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Review article

Mindfulness-based interventions for stress and burnout in teachers: A systematic review

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ABSTRACT

This systematic review provides an updated synthesis of mindfulness-based interventions (MBIs) for stress and burnout in teachers (K-12) and assessed implementation fidelity. We followed PRISMA guidelines, conducted electronic searches in five databases, and included studies through to February 2022. We included assessments of fidelity (using Treatment Fidelity Tool for MBIs) and methodological quality (using Down and Black checklist). Thirty-nine studies met our inclusion criteria. Evidence of MBIs for reducing stress and burnout, and improving other psychological outcomes showed great promise. However, a lack of standardisation in intervention components, facilitators, duration, and outcome measures was observed. Recommendations for future interventions and research are provided.

1. Introduction

1.1. Stress and burnout in teachers

Almost half of all teachers in Organisation for Economic Co-operation and Development (OECD) countries report occupational stress and a quarter report that stress at work negatively affects their physical and mental health (Thompson, 2020). Over the last decade, teacher stress (psychological discomfort from working in schools; see Embse et al., 2019) and burnout (exhaustion, cynicism, and inefficacy; see Maslach et al., 2001), is on an upward trajectory (Hultell et al., 2013; Kuok & Lam, 2018). Stress and burnout have been linked to lowered performance (e.g., Harmsen et al., 2018) and higher attrition in teachers (e.g., Madigan & Kim, 2021), and associated with high workloads (e.g., Harmsen et al.), unfulfilled expectations (e.g., Madigan & Kim), poor students' behaviour (e.g., Harmsen et al.), and negative relationships with school staff, parents, and students (see Thompson, 2020). As such, it is critical for teachers to cultivate strategies to reduce stress and burnout and maintain good psychological well-being (Aulén et al., 2021; Hascher et al., 2021), which affords positive downstream consequences for students (see Maricutoiu et al., 2023).

Psychological well-being and emotional exhaustion are essentially opposite sides of the same coin, albeit multifaceted constructs that include stress and burnout. A plethora of research has operationally defined psychological well-being as including: subjective life satisfaction and positive and negative affect (Diener, 1984); self-acceptance, purpose in life, environmental mastery, positive relationships, personal growth and autonomy (Ryff & Singer, 2008); positive emotion, engagement, relationships, meaning and accomplishment (Forgeard et al., 2011); and more specifically teacher well-being as workload, organizational, and student interaction well-being (Collie et al., 2015). Defining teacher well-being is complex and nuanced, therefore we followed Zarate et al. (2019) and defined psychological well-being in teachers as the capacity to manage feelings related to stress exhaustion. This operational definition aligns with much of the empirical literature in teachers' well-being that focusses on the absence of stress and burnout (Split et al., 2011). We use the terms psychological well-being and well-being interchangeably. The purpose of our review was to examine the efficacy of interventions to reduce stress and burnout and improve other psychological outcomes (many of which align with well-being; see Section 3.6.3 and 3.7.3).

1.2. Mindfulness-based interventions

Research has shown that resilience to endure high levels of stress may be developed through *mindfulness* practices, through the

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improvement of one's self-awareness and emotion regulation which in turn reduces emotional exhaustion (Lee et al., 2021; Neumann & Tillott, 2021). Mindfulness involves the self-regulation of attention to the present moment, switching and sustaining awareness to the thoughts, feelings, and sensations in a given moment (Bishop et al., 2004; Kabat-Zinn, 2003). Mindfulness also involves curiosity, acceptance, and openness towards current experiences, allowing an individual to differentiate and identify potential contributors to positive and/or negative encounters (Bishop et al., 2004) and understand and respond to negative experiences (Hwang et al., 2017).

Mindfulness-based interventions (MBIs) have been conducted to promote psychological well-being in a variety of stressful occupations, such as, with police officers (e.g., Grupe et al., 2021; Hoeve, de Bruin, van Rooij, & Bögels, 2021), social workers (e.g., Crowder & Sears, 2017; Kinman et al., 2020), nurses (e.g., Pipe et al., 2009; Saban et al., 2021), physicians (e.g., Schroeder et al., 2018), and teachers (e.g., de Carvalho et la., 2021; Flook et al., 2013; Roeser et al., 2012; Taylor et al., 2021). Results of studies that have used MBIs to reduce teacher stress and burnout are promising; showing other benefits such as improved teaching practices and enhanced relationships with students (Gouda et al., 2016; Jennings, 2014).

