., & Bakker, A. B. (2008). The Oldenburg Burnout Inventory: A good alternative to measure burnout and engagement. In J. R. B. Halbesleben (Ed.), *Handbook of Stress and Burnout in Health Care*. Hauppauge, NY: Nova Science.

Dobie, A., Tucker, A., Ferrari, M., & Rogers, J. M. (2016). Preliminary evaluation of a brief mindfulness-based stress reduction intervention for mental health professionals. *Australasian Psychiatry*, 24(1), 42–45. doi: 10.1177/1039856215618524

Dobkin, P. L., Irving, J. A., & Amar, S. (2012). For whom may participation in a mindfulness-based stress reduction program be contraindicated? *Mindfulness, 3*(1), 44-50. doi: 10.1007/s12671-011-0079-9

Dorian, M., & Killebrew, J. E. (2014). A study of mindfulness and self-care: A path to self-compassion for female therapists in training. *Women & Therapy*, 37(1–2), 155–

163. doi: 10.1080/02703149.2014.850345

Duchemin, A.-M., Steinberg, B. A., Marks, D. R., Vanover, K., & Klatt, M. (2015). A Small randomized pilot study of a workplace mindfulness-based intervention for surgical intensive care unit personnel: Effects on salivary α-Amylase levels. *Journal of Occupational and Environmental Medicine, 57*(4), 393-399. doi: 10.1097/jom.0000000000000371

Dudman, J., Isaac, A., & Johnson, S. (2015, 10 June 2015). Revealed: How the stress of working in public services is taking its toll on staff, *The Guardian*. Retrieved from http://www.theguardian.com/society/2015/jun/10/stress-working-public-services-survey

Edwards, R. T., Bryning, L., & Crane, R. (2015). Design of economic evaluations of mindfulness-based interventions: ten methodological questions of which to be mindful. *Mindfulness, 6*(3), 490-500.

Erogul, M., Singer, G., McIntyre, T., & Stefanov, D. G. (2014). Abridged mindfulness intervention to support wellness in first-year medical students. *Teaching and Learning in Medicine*, 26(4), 350–356. doi: 10.1080/10401334.2014.945025

Felton, T. M., Coates, L., & Christopher, J. C. (2015). Impact of mindfulness training on counseling students' perceptions of Stress. *Mindfulness*, 6(2), 159–169. doi: 0.1007/s12671-013-0240-8

Firth-Cozens, J. (2003). Doctors, their wellbeing, and their stress : It's time to be proactive about stress—and prevent it. *BMJ : British Medical Journal, 326*(7391), 670-671.

Fisher, P., & Hemanth, P. (2015). The development, facilitation and initial evaluation of a mindfulness group for a clinical psychology training course. *Clinical Psychology Forum,* 266, 12-16.

Flaxman, P. E., & Bond, F. W. (2010). Worksite stress management training: moderated

effects and clinical significance. *Journal of Occupational Health Psychology*, 15(4), 347–358. doi: 10.1037/a0020522

Flook, L., Goldberg, S. B., Pinger, L., Bonus, K., & Davidson, R. J. (2013). Mindfulness for teachers: A pilot study to assess effects on stress, burnout, and teaching efficacy. *Mind, Brain, and Education, 7*(3), 182-195. doi: 10.1111/mbe.12026

Fortney, L., Luchterhand, C., Zakletskaia, L., Zgierska, A., & Rakel, D. (2013). Abbreviated mindfulness intervention for job satisfaction, quality of life, and compassion in primary care clinicians: A Pilot Study. *Annals of Family Medicine*, 11(5), 412–420. doi: 10.1370/afm.1511

Foureur, M., Besley, K., Burton, G., Yu, N., & Crisp, J. (2013). Enhancing the resilience of nurses and midwives: Pilot of a mindfulness based program for increased health, sense of coherence and decreased depression, anxiety and stress. *Contemporary Nurse*, 45(1), 114–125. doi: 10.5172/conu.2013.45.1.114

Franco, C., Mañas, I., Cangas, A. J., Moreno, E., & Gallego, J. (2010). Reducing teachers' psychological distress through a mindfulness training program. *Spanish Journal of Psychology,* 13(2), 655–666.

Frank, J. L., Reibel, D., Broderick, P., Cantrell, T., & Metz, S. (2015). The effectiveness of Mindfulness-Based Stress Reduction on educator stress and well-being: Results from a pilot study. *Mindfulness, 6*(2), 208-216. doi: 10.1007/s12671-013-0246-2

Fresco, D. M., Moore, M. T., van Dulmen, M. H. M., Segal, Z. V., Ma, S. H., Teasdale, J. D., & Williams, J. M. G. (2007). Initial psychometric properties of the experiences questionnaire: Validation of a self-report measure of decentering. *Behavior Therapy, 38*(3), 234-246. doi: 10.1016/j.beth.2006.08.003

Galantino, M. Lou, Baime, M., Maguire, M., Szapary, P. O., & Farrar, J. T. (2005).

Association of psychological and physiological measures of stress in health-care professionals during an 8-week mindfulness meditation program: Mindfulness in pratice. *Stress and Health*, 21(4), 255–261. doi: 10.1002/smi.1062

Gauthier, T., Meyer, R. M. L., Grefe, D., & Gold, J. I. (2015). An on-the-job mindfulness-based intervention for pediatric ICU nurses: A pilot. *Journal of pediatric nursing, 30*(2), 402-409. doi: 10.1016/j.pedn.2014.10.005

Gilbert, P. (2009). Introducing compassion-focused therapy. *Advances in Psychiatric Treatment, 15*(3), 199-208. doi: 10.1192/apt.bp.107.005264

Gockel, A., Burton, D., James, S., & Bryer, E. (2013). Introducing mindfulness as a self-care and clinical training strategy for beginning social work students. *Mindfulness, 4*(4), 343-353. doi: 10.1007/s12671-012-0134-1

Gold, E., Smith, A., Hopper, I., Herne, D., Tansey, G., & Hulland, C. (2010) Mindfulness-based stress reduction (MBSR) for primary school teachers. *Journal of Child and Family Studies*, 19(2), 184–189. doi: 10.1007/s10826-009-9344-0

Goodman, M. J., & Schorling, J. B. (2012). A mindfulness course decreases burnout and improves well-being among healthcare providers. *The International Journal of Psychiatry in Medicine*, 43(2), 119–128. doi: 10.2190/PM.43.2.b

Grégoire, S., & Lachance, L. (2015). Evaluation of a brief mindfulness-based intervention to reduce psychological distress in the workplace. *Mindfulness, 6*(4), 836-847. doi: 10.1007/s12671-014-0328-9

Grégoire, S., Lachance, L., & Taylor, G. (2015). Mindfulness, mental health and emotion regulation among workers. *International Journal of Wellbeing, 5*(4).