There are several published systematic reviews of MBIs for teachers (Emerson et al., 2017; Feagans Gould et al., 2016; Hwang et al., 2017; Klingbeil & Renshaw, 2018; Lomas et al., 2017; Zarate et al., 2019). Lomas et al. (2017) identified 19 studies, Klingbeil and Renshaw (2018) found 29 studies, and Zarate et al. (2019) reported 18 studies which indicated that MBIs had positive implications for teachers. Emerson et al. (2017) identified 13 studies where MBIs were shown to lower levels of stress and burnout through improved emotional regulation in coping with negative experiences. However, there are some shortcomings of these reviews, as many were not conducted based on the 'gold standards of evidence-based medicine'. For example, some did not follow Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (e.g., Emerson et al., 2017; Feagans Gould et al., 2016). Many did not pre-register their protocols with databases such as the International Prospective Register of Systematic Reviews (PROSPERO; e.g., Emerson et al., 2017; Feagans Gould et al., 2016; Hwang et al., 2017; Klingbeil & Renshaw, 2018; Zarate et al., 2019). And others did not include quality appraisals (e.g., Feagans Gould et al., 2016; Hwang et al., 2017; Klingbeil & Renshaw, 2018; Lomas et al., 2017), or bias assessments of included studies (e.g., Emerson et al., 2017; Feagans Gould et al., 2016; Hwang et al., 2017; Zarate et al., 2019).

Harris et al. (2014) suggests that following PRISMA guidelines and pre-registration improves the quality and conduct of the review, and in turn strengthens the concluding recommendations. PRISMA guidelines increase rigour by reducing reporting bias through systematic and selective study identification (Shamseer et al., 2015). The present systematic review followed PRISMA guidelines, was pre-registered with PROSPERO and examined the efficacy of MBIs for reducing teacher stress and burnout and improving other psychological outcomes. We also assessed implementation fidelity of the MBIs.

1.3. Fidelity of mindfulness-based interventions

Baelen et al. (2023) proposed a School-Based Mindfulness Programs Implementation Framework which recommends standards for implementing and reporting school-based MBIs. Baelen et al. urges researchers to evaluate implementation fidelity; the degree to which interventions are conducted according to the intended protocols (Cutbush et al., 2017; Dane & Schneider, 1998). An assessment of fidelity demonstrates rigour in the implementation and determines whether outcomes can reliably be traced to the intervention rather than other confounding factors (Carroll et al., 2007; Durlak & DuPre, 2008). Traditionally, fidelity assessments comprised adherence (how much the intervention adhered to the manual), dosage (amount of the intervention received by the participant), quality of delivery (quality of intervention delivered as intended in the manual), participant responsiveness (the participants' enthusiasm, engagement, and responsiveness), and/or program differentiation (assurance that the program specifically delivered the intended intervention; Dane & Schneider, 1998; Durlak & DuPre, 2008). The Treatment Fidelity Tool for MBIs was developed (Kechter et al., 2019) to standardise fidelity assessment including design (intervention & dosage), training, delivery, receipt, and enactment of the intervention, and to '*improve transparency and interpretability of the MBI evidence base*' (pp. 215). The lack of reporting of fidelity threatens the reliability and validity of findings and limits the accuracy of inferences (Kechter et al.). Nevertheless, it is acknowledged that inconsistencies and minor adaptations are common challenges in applying research protocols in real-world research contexts (Durlak & DuPre).

Many systematic reviews of MBIs for teachers have not reported the fidelity of identified studies (e.g., Emerson et al., 2017; Hwang et al., 2017; Klingbeil & Renshaw, 2018; Zarate et al., 2019). Feagans Gould et al. (2016) assessed fidelity across the domains of adherence, dosage, quality, and responsiveness (see Durlak & DuPre, 2008) in 48 studies and found that only 13% assessed the relationship between fidelity and intervention outcomes. Despite the many strengths, Feagans Gould et al.'s review identified studies published up to May 2014. Zarate et al. (2019) included studies up to April 2018, yet they did not assess fidelity. To date, no systematic reviews of MBIs for teachers have used the Treatment Fidelity Tool for MBIs (see Kechter et al., 2019), which includes the enactment and receipt component to assess participants' understanding and application of mindfulness practices in real-life contexts (Monteiro, 2020). We argue that a thorough assessment of fidelity in MBIs (such as Treatment Tool for MBIs) is critical in ensuring the reliability and validity of the intervention, and in turn the accuracy of the inferences drawn from findings. As such, our review provides an update on previous systematic reviews of MBIs for teachers and is the first that we know to include a rigorous assessment of implementation fidelity to strengthen our recommendations.