Gregory, A. (2015). Yoga and mindfulness program: The effects on compassion fatigue and compassion satisfaction in social workers. *Journal of Religion &*

Spirituality in Social Work: Social Thought, 34(4), 372–393. doi: 10.1080/15426432.2015.1080604

Grepmair, L., Mitterlehner, F., Loew, T., & Nickel, M. (2007). Promotion of mindfulness in psychotherapists in training: Preliminary study. *European Psychiatry, 22*(8), 485-489. doi: 10.1016/j.eurpsy.2007.02.004

Hallman, I. S., O'Connor, N., Hasenau, S., & Brady, S. (2014). Improving the culture of safety on a high-acuity inpatient child/adolescent psychiatric unit by Mindfulness-Based Stress Reduction training of staff. *Journal of Child and Adolescent Psychiatric Nursing,* 27(4), 183–189. doi: 10.1111/jcap.12091

Harris, A. R., Jennings, P. A., Katz, D. A., Abenavoli, R. M., & Greenberg, M. T. (2015). Promoting stress management and wellbeing in educators: Feasibility and efficacy of a school-based yoga and mindfulness intervention. *Mindfulness, 7*(1), 143-154. doi: 10.1007/s12671-015-0451-2

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and Commitment Therapy: An Experiential Approach to Behavior Change*. New York: Guilford.

Hemanth, P., & Fisher, P. (2015). Clinical psychology trainees' experiences of mindfulness: An interpretive phenomenological analysis. *Mindfulness*, 6(5), 1143–1152. doi: 10.1007/s12671-014-0365-4

Hopkins, A., & Proeve, M. (2013). Teaching mindfulness-based cognitive therapy to trainee psychologists: Qualitative and quantitative effects. *Counselling Psychology Quarterly*, 26(2), 115–130. doi: 10.1080/09515070.2013.792998

Horner, J. K., Piercy, B. S., Eure, L., & Woodard, E. K. (2014). A pilot study to evaluate mindfulness as a strategy to improve inpatient nurse and patient experiences. *Applied Nursing Research*, 27(3), 198–201. doi: 10.1016/j.apnr.2014.01.003

Huang, S.-L., Li, R.-H., Huang, F.-Y., & Tang, F.-C. (2015). The potential for mindfulness-

based intervention in workplace mental health promotion: Results of a randomized controlled trial. *PLoS One*, 10(9), e0138089. doi: 10.1371/journal.pone.0138089

Hue, M., & Lau, N. (2015). Promoting well-being and preventing burnout in teacher education: A pilot study of a mindfulness-based programme for pre-service teachers in Hong Kong. *Teacher Development*, 19(3), 381–401. doi: 0.1080/13664530.2015.1049748

Hülsheger, U. R., Alberts, H. J. E. M., Feinholdt, A., & Lang, J. W. B. (2013). Benefits of mindfulness at work: The role of mindfulness in emotion regulation, emotional exhaustion, and job satisfaction. *Journal of Applied Psychology*, 98(2), 310–325. doi: 10.1037/a0031313

Hülsheger, U. R., Feinholdt, A., & Nübold, A. (2015). A low-dose mindfulness intervention and recovery from work: Effects on psychological detachment, sleep quality, and sleep duration. *Journal of Occupational and Organizational Psychology*, 88(3), 464–489. doi: 10.1111/joop.12115

Jay, K., Brandt, M., Hansen, K., Sundstrup, E., Jakobsen, M. D., Schraefel, M. C., … Andersen, L. L. (2015). Effect of individually tailored biopsychosocial workplace interventions on chronic musculoskeletal pain and stress among laboratory technicians: Randomized controlled trial. *Pain Physician*, 18(5), 459–471. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/26431123

Jennings, P. A., Frank, J. L., Snowberg, K. E., Coccia, M. A., & Greenberg, M. T. (2013). Improving classroom learning environments by cultivating awareness and resilience in education (CARE): Results of a randomized controlled trial. *School Psychology Quarterly*, 28(4), 374–390. doi: 10.1037/spq0000035

Jennings, P. A., Snowberg, K., Coccia, M., & Greenberg, M. (2011). Improving classroom

learning environments by cultivating awareness and resilience in education (CARE):

Results of two pilot studies. *Journal of Classroom Interaction*, 46, 37–48. doi:

10.1037/spq0000035

John, K. S., Kumar, V. S., & Lal, K. G. (2012). The effect of music therapy and meditation

on sports performance in professional shooters. *International Journal of Research in

Ayurveda and Pharmacy, 3*(1), 133-136.

Johnson, J. R., Emmons, H. C., Rivard, R. L., Griffin, K. H., & Dusek, J. A. (2015).

Resilience training: A pilot study of a mindfulness-based program with depressed

healthcare professionals. *EXPLORE: The Journal of Science and Healing, 11*(6), 433-

444. doi: 10.1016/j.explore.2015.08.002

Jouper, J., & Johansson, M. (2013). Qigong and mindfulness-based mood recovery: Exercise

experiences from a single case. *Journal of Bodywork and Movement Therapies*, 17(1),

69–76. doi: 10.1016/j.jbmt.2012.06.004

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain

patients based on the practice of mindfulness meditation: Theoretical considerations

and preliminary results. *General Hospital Psychiatry, 4*(1), 33-47. doi: 10.1016/0163-

8343(82)90026-3

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future.

Clinical Psychology: Science and Practice, 10(2), 144-156. doi:

10.1093/clipsy.bpg016

Kemper, K. J., & Khirallah, M. (2015). Acute effects of online mind–body skills training on

resilience, mindfulness, and empathy. *Journal of Evidence-Based Complementary and

Alternative Medicine,* 20(4), 247–253. doi: 0.1177/2156587215575816

Klatt, M. D., Buckworth, J., & Malarkey, W. B. (2009). Effects of low-dose mindfulness-

based stress reduction (MBSR-ld) on working adults. *Health Education & Behavior :*

The Official Publication of the Society for Public Health Education, 36(3), 601–614. doi: 10.1177/1090198108317627

Klatt, M. D., Steinberg, B., & Duchemin, A. M. (2015). Mindfulness in motion (Mim): An onsite mindfulness based intervention (mbi) for chronically high stress work environments to increase resiliency and work engagement. *Journal of Visualized Experiments, 2015*(101), 1-11. doi: 10.3791/52359

Krasner, M. S., Epstein, R. M., Beckman, H., Suchman, A. L., Chapman, B., Mooney, C. J., & Quill, T. E. (2009). Association of an educational program in mindful communication with burnout, empathy, and attitudes among primary care physicians. *JAMA: The Journal of the American Medical Association*, 302(12), 1284–1293. doi: 10.1001/jama.2009.1384

Lamothe, M., Rondeau, É., Malboeuf-Hurtubise, C., Duval, M., & Sultan, S. (2016). Outcomes of MBSR or MBSR-based interventions in health care providers: A systematic review with a focus on empathy and emotional competencies. *Complementary Therapies in Medicine, 24*, 19-28. doi: 10.1016/j.ctim.2015.11.001

Ledesma, D., & Kumano, H. (2009). Mindfulness-based stress reduction and cancer: A meta-analysis. *Psycho-Oncology, 18*(6), 571-579. doi: doi:10.1002/pon.1400

Leroy, H., Anseel, F., Dimitrova, N. G., & Sels, L. (2013). Mindfulness, authentic functioning, and work engagement: A growth modeling approach. *Journal of Vocational Behavior, 82*(3), 238-247. doi: 10.1016/j.jvb.2013.01.012

Lomas, T., Ivtzan, I., & Fu, C. (2015). A systematic review of the neurophysiology of mindfulness on EEG oscillations. *Neuroscience & Biobehavioral Reviews, 57*, 401-410. doi: 10.1016/j.neubiorev.2015.09.018

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck

Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33(3), 335-343. doi: 10.1037/apl0000019

Luken, M., & Sammons, A. (2016). Systematic review of mindfulness practice for reducing job burnout. *The American Journal of Occupational Therapy, 70*(2), 1-10. doi: 10.5014/ajot.2016.016956

Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences, 12*(4), 163-169. doi: 10.1016/j.tics.2008.01.005

Mackenzie, C. S., Poulin, P. A., & Seidman-Carlson, R. (2006). A brief mindfulness-based stress reduction intervention for nurses and nurse aides. *Applied Nursing Research, 19*(2), 105-109. doi: 10.1016/j.apnr.2005.08.002

Malarkey, W. B., Jarjoura, D., & Klatt, M. (2013). Workplace based mindfulness practice and inflammation: a randomized trial. *Brain, Behavior, and Immunity*, 27(1), 145–154. doi: 10.1016/j.bbi.2012.10.009

Manotas, M., Segura, C., Eraso, M., Oggins, J., & McGovern, K. (2014). Association of brief mindfulness training with reductions in perceived stress and distress in Colombian health care professionals. *International Journal of Stress Management, 21*(2), 207-225. doi: 10.1037/a0035150

Martín-Asuero, A., & García-Banda, G. (2010). The mindfulness-based stress reduction program (MBSR) reduces stress-related psychological distress in healthcare professionals. *Spanish Journal of Psychology, 13*(2), 897-905.

Martín-Asuero, A., Moix-Queraltó, J., Pujol-Ribera, E., Berenguera, A., Rodriguez-Blanco, T., & Epstein, R. M. (2014). Effectiveness of a mindfulness education program in primary health care professionals: A pragmatic controlled trial. *Journal of Continuing Education in the Health Professions,* 34(1), 4–12. doi: 10.1002/chp.21211

Maslach, C., Jackson, S., & Leiter, M. (1986). *Maslach Burnout Inventory Manual*. Palo

>Alto, CA: Consult. Psychol. Press.

McConachie, D. A. J., McKenzie, K., Morris, P. G., & Walley, R. M. (2014). Acceptance and

>mindfulness-based stress management for support staff caring for individuals with

>intellectual disabilities. *Research in Developmental Disabilities*, 35(6), 1216–1227.

>doi: 10.1016/j.ridd.2014.03.005

McGarrigle, T., & Walsh, C. A. (2011). Mindfulness, self-care, and wellness in social work:

>Effects of contemplative training. *Journal of Religion & Spirituality in Social Work:

>Social Thought*, 30(3), 212–233. doi: 10.1080/15426432.2011.587384

Mealer, M., Conrad, D., Evans, J., Jooste, K., Solyntjes, J., Rothbaum, B., & Moss, M.

>(2014). Feasibility and acceptability of a resilience training program for intensive care

>unit nurses. *American Journal of Critical Care, 23*(6), e97-e105.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred Reporting Items for

>Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Medicine,

>6*(7), e1000097. doi: 10.1371/journal.pmed.1000097

Moody, K., Kramer, D., Santizo, R. O., Magro, L., Wyshogrod, D., Ambrosio, J., . . . Stein, J.

>(2013). Helping the helpers: Mindfulness training for burnout in pediatric oncology-A

>pilot program. *Journal of pediatric oncology nursing, 30*(5), 275-284. doi:

>10.1177/1043454213504497

Moore, P. (2008). Introducing mindfulness to clinical psychologists in training: An

>experiential course of brief exercises. *Journal of Clinical Psychology in Medical

>Settings*, 15(4), 331–337. doi: 10.1007/s10880-008-9134-7

Napoli, M., & Bonifas, R. (2011). From theory toward empathic self-care: Creating a mindful

>classroom for social work students. *Social Work Education*, 30(6), 635–649. doi:

>10.1080/02615479.2011.586560

National Collaborating Centre for Methods and Tools (2008). *Quality Assessment Tool for Quantiative Studies (QATQS)*. Hamilton, ON: McMaster University.