1.4. Current study

The current review aimed to: (1) provide an updated evaluation of the efficacy of MBIs for teacher stress, burnout and other psychological outcomes, and (2) examine the reporting and assessment of implementation fidelity. We followed the PRISMA guidelines, registered a protocol with PROSPERO, assessed fidelity using the Treatment Fidelity Tool for MBIs (Kechter et al., 2019) and conducted a quality and bias assessment (Downs & Black, 1998). The review was guided by the research question: *Are mindfulness-based interventions (MBIs) effective for improving teacher well-being (i.e., reducing stress and burnout, and improving other psychological outcomes)?* Following others, we defined *teachers* as in-service teachers of students in K-12 grades (cf. Emerson et al., 2017; Hwang et al., 2017; Zarate et al., 2019) and *well-being* as the capacity to manage feelings related to stress exhaustion (Zarate et al., 2019), including absence of stress and burnout, and presence of other psychological attributes.

2. Method

2.1. Literature search

The current review was conducted according to PRISMA 2020 (see Page et al., 2021) and Cochrane Collaboration (see Lefebvre et al., 2019) guidelines, and in consultation with a university librarian. The synthesis plan was pre-registered: CRD42021290067 (http://www.crd.york.ac.uk/PROSPERO). The following databases were searched for peer-reviewed studies that met the eligibility criteria for inclusion: PsycInfo (APA PsycNET), ProQuest Education Collection (including ERIC and full-text Education Database), Medline (PubMed), Web of Science, and Scopus.

Other databases were also searched to find relevant studies that were not published in peer-reviewed journals, including: ProQuest Dissertations and Theses, Web of Science, trial registries, and grey literature databases (e.g., PsycEXTRA, PsyArXiv, OpenGrey). All searches were conducted between November 10–14, 2021. The determination of search terms followed other work (Emerson et al., 2017; Feagans Gould et al., 2016; Hwang et al., 2017; Kechter et al., 2019; Klingbeil & Renshaw, 2018; Lomas et al., 2017; Parsons et al., 2017; Zarate et al., 2019) and were pilot tested for suitability and sensitivity for capturing studies of interest. The search terms used were kept broad but included key concepts linked to the research aims. The terms *mindfulness* OR *MBI* OR *"mindfulness-based intervention"* AND *teacher** were entered at the title and abstract levels to capture studies related to MBIs and teachers. The term *English* was included to limit the search to studies conducted in English (see Appendix for search strings).

Manual searches were also conducted to identify studies that were not captured in the primary database searches (i.e., snowballing). First, the reference lists of theoretical papers, reviews, or meta-analyses on the topic of MBIs for teachers identified during the title and abstract screening were manually screened. Then, the reference lists of studies included after full-text screening were searched for additional studies. Grey literature searches were also conducted to find related studies that had not been captured (following Lefebvre et al., 2019).

2.2. Inclusion and exclusion criteria

Included studies had to be written in English, and examine the efficacy of MBIs to reduce stress and burnout, and improve other psychological outcomes in teachers. The studies must have been published in a peer-reviewed journal, or unpublished but reported as dissertations, theses, or grey literatures, up until the search date. Studies had to have been empirical and must have had either experimental or quasi-experimental research designs which compared the effects of MBIs for teachers with a comparison or control group (e.g., waitlists, other treatments). The studies must have been conducted in a school setting. The sample must have included in-service K-12 teachers, which may have included classroom teachers, general education teachers, special educators, and other school staff or administrators who held teaching positions. Studies with educators in non-teaching positions, and studies with heterogeneous samples where the outcomes for in-service teachers had not been separated from the other subgroups, were excluded. Following studies that have conducted systematic reviews of other interventions (e.g., self-compassion, Mistretta & Davis, 2022; meditation, Perkins et al., 2022) the included studies must have employed mindfulness as the primary intervention and comprised more than 50% of the total session-time. Studies must have included at least one outcome related to stress, burnout, or another psychological outcome (see operational definition Section 1.1). Therefore, studies that used MBIs that were not aimed at reducing stress or burnout, or improving psychological outcomes (e.g., meditation for relaxation) were excluded. Moreover, studies that employed multi-component interventions must have conducted mindfulness as the primary intervention, with the primary aim of training and increasing mindfulness (Klingbeil & Renshaw, 2018).

2.3. Study selection

The searches through ProQuest, APA PsycNet, Scopus, Web of Science, and PubMed yielded 3732 studies, which included peer-reviewed journal articles as well as grey literatures. There were 1707 duplicates identified and manually removed using EndNote 20. The remaining studies were then transferred to Covidence online software, where a further 54 duplicates were removed. After the duplicates were removed, 1971 studies went through the title and abstract screening process, with 70 studies requiring full-text screening. Where full texts were not accessible via UQ Library or Google Scholar, they were requested via document delivery and/or the authors were contacted. From the 70 studies that underwent full-text screening, 33 studies were included in the systematic review. Following the full-text screening, the reference lists of 8 theoretical papers, reviews, or meta-analyses identified during the title and abstract screening, as well as the reference lists of the 33 included studies were manually searched for additional studies that had not been screened (i.e., snowballing). Four additional studies were assessed and included. One additional paper, reporting on two separate studies, was identified through grey literature searches, and was also included. Thirty-nine studies met the inclusion criteria and are included in the present review (see Fig. 1).

2.4. Coding procedure

All studies were screened at the title and abstract levels by two reviewers, by voting to include or exclude for full-text screening based on the inclusion and exclusion criteria. Where the two votes conflicted, a third reviewer, who was not involved in the title and abstract screening, resolved the conflict. Forty-five studies had conflicting votes between two reviewers, with an inter-rater reliability of Cohen's $k = 0.66$, which was deemed acceptable in representing adequate inter-rater reliability (Belur et al., 2021; McHugh, 2012). These were resolved by the third voter. A similar voting and conflict resolution process was used in the full-text screening, with the use of a ranked-list of exclusion reasons set prior and during the screening process.

2.5. Data extraction

Data were extracted based on previous reviews of MBIs (e.g., Emerson, 2017; Hwang, 2017; von der Embase, 2019; Zarate et al., 2019) which included: study design, participant characteristics, country of study, sample size, name of intervention, dosage, intervention components, outcomes, outcome measures. Fidelity and quality and bias assessments were conducted during the data extraction process.

2.5.1. Fidelity assessment

The Treatment Fidelity Tool for MBIs (Kechter et al., 2019) was used for fidelity assessment across five domains: design, training, delivery, receipt, and enactment. Design includes ensuring that the interventions are testing the hypothesized theories and variables, such as through the program development or adaptation, and the dosage. Training consists of ensuring that the facilitators are trained and qualified to provide the interventions. Delivery includes the monitoring and assessment of adherence to the intended protocol. Receipt consists of attempts to ensure that the participants are engaged and adhere to the intervention. Enactment involves assessing whether the participants complete homework assignments and apply taught mindfulness skills outside the intervention environment (Kechter et al.).

2.5.2. Quality and bias assessment

The Downs and Black (1998) checklist was used to assess the methodological quality of the identified studies. The studies were assessed for any risk of bias across the reporting, external validity, bias, confounding, and power domains. Following Lowther and Newman (2014), the assessment for power was adjusted from a maximum of five points to a maximum of one point, which is given when the study is deemed to have sufficient power with a sample size of more than eight participants in the smallest intervention group. The total possible score was 28 with quality levels ≤ 14 = *poor*, 15–19 = *fair*, 20–25 = *good*, and 26–28 = *excellent* (see Hooper et al., 2008). Two reviewers assessed the methodological quality independently, and disagreements were resolved by a third or fourth reviewer.