Newsome, S., Christopher, J. C., Dahlen, P., & Christopher, S. (2006). Teaching counselors self-care through mindfulness practices. *Teachers College Record*, 108(9), 1881–1900. doi: 10.1111/j.1467-9620.2006.00766.x

Newsome, S., Waldo, M., & Gruszka, C. (2012). Mindfulness group work: Preventing stress and increasing self-compassion among helping professionals in training. *The Journal for Specialists in Group Work*, 37(4), 297–311. doi: 10.1080/01933922.2012.690832

Noone, S. J., & Hastings, R. P. (2010). Using acceptance and mindfulness-based workshops with support staff caring for adults with intellectual disabilities. *Mindfulness*, 1(2), 67–73. doi: 10.1007/s12671-010-0007-4

Office for National Statistics (2014). *Full Report: Sickness Absence in the Labour Market*. London: Office for National Statistics.

Pflugeisen, B. M., Drummond, D., Ebersole, D., Mundell, K., & Chen, D. (2016). Brief video-module administered mindfulness program for physicians: a pilot study. *EXPLORE: The Journal of Science and Healing*, 12(1), 50–54. doi: 10.1016/j.explore.2015.10.005

Phang, C.Chiang, K. C., Ng, L. O., Keng, S.-L., & Oei, T.S. (2016). Effects of brief group mindfulness-based cognitive therapy for stress reduction among medical students in a malaysian university. *Mindfulness*, 7(1), 189–197. doi: 10.1007/s12671-015-0399-2

Pidgeon, A. M., Ford, L., & Klaassen, F. (2014). Evaluating the effectiveness of enhancing resilience in human service professionals using a retreat-based Mindfulness with Metta Training Program: a randomised control trial. *Psychology, Health & Medicine*, 19(3), 355–64. doi: 10.1080/13548506.2013.806815

Pipe, T. B., Bortz, J. J., Dueck, A., Pendergast, D., Buchda, V., & Summers, J. (2009). Nurse
leader mindfulness meditation program for stress management: A randomized
controlled trial. *Journal of Nursing Administration*, 39(3), 130–137.

Posner, M. I., & Petersen, S. E. (1990). The attention system of the human brain. *Annual
Review of Neuroscience, 13*(1), 25-42. doi: 10.1146/annurev.ne.13.030190.000325

Poulin, P. A., Mackenzie, C. S., Soloway, G., & Karayolas, E. (2008). Mindfulness training
as an evidenced-based approach to reducing stress and promoting well-being among
human services professionals. *International Journal of Health Promotion and
Education, 46*(2), 72-80. doi: 10.1080/14635240.2008.10708132

Raab, K., Sogge, K., Parker, N., & Flament, M. F. (2015). Mindfulness-based stress reduction
and self-compassion among mental healthcare professionals: A pilot study. *Mental
Health, Religion and Culture, 18*(6), 503-512. doi: 10.1080/13674676.2015.1081588

Raffone, A., & Srinivasan, N. (2010). The exploration of meditation in the neuroscience of
attention and consciousness. *Cognitive Processing, 11*(1), 1-7. doi: 10.1007/s10339-
009-0354-z

Ramsey, A. T., & Jones, E. E. (2015). Minding the interpersonal gap: Mindfulness-based
interventions in the prevention of ostracism. *Consciousness and Cognition*, 31, 24–34.

Reingold, L. (2015). Evaluation of stress and a stress-reduction program among radiologic
technologists. *Radiologic Technology*, 87(2), 150–162.

Rimes, K. A., & Wingrove, J. (2011). Pilot study of Mindfulness-Based Cognitive Therapy
for trainee clinical psychologists. *Behavioural and Cognitive Psychotherapy*, 39(2),
235–241. doi: 10.1017/S1352465810000731

Rocco, S., Dempsey, S., & Hartman, D. (2012). Teaching calm abiding meditation to mental
health workers: A descriptive account of valuing subjectivity. *Contemporary
Buddhism*, 13(2), 193–211. doi: 10.1080/14639947.2012.716707

Roeser, R. W., Schonert-Reichl, K. a., Jha, A., Cullen, M., Wallace, L., Wilensky, R., …
Harrison, J. (2013). Mindfulness training and reductions in teacher stress and burnout:
Results from two randomized, waitlist-control field trials. *Journal of Educational
Psychology*, 105(3), 787–804. doi: 10.1037/a0032093

Ruths, F. A., de Zoysa, N., Frearson, S. J., Hutton, J., Williams, J. M. G., & Walsh, J. (2013).
Mindfulness-Based Cognitive Therapy for mental health professionals—A pilot
study. *Mindfulness*, 4(4), 289–295. doi: 10.1007/s12671-012-0127-0

Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2002). *Mindfulness-Based Cognitive
Therapy for Depression: A New Approach to Preventing Relapse*. New York:
Guilford Press.

Schussler, D. L., Jennings, P. A., Sharp, J. E., & Frank, J. L. (2016). Improving teacher
awareness and well-being through CARE: A qualitative analysis of the underlying
mechanisms. *Mindfulness*, 7(1), 130–142. doi: 10.1007/s12671-015-0422-7

Shapiro, S. L., Astin, J. A., Bishop, S. R., & Cordova, M. (2005). Mindfulness-based stress
reduction for health care professionals: Results from a randomized trial. *International
Journal of Stress Management, 12*(2), 164-176. doi: 10.1037/1072-5245.12.2.164

Shapiro, S. L., Brown, K. W., & Biegel, G. M. (2007). Teaching self-care to caregivers:
Effects of mindfulness-based stress reduction on the mental health of therapists in
training. *Training and Education in Professional Psychology, 1*(2), 105-115. doi:
10.1037/1931-3918.1.2.105

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of
mindfulness. *Journal of Clinical Psychology, 62*(3), 373-386. doi: 10.1002/jclp.20237

Shapiro, S. L., Schwartz, G. E., & Bonner, G. (1998). Effects of mindfulness-based stress
reduction on medical and premedical students. *Journal of Behavioral Medicine, 21*(6),
581-599. doi: 10.1023/A:1018700829825

Shonin, E., & Van Gordon, W. (2015). Managers' experiences of Meditation Awareness

Training. *Mindfulness, 6*(4), 899-909. doi: 10.1007/s12671-014-0334-y

Shonin, E., Van Gordon, W., Dunn, T. J., Singh, N. N., & Griffiths, M. D. (2014). Meditation

Awareness Training (MAT) for work-related wellbeing and job performance: A

randomised controlled trial. *International Journal of Mental Health and Addiction,*

12(6), 806-823.