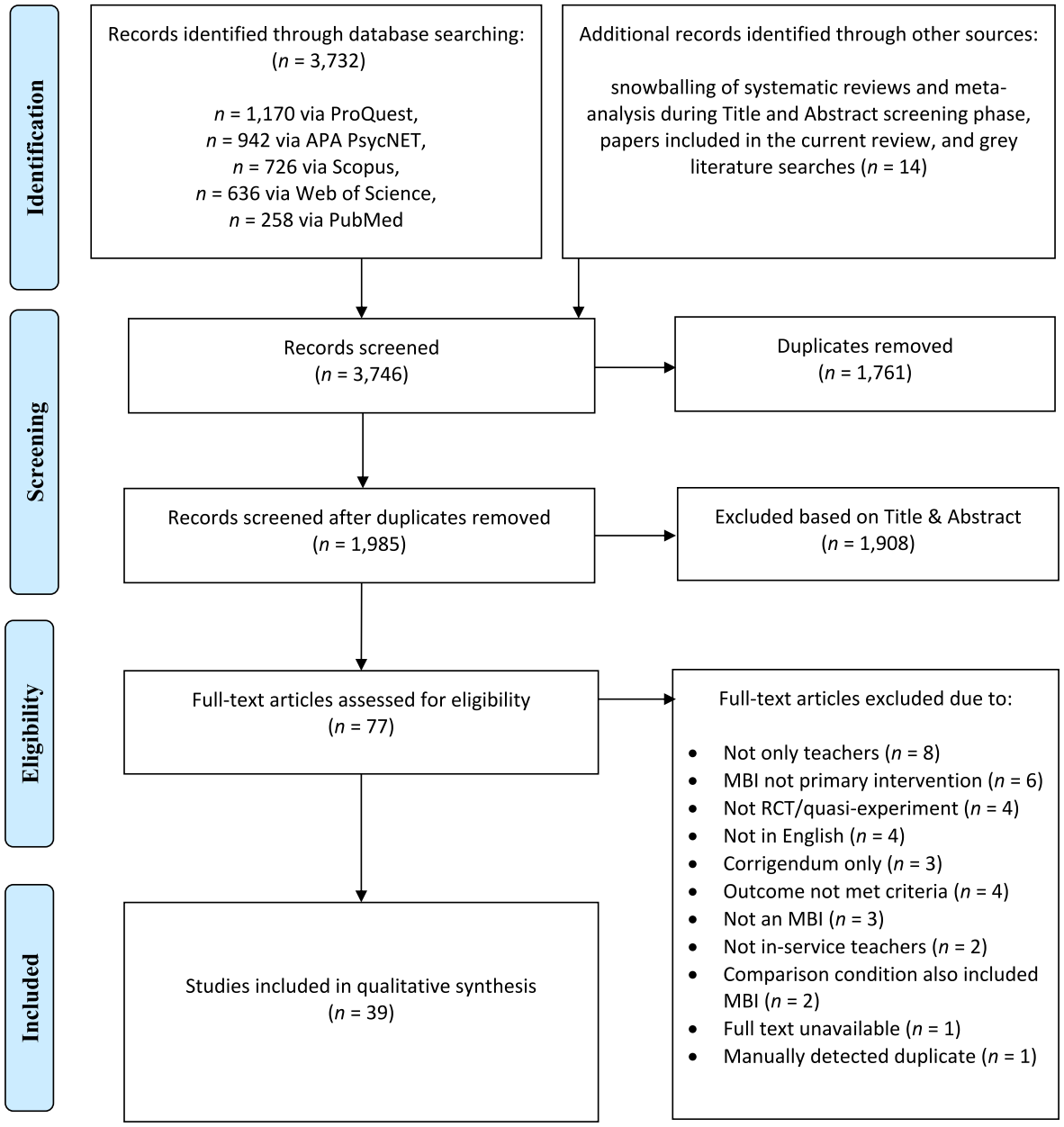

Fig. 1. PRISMA flow chart.

3. Results

3.1. Intervention characteristics

The current review identified 39 studies that met the inclusion criteria. Table 1 provides demographic characteristics. As shown, data were gathered from 3039 in-service teachers (after attrition) participating in MBI studies across the US, Mexico, Israel, England, Wales, Australia, China, Canada, Portugal, Italy, Spain, Germany, and Brazil. Table 1 also shows whether the comparison groups were active controls (i.e., control participants were given other types of non-MBIs), passive controls (i.e., control participants were not given any intervention), or wait-list controls (i.e., control participants were given the same intervention at a later time). However, it should be noted that there were two studies that used the same sample (Jennings et al., 2017, 2019), but were kept as separate studies. Table 2 provides information on the MBI characteristics: facilitators delivering the intervention, components, and outcomes (stress and burnout outcomes, other psychological outcomes).

3.2. Facilitators

Most MBIs were delivered by external providers ($n = 26$), who were trained instructors but were not reported as psychologists or psychotherapists. Some MBIs were delivered by professionals i.e., a psychologist ($n = 1$), a psychiatrist ($n = 1$), a psychotherapist ($n = 1$), a yoga instructor ($n = 1$), and a meditation expert ($n = 1$) and several were self-administered using independent activities ($n = 1$) or digital platforms ($n = 4$). Three studies did not provide facilitator details. Results of identified studies showed that MBIs for in-service teachers yielded positive outcomes regardless of the varying intervention facilitator.

3.3. Dosage

The identified studies included MBIs of varying intervention lengths (see Table 2). The duration of the MBIs ranged from ≤1 to 12 weeks ($M = 7.63$ weeks, $SD = 3.92$; $Mdn = 3.5$ weeks), and total contact hours ranged from 1.7 to 42 h ($M = 20.51$ h, $SD = 11.93$; $Mdn = 18.5$ h). There

Table 1
Demographic characteristics.

Study	*N* = number of participating teachers m = % male, f = % female, oth = % other Level of teaching	Intervention group Active/ Passive/WL group	Location
Almaguer-Botero (2020)	*N* = 33 m = 21%, f = 76%, oth = 3% Level: K-12	MBI: *n* = 14 Passive: *n* = 19	USA-Mexico border
Ancona and Mendelson (2014)	*N* = 43 m = 19%, f = 81% Level: K-8	MBI: *n* = 21 Passive: *n* = 22	USA
Berkovich-Ohana et al. (2020)	*N* = 31 - Level: K-5	MBI: *n* = 12 Active: *n* = 19	Israel
Beshai et al. (2016)	*N* = 89 m = 30%, f = 70% Level: Grade 6-12	MBI: *n* = *49* Passive: *n* = *40*	England
Braun et al. (2020)	*N* = 150 - Level: K-12	MBI: *n* = 73 WL: *n* = 77	USA
Bull-Beddows, 2020	*N* = 32 - Level: K-12	MBI: *n* = 8 WL: *n* = 24	England & Wales
Carroll et al. (2021)	*N* = 83 m = 12%, f = 88% Level: K-12	MBI: *n* = 42 Active: *n* = 41	Australia
Cheng et al. (2021)	*N* = 70 m = 6%, f = 94% Level: K	MBI: *n* = *35* Active: *n* = 35	China
Crain et al. (2017)	*N* = 113 m = 11%, f = 89% Level: K-12	MBI: *n* = 54 WL: *n* = 59	Canada & USA
Czerwinski et al. (2021)	*N* = 35 - Level: K-12 and University	MBI: *n* = 18 WL: *n* = 17	England
de Carvalho et al. (2021)	*N* = 205 - Level: Grade 1-6	MBI: *n* = 112 WL: *n* = 93	Portugal
Fabbro et al. (2020)	*N* = 39 m = 0%, f = 100% Level: K-9	MBI: *n* = 19 WL: *n* = 20	Italy
Flook et al. (2013)	*N* = 18 m = 11%, f = 89% Level: K-5	MBI: *n* = 10 WL: *n* = 8	USA
Franco et al. (2010)	*N* = 68 m = 43%, f = 57% Level: Grade 7-10	MBI: *n* = 34 Active: *n* = 34	Spain
Frank et al., 2013	*N* = 36 m = 32%, f = 78% Level: Grade 9-12	MBI: *n* = 18 WL: *n* = 18	USA
Gouda et al. (2016)	*N* = 29 - Level: Grade 5-10	MBI: *n* = 14 WL: *n* = 15	Germany
Guss (2020)	*N* = 60 m = 27%, f = 73% Level: K-8	MBI: *n* = 40 Passive: *n* = 20	USA
Harris et al. (2016)	*N* = 63 m = 12%, f = 88% Level: Grade 6-8	MBI: *n* = 34 WL: *n* = 29	USA
Harrison (2014)	*N* = 69 - Level: K-12	MBI: *n* = 37 WL: *n* = 32	USA & Canada
Hwang et al., 2019a	*N* = 101 - Level: K-8	MBI: *n* = 32 WL: *n* = 69	Australia
Hwang et al. (2019b)	*N* = 48 - Level: K-9	MBI: *n* = 22 WL: *n* = 26	Australia
James (2016)	*N* = 39 - Level: Grade 6-12	MBI: *n* = 22 Active: *n* = 17	England
Jennings et al. (2017)	*N* = 224 m = 7%, f = 93% Level: K-5	MBI: *n* = 118 WL: *n* = 106	USA
Jennings et al. (2019)	*N* = 224 m = 7%, f = 93% Level: K-5	MBI: *n* = 118 WL: *n* = 106	USA
Kemeny et al. (2012)	*N* = 76 m = 0%, f = 100% Level: K-12	MBI: *n* = - WL: *n* = -	USA
Luong et al. (2019)	*N* = 82 - Level: Grade 9-12	MBI: *n* = 45 WL: *n* = 37	Germany
O'Connor, 2020	*N* = 40 m = 12%, f = 88% Level: PK-12	MBI: *n* = 15 WL: *n* = 25	USA
Rodrigues de Oliveira et al. (2021)	*N* = 41 m = 0%, f = 100% Level: K-12	MBI:=21 Active: *n* = 20	Brazil
Roeser et al. (2021)	*N* = 58 m = 31%, f = 69% Level: Grade 6-8	MBI:=29 WL: *n* = 29	USA
Roeser et al. (2013)	*N* = 113 m = 11%, f = 89% Level: K-8	MBI:=54 WL: *n* = 59	Canada & USA
Rupprecht et al. (2017)	*N* = 32 m = 7%, f = 93% Level: Grade 1-4	MBI: *n* = 18 WL: *n* = 14	Germany
Salas, 2018	*N* = 18 m = 28%, f = 72% Level: Grade 6-12	MBI:=11 WL: *n* = 7	USA
Shanbour (2019)	*N* = 31 m = 23%, f = 77% Level: Grade 1-8	MBI: *n* = 12 Active: *n* = 19	Israel
Song et al. (2020)	*N* = 161 m = 15%, f = 85% Level: K-12, University	MBI: *n* = 77 WL: *n* = 84	China
Tarrasch et al. (2020)	*N* = 39 m = 8%, f = 92% Level: K-12	MBI: *n* = 17 Passive group: *n* = 22	Israel
Taylor et al. (2016)	*N* = 55 - Level: K-12	MBI: *n* = 24 WL: *n* = 31	Canada
Van Doren & Roeser, 2021 (Study 1)	*N* = 51 - Level: K-12	MBI: *n* = 22 WL: *n* = 29	Canada
Van Doren & Roeser, 2021 (Study 2)	*N* = 49 - Level: K-12	MBI: *n* = 26 WL: *n* = 23	USA
Varona, 2019	*N* = 250 m = 23%, f = 77% Level: K-12	MBI: *n* = 90 WL: *n* = 160	USA