Shonin, E., Van Gordon, W., & Griffiths, M. D. (2014). The treatment of workaholism with

Meditation Awareness Training: A case study. *EXPLORE: The Journal of Science*

and Healing, 10(3), 193–195. doi: 10.1016/j.explore.2014.02.004

Singh, N. N., Lancioni, G. E., Karazsia, B. T., Myers, R. E., Winton, A. S. W., Latham, L. L.,

& Nugent, K. (2015). Effects of training staff in MBPBS on the use of physical

restraints, staff stress and turnover, staff and peer injuries, and cost effectiveness in

developmental disabilities. *Mindfulness, 6*(4), 926-937. doi: 10.1007/s12671-014-

0369-0

Singh, N. N., Singh, S. D., Sabaawi, M., Myers, R. E., & Wahler, R. G. (2006). Enhancing

treatment team process through mindfulness-based mentoring in an inpatient

psychiatric hospital. *Behavior Modification, 30*(4), 423-441. doi:

10.1177/0145445504272971

Song, Y., & Lindquist, R. (2015). Effects of mindfulness-based stress reduction on

depression, anxiety, stress and mindfulness in Korean nursing students. *Nurse*

Education Today, 35(1), 86-90. doi: 10.1016/j.nedt.2014.06.010

Sood, A., Sharma, V., Schroeder, D. R., & Gorman, B. (2014). Stress Management and

Resiliency Training (SMART) program among Department of Radiology faculty: A

pilot randomized clinical trial. *EXPLORE: The Journal of Science and Healing,* 10(6),

358–363. doi: 10.1016/j.explore.2014.08.002

Stew, G. (2011). Mindfulness training for occupational therapy students. *British Journal of Occupational Therapy,* 74(6), 269–276. doi: 10.4276/030802211X13074383957869

Tarrasch, R. (2014). Mindfulness meditation training for graduate students in educational counseling and special education: A qualitative analysis. *Journal of Child and Family Studies*, 24(5), 1322–1333. doi: 10.1007/s10826-014-9939-y

Taylor, C., Harrison, J., Haimovitz, K., Oberle, E., Thomson, K., Schonert-Reichl, K., & Roeser, R. W. (2016). Examining ways that a mindfulness-based intervention reduces stress in public school teachers: A mixed-methods study. *Mindfulness,* 7(1), 115–129. doi: 10.1007/s12671-015-0425-4

Thomley, B. S., Ray, S. H., Cha, S. S., & Bauer, B. A. (2011). Effects of a brief, comprehensive, yoga-based program on quality of life and biometric measures in an employee population: A pilot study. *EXPLORE: The Journal of Science and Healing,* 7(1), 27-29. doi: 10.1016/j.explore.2010.10.004

van Berkel, J., Boot, C. R. L., Proper, K. I., Bongers, P. M., & van der Beek, A. J. (2013). Process evaluation of a workplace health promotion intervention aimed at improving work engagement and energy balance. *Journal of Occupational and Environmental Medicine, 55*(1), 19-26. doi: 10.1097/JOM.0b013e318269e5a6

van Berkel, J., Boot, C. R. L., Proper, K. I., Bongers, P. M., & van der Beek, A. J. (2014a). Effectiveness of a worksite mindfulness-based multi-component intervention on lifestyle behaviors. *International Journal of Behavioral Nutrition and Physical Activity, 11*(9).

van Berkel, J., Boot, C. R. L., Proper, K. I., Bongers, P. M., & van der Beek, A. J. (2014b). Effectiveness of a worksite mindfulness-related multi-component health promotion intervention on work engagement and mental health: Results of a randomized controlled trial. *PLoS One, 9*(1), e84118. doi: 10.1371/journal.pone.0084118

van der Riet, P., Rossiter, R., Kirby, D., Dluzewska, T., & Harmon, C. (2015). Piloting a

stress management and mindfulness program for undergraduate nursing students:

Student feedback and lessons learned. *Nurse Education Today*, 35(1), 44–49. doi

10.1016/j.nedt.2014.05.003

Vogus, T. J., Cooil, B., Sitterding, M., & Everett, L. Q. (2014). Safety organizing, emotional

exhaustion, and turnover in hospital nursing units. *Medical Care Research and*

Review, 52(10), 870-876.

Walach, H., Nord, E., Zier, C., Dietz-Waschkowski, B., Kersig, S., & Schüpbach, H. (2007).

Mindfulness-based stress reduction as a method for personnel development: A pilot

evaluation. *International Journal of Stress Management*, 14(2), 188–198.

Walsh, R., & Shapiro, S. L. (2006). The meeting of meditative disciplines and western

psychology: A mutually enriching dialogue. *American Psychologist, 61*(3), 227-239.

doi: 10.1037/0003-066X.61.3.227

Weare, K. (2014). *Evidence for Mindfulness: Impacts on the Wellbeing and Performance of*

School Staff. Exeter; Southampton: Universities of Exeter and Southampton.

West, C. P., Dyrbye, L. N., Rabatin, J. T., Call, T. G., Davidson, J. H., Multari, A., …

Shanafelt, T. D. (2014). Intervention to promote physician well-being, job

satisfaction, and professionalism: a randomized clinical trial. *JAMA Internal*

Medicine, 174(4), 527–533. doi: 10.1001/jamainternmed.2013.14387

Wolever, R. Q., Bobinet, K. J., McCabe, K., Mackenzie, E. R., Fekete, E., Kusnick, C. A., &

Baime, M. (2012). Effective and viable mind-body stress reduction in the workplace:

A randomized controlled trial. *Journal of Occupational Health Psychology, 17*(2),

246-258. doi: 10.1037/a0027278

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 program (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, & Minozzo, 2013)	University administrators	10	10	Mindfulness program (specific to study)	4 weeks	NR	Effect size data not available. PI > mindfulness & awareness; and wellbeing, satisfaction and flourishing.
(Burnett & 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, & 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 wellbeing, satisfaction & flourishing (subjective wellbeing, d = .43). PI >< mindfulness & awareness (act aware, d = -.04; describe, d = -.06; and observe, d = .18).
(Duchemin, Steinberg, Marks, Vanover, & Klatt, 2015)	Intensive care professionals	16	16	Mindfulness program (specific to study)	8 weeks	Wait-list	Effect size data not available. PI < stress & strain. PI > wellbeing, satisfaction & flourishing. PI >< anxiety; burnout; depression; mindfulness & awareness; and stress & strain.
(Erogul, Singer, McIntyre, & 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 & Bond, 2010)	Government employees	104 (177)	87 (134)	Stress management training	3 x 0.5 days	Wait-list	PI < distress & anger (d = -.28).
(Flook, Goldberg, Pinger, Bonus, & Davidson, 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, & Gallego, 2010)	Teachers	34	34	Mindfulness program (specific to study)	10 weeks	Music listening	PI < distress & anger (psychological distress, d = -1.71).
(Frank, Reibel, Broderick, Cantrell, & Metz, 2015)	Teachers	18	18	MBSR	8 weeks	Wait-list	PI < mindfulness & awareness (act aware, d = -.34). PI > burnout (depersonalisation, 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, & 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 & Lachance, 2015)	Call-centre employees	18(24)	25(25)	Mindfulness program (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 wellbeing, satisfaction & flourishing (negative affect, d = -1.09).
(Grégoire, Lachance, & Taylor, 2015)	Call-centre employees	26(39)	15(32)	Mindfulness program (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 wellbeing, satisfaction & flourishing (psychological wellbeing, d = 1.33).
(Harris, Jennings, Katz, Abenavoli, & Greenberg, 2016)	Teachers	34	29 (30)	CALM	16 weeks	Wait-list	PI < burnout (emotional exhaustion, d = -.27; depersonalisaton, 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 wellbeing, satisfaction & flourishing (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 wellbeing, satisfaction & flourishing (negative affect, d = -.06).
(Huang, Li, Huang, & Tang, 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).
(Hülsheger, Alberts, Feinholdt, & Lang, 2013)	Mixed employees	22 (102)	42 (101)	Mindfulness program (specific to study)	2 weeks	Wait-list	PI > mindfulness & awareness (mindfulness, d = .39), and wellbeing, satisfaction & flourishing (job satisfaction, d = .69). PI >< burnout (emotional exhaustion, d = -.18).
(Hülsheger, Feinholdt, & Nübold, 2015)	Company employees	67(75)	73	Mindfulness program (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 program (specific to study)	10 weeks	Company health initiative	Effect size data not available. PI > health. PI >< stress & strain.
(Jennings, Frank, Snowberg, Coccia, & Greenberg, 2013)	Teachers	25 (27)	25 (26)	Cultivating awareness & resilience in education	1 month (2 w'end)	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 wellbeing, satisfaction & flourishing (positive affect, d = .32; and negative affect, d = -.51). PI >< burnout (emotional exhaustion, d = -.05; and depersonalisation, d = -.16), job performance (classroom management, d = .13), mindfulness & awareness (describe, d = -.03); and stress & strain (task-related hurry, d = -.18).
(John, Kumar, & Lal, 2012)	Professional shooters	55	55	Mindfulness program (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, & Malarkey, 2009)	University employees	22 (24)	20 (24)	MBSR adaptation	6 weeks	Wait-list	PI < mindfulness (mindful attention awareness, d = -1.20), and stress & strain (perceived stress, d = -.44). PI > health (sleep impairment, d = -.85).

(Klatt, Steinberg, & 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, & Sels, 2013)	Mixed employees	76	14	MBSR	8 weeks	Wait-list	Effect size data not available. PI < burnout. PI > mindfulness & awareness, and wellbeing, satisfaction & flourishing.
(Mackenzie, Poulin, & Seidman-Carlson, 2006)	Nurses	16	14	MBSR adaptation	4 weeks	Wait-list	PI < burnout (depersonalisation, d = -.20; and personal accomplishment, d = 8.27). PI > burnout (emotional exhaustion, d = 3.44), and wellbeing, satisfaction & flourishing (relaxation dispositions, d = .24. PI >< wellbeing, satisfaction & flourishing (intrinsic job satisfaction, d = .17; satisfaction with life, d = -.13; and sense of coherence, d = .16).
(Malarkey, Jarjoura, & Klatt, 2013)	University employees	84 (93)	86 (93)	Mindfulness program (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, Segura, Eraso, Oggins, & McGovern, 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). P >< mindfulness & awareness (non-reacting, d = .03), and total mindfulness, d = .07).
(Martín-Asuero et al., 2014)	Healthcare professionals	43	25	MBSR adaptation	8 weeks	Wait-list	PI < burnout (emotional exhaustion, d = -7.20; depersonalisation, 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, & Walley, 2014)	Support staff	66	54	Acceptance and mindfulness workshop	1.5 days	Wait-list	PI < distress & anger (distress, d = -.35). PI >< wellbeing, satisfaction & flourishing (mental wellbeing, d = .17).
(Mealer et al., 2014)	Intensive care nurses	13	14	Resilience training program*	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 program (specific to study)	8 weeks	Nothing	Effect size data not available. PI >< burnout; depression; and stress & strain.
(Pidgeon, Ford, & 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 & Jones, 2015)	Teachers	13 (22)	24 (29)	Mindfulness workshop (specific to study)	1 day	NR	Effect size data not available. PI > relationships.
(Roeser 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, Schwartz, & Bonner, 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 wellbeing, satisfaction & flourishing (spirituality, d = .32).
(Shapiro, Astin, Bishop, & Cordova, 2005)	Healthcare professionals	10 (18)	18 (20)	MBSR	8 weeks	Wait-list	PI < burnout (emotional exhaustion, d = -2.10; depersonalisation, 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 wellbeing, satisfaction & flourishing (satisfaction with life, d = .15).
(Shonin, Van Gordon, Dunn, Singh, & Griffiths, 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 wellbeing, satisfaction & flourishing (job satisfaction, d = 1.63).
(Shonin & Van Gordon, 2015)	Office middle managers	68	65	Meditation awareness training	8 weeks	CBT education class	Qualitative interviews: PI > job performance; and wellbeing, satisfaction & flourishing.
(Song & 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, Sharma, Schroeder, & Gorman, 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 wellbeing, satisfaction & flourishing (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, Boot, Proper, Bongers, & van der Beek, 2013)	Mixed employees	121 (129)	114 (128)	Mindful vitality in practice	8 weeks	NR	NA.