Note. (−) = missing information; *N* = number of total participants; *n* = number of participants in a subgroup; MBI = mindfulness-based intervention.

was no indication that differences in outcomes were based on dosage. Additional retreats and/or home exercises were included in several studies (*n* = 8), although no additional benefits were observed.

3.4. Components

The categorisation of core components of MBIs (see Feagans Gould et al., 2016; Felver et al., 2023 for a review) were guided by Zarate et al. (2019): psychoeducation (e.g., lectures), guided reflection (e.g., experiential practices, loving kindness practices, gratitude practices, self-compassion practices), breathing, self-regulation (e.g., regulation of thoughts, emotion regulation, mindful listening, movement practice, focused-attention, monitoring of experience to develop concentration and non-reactivity), yoga, journaling, body scan (e.g., bringing attention to the body to build awareness of any physiological and/or emotional experience), meditation, discussion, and creative expression (e.g., colouring). Fig. 2 shows the components included across the included studies. As shown, self-regulation was involved in 72% of studies, psychoeducation 70%, meditation 67%, body scans 62%, breathing 59%, discussions 44%, and guided reflections 44% were included most, whereas journaling 8% and creative expression 3% were the least included components. Almost all studies used multi-component interventions with most studies using four (*n* = 9) to five (*n* = 13) components. Table 2 shows that reduced stress and burnout, as well as improvements in other psychological outcomes were observed across studies with varying numbers of intervention components - possibly indicating no relationship between the number of intervention components and outcomes. One study by Guss (2020) did not report components of the MBI.

Table 2
Intervention characteristics.