(van Berkel, Boot, Proper, Bongers, & van der Beek, 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, Boot, Proper, Bongers, & Van Der Beek, 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 wellbeing, satisfaction & flourishing (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 program	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 = 0.42), 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)

Note: 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).*

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

Authors	Occupation	Expt. group	Control group	Intervention	Length	Control	Primary outcome(s)
(Aggs & 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 depersonalisation, d = -.26), and compassion & empathy (physician empathy, d = -.77).. PI >< anxiety (d = -.09).
(Baltzell & Akhtar, 2014)	Football players	19	23	Mindfulness meditation training for sports	12 sessions	Nothing	PI < wellbeing, satisfaction, and flourishing (positive affect, d = -.20; and satisfaction with life, d = -.43). PI > mindfulness & awareness (mindfulness, d = .41), wellbeing, satisfaction, and flourishing (negative affect, d = -.86; and wellbeing, d = .60).
(Baltzell, Caraballo, Chipman, & Hayden, 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, & 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 wellbeing, satisfaction & flourishing (serenity, d = 1.48).
(Beckman et al., 2012)	Primary care physicians	20	-	Program in mindful communication	52 hours	N/A	Qualitative interviews: PI > mindfulness & awareness; and relationships.
(Beddoe & 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, & 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 wellbeing, satisfaction & flourishing (mental wellbeing, d = .70). PI >< mindfulness & awareness (act aware, d = -.10).
(Birnbaum, 2008)	Trainee social workers	7	-	Mindfulness program (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 & Napoli, 2014)	Trainee social workers	77	-	Mindfulness curriculum (specific to study)	16 weeks	N/A	PI > wellbeing, satisfaction & flourishing (quality of life, d = .88). PI >< stress & strain (perceived stress, d = .06).

(Brady, O'Connor, Burgermeister, & Hanson, 2012)	Psychiatric ward professionals	16 (23)	-	MBSR adaptation	4 weeks	N/A	PI < burnout (emotional exhaustion, d = -.50; depersonalisation, 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 program	8 weeks	N/A	Effect size data not available. PI > mindfulness & awareness; and wellbeing, satisfaction & flourishing. PI >< anxiety; burnout; compassion & empathy; depression; stress & strain, and wellbeing, satisfaction & flourishing.
(Brooker et al., 2014)	Disability professionals	12	-	Occupational mindfulness training program	8 weeks	N/A	Effect size data not available. PI > job performance.
(Christopher, Christopher, Dunnagan, & Schure, 2006)	Trainee counsellors	11	-	Mindfulness curriculum (specific to study)	1 term	N/A	Qualitative interviews: PI < burnout; and stress & strain.
(Cohen & Miller, 2009)	Trainee clinical psychologists	21 (28)	-	Interpersonal mindfulness training	6 weeks	N/A	PI < anxiety (d = -.46), stress & strain (perceived stress, d = -.53), and wellbeing, satisfaction & flourishing (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 wellbeing, satisfaction & flourishing (life satisfaction, d = .43). PI >< depression (d = -.11), and wellbeing, satisfaction & flourishing (presence of meaning in life, d = .12).
(Cohen-Katz, Wiley, Capuano, Baker, Deitrick, 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, & 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, & Hutton, 2014)	Mental health professionals	7	-	MBCT	8 weeks	N/A	Qualitative interviews: PI > emotional intelligence & regulation.
(Dorian & 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, & 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 & Hemanth, 2015)	Clinical psychologists	8	-	Mindfulness program (specific to study)	10 weeks	N/A	Qualitative interviews: PI > emotional intelligence & regulation, mindfulness & awareness.
(Fortney, Luchterhand, Zakletskaia, Zgierska, & Rakel, 2013)	Primary care clinicians	28 (30)	-	MBSR adaptation	18 hours (over 5 sessions)	N/A	PI < anxiety (d = -.47), burnout (emotional exhaustion, d = -.31; depersonalisation, 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, & 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 > wellbeing, satisfaction & flourishing (sense of coherence, d = .73).

(Galantino, Baime, Maguire, Szapary, & Farrar, 2005)	Healthcare professionals	84	-	Mindfulness program (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, & Gold, 2015)	Paediatric ICU nurses	42 (45)	-	Mindfulness program (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; depersonalisation, 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).
(Goodman & Schorling, 2012)	Healthcare professionals	73 (93)	-	Mindfulness for healthcare providers	8 weeks	N/A	Physicians sample: PI < burnout (emotional exhaustion, d = -.72; depersonalisation, 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; depersonalisation, 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 program (specific to study)	3 weeks	Nothing	Effect size data not available. PI > compassion & empathy. PI >< burnout, and stress & strain.
(Grepmair, Mitterlehner, Loew, & Nickel, 2007)	Trainee psychotherapists	58	55 (same as expt)	Mindfulness program (specific to study)	9 weeks	Pre-training	PI > job performance (patients' distress, d = -.93).
(Hallman, O'Connor, Hasenau, & 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 & Fisher, 2015)	Clinical psychology trainees	10	-	Mindfulness program (specific to study)	10 weeks	N/A	Qualitative interviews: PI > compassion & empathy; emotional intelligence & regulation; job performance; and relationships.
(Hopkins & 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, & Woodard, 2014)	Nurses	31 (46)	12 (28)	Mindfulness program (specific to study)	10 weeks	Nothing	Effect size data not available. PI >< burnout; compassion & empathy; mindfulness & awareness; stress & strain; and wellbeing, satisfaction & flourishing.
(Hue & Lau, 2015)	Trainee teachers	35 (78)	35	Mindfulness program (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 wellbeing, satisfaction & flourishing (wellbeing, d = .43). PI >< mindfulness & awareness (mindful attention awareness, d = .07).
(Jennings, Snowberg, Coccia, & Greenberg, 2011)	Study 1: Teachers	29 (31)	-	Cultivating awareness & resilience in education	1 month (2 w'end)	N/A	PI < depression (depression, d = -.22), and stress & strain (task-related hurry, d = -.23; and general hurry, d = -.25). P > 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 wellbeing, satisfaction & flourishing (negative affect, d = -.22). P >< health (physical symptoms, d = -.10), job performance (promoting intrinsic motivation, d = .01; and students' engagement, d = .16), and wellbeing, satisfaction & flourishing (positive affect, d = .00).
	Study 2: Teachers	17(21)	22	Cultivating awareness & resilience in education	1 month (2 w'end)	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 wellbeing, satisfaction & flourishing (negative affect, d = -.43). PI >< depression (despression, 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), wellbeing, satisfaction & flourishing (positive affect, d = .11).
(Johnson, Emmons, Rivard, Griffin, & 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; abseentism, d = -.50; activity impairment, d = -1.23; presenteeism, d = -1.28; and work productivity loss, d = -1.38).
(Jouper & Johansson, 2013)	Administrative employee	1	-	Mindfulness program (specific to study)	12 weeks	N/A	Qualitative interviews: PI < stress & strain. PI > mindfulness & awareness, and wellbeing, satisfaction & flourishing.
(K. Kemper & Khirallah, 2015)	Health professionals	112 one module and 102 the other	-	Mindfulness in daily life	1 hour	N/A	PI > mindfulness & awareness (cognitive and affective mindfulness, d = .24; and mindful attention awareness, d = .20), and resilience (resilience, d = .21).
(Krasner et al., 2009)	Primary care physicians	59 (70)	-	Mindfulness program (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 (depersonalisation, d = -.19; and personal accomplishment, d = .15).
(Martín-Asuero & 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 > wellbeing, satisfaction & flourishing, (negative affect, d = -.26). P >< emotional intelligence & regulation (rumination, d = -.19).
(McGarrigle & Walsh, 2011)	Human service workers	12	-	Mindfulness program (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 program (specific to study)	4 weeks	N/A	Effect size data not available. PI > mindfulness & awareness. PI >< compassion & empathy; and stress & strain.
(Napoli & Bonifas, 2011)	Trainee social workers	31 (46)	-	Mindfulness program (specific to study)	16 weeks	N/A	PI > mindfulness & awareness (mindfulness, d = .64).

(Newsome, Christopher, Dahlen, & Christopher, 2006)	Counsellors	33	-	Mindfulness curriculum (specific to study)	15 weeks	N/A	Qualitative interviews: PI > emotional intelligence & regulation; health; mindfulness & awareness; relationships; and wellbeing, satisfaction & flourishing.
(Newsome, Waldo, & Gruszka, 2012)	Trainee helping professionals	31	-	Mindfulness program (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 & 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).
(Pflugeisen, Drummond, Ebersole, Mundell, & Chen, 2016)	Physicians	19 (23)	-	MBSR adaptation	8 weeks	N/A	PI < burnout (emotional exhaustion, d = -.46; depersonalisation, d = -.32; and personal accomplishment, d = .56), and stress & strain (perceived stress, d = -.87). PI > mindfulness & awareness (mindfulness skills, d = .84).
(Poulin, Makenzie, Soloway, & 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 wellbeing, satisfaction & flourishing (relaxation, d = -.63). PI >< burnout (emotional exhaustion, d = -.07; and depersonalisation, d = -.16), and wellbeing, satisfaction & flourishing (satisfaction with life, d = .15). Mindfulness vs. wait-list: PI < burnout (personal accomplishment, d = 1.32). PI > burnout (emotional exhaustion, d = .22), and wellbeing, satisfaction & flourishing (relaxation, d = .24). PI >< burnout (depersonalisation, d = .00), and wellbeing, satisfaction & flourishing (satisfaction with life, d = -.07).
	Study 2: Teachers	28	16	Mindfulness-based wellbeing 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 wellbeing, satisfaction & flourishing (satisfaction with life, d = .09).
(Phang, Chiang, Ng, Keng, & 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, & 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 (depersonalisation, d = -.11), and wellbeing, satisfaction & flourishing (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 & 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, & 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 wellbeing, satisfaction & flourishing.
(Schussler, Jennings, Sharp, & Frank, 2016)	Teachers	50	-	CARE	8 weeks	N/A	Qualitative focus groups. PI > emotional intelligence & regulation.
(Shapiro, Brown, & 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 wellbeing, satisfaction & flourishing (positive affect, d = .57; and negative affect, d = -.46).
(Shonin, Van Gordon, & 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, & 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 wellbeing, satisfaction & flourishing.
(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, & Bauer, 2011)	Mixed employees	37(50)	-	Yoga-based wellness program	6 weeks	N/A	PI < stress & strain (diastolic blood pressure, d = -.24). PI > wellbeing, satisfaction & flourishing (wellbeing, d = .39). PI >< stress & strain (systolic blood pressure, d = -.14).
(van der Riet, Rossiter, Kirby, Dluzewska, & Harmon, 2015)	Trainee nurses	14	-	Mindfulness program (specific to study)	7 weeks	N/A	Qualitative analysis: PI < stress & strain. PI > emotional intelligence & regulation; mindfulness & awareness; and relationships.

Note: 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.

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	83	55	15	5	8
Wellbeing, satisfaction & flourishing	66	40	10	2	14