Study	Facilitators	Intervention	Components (number)	Stress and burnout outcomes (measure)	Other psychological outcomes (measure)
Almaguer-Botero (2020)	External providers	SPAM	Psychoeducation, guided reflection, breathing, body scan, meditation, discussion (5)	No improvement in stress (PSS) for MBI group relative to controls	No improvement in mindfulness (FFMQ), well-being (WEMWBS), self-efficacy (TSES) or job satisfaction (JSS) in MBI group vs. controls.
Ancona and Mendelson (2014)	External providers	HLF	Psychoeducation, guided reflection, breathing, self-regulation, and yoga (6)	Reductions in perceived stress (TSI) and emotional exhaustion in burnout (MaBI-ES) in MBI group relative to controls	–
Berkovich-Ohana et al. (2020)	External providers	Applied Mindful Pedagogy for Educators	Psychoeducation, guided reflection, breathing, body scan, journaling, self-regulation (7)	Reductions in stress (PSS) in MBI group	Improvements in mindfulness (FFMQ) in MBI group compared to controls. Reduction in rumination (EQ), as well as improvements in decentering (EQ) and cognitive appraisal, but not expressive suppression in emotion regulation (ERQ) in MBI group.
Beshai et al. (2016)	External providers	Foundations Course	Psychoeducation, guided reflections, body scan, self-regulation (4)	Reductions in stress (PSS) in MBI group compared to controls, with greater reductions over time even when controlling for baseline	Increased mindfulness (FFMQ), self-compassion (SCS), and well-being (WEMWBS) in MBI group compared to controls, with greater increases over time—even when controlling for baseline
Braun et al. (2020)	External providers	MBEB	Psychoeducation, guided reflection, breathing, self-regulation, body scan, discussion (6)	–	Increased efficacy and tendency to forgive (TTF), as well as reduced situation-specific unforgiveness in MBI group at post-intervention and follow up, compared to controls
Bull-Beddows, 2020	Self-administered, digital-based application	Headspace	Meditation (1)	Reductions in personal accomplishment in burnout (MaBI-ES) in MBI group in relation to the control group	Improvements in mindfulness (PHMLS), self-efficacy (TSES), and self-compassion (SCS), as well as reduction in teaching anxiety (TCHAS) over time in MBI group.
Carroll et al. (2021)	External providers	MBSR	Psychoeducation, body scan, yoga, meditation, discussion (5)	Reductions in stress (PSS and DASS) and burnout (CBI) in MBI group over time	Improvements in mindfulness (FFMQ), emotion regulation (DERS), and well-being (CIT) in MBI group
Cheng et al. (2021)	Psychologist	Mindfulness training	Breathing, self-regulation, body scan, meditation, discussion (5)	Reductions in overall and depersonalization in burnout (MaBI-GS) in MBI group, compared to controls	Improvements in intrapersonal mindfulness (IMTS) and emotional intelligence (WLEIS), as well as reduction in Depression (DASS) over time in MBI group in relation to the control group
Crain et al. (2017)	External providers	WMT	Psychoeducation, guided reflection, self-regulation, body scan, meditation, discussion (6)	–	Improvements in mindfulness (FFMQ) and satisfactions at home and work (although satisfactions were not retained at 3-month follow up); reductions in rumination (CARD) and bad mood at home and at work in MBI group in relation to the control group
Czerwinski et al. (2021)	Self-administered	Mindful colouring	Guided reflection, creative expression (2)	Reductions in burnout (CBI) in MBI group compared to the control group	Increased mindfulness (FFMQ) and resilience (CD-RISK 10), as well as reductions in Depression, Anxiety, and Stress (DASS-21) over time in MBI group compared to the control group
de Carvalho et al. (2021)	External providers	Atentamente	Psychoeducation, guided reflections, breathing, self-regulation, body scan (5)	Reductions in exhaustion and depersonalization in burnout (MaBI-ES) in MBI group compared to controls	Increased mindfulness (FFMQ), self-compassion (SCS), self-efficacy (TSES), as well as emotion regulation through cognitive reappraisal (ERQ) and well-being (MHC-SF) in MBI group compared to the control group
Fabbro et al. (2020)	–	MOM	Breathing, body scan, meditation, discussion (4)	Reductions in stress (TSI) and emotional exhaustion in burnout (MaBI) in MBI group compared to controls	Improvements in mindfulness (FFMQ) in MBI group in relation to the control group
Flook et al. (2013)	External providers	mMBSR	Guided reflection, self-regulation, body scan, yoga, meditation (5)	Reductions in emotional exhaustion and personal accomplishment in burnout (MaBI) in the MBI group compared to controls	Increased mindfulness (FFMQ), as well as reductions in psychological symptoms (SCL-90-R) in the MBI group in relation to the control group
Franco et al. (2010)	External providers	Flow Meditation	Breathing, self-regulation, body scan, meditation (4)	–	Reductions in psychological distress (SCL-90-R) at post-intervention and follow-up in MBI group compared to controls

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Table 2 (*continued*)

Study	Facilitators	Intervention	Components (number)	Stress and burnout outcomes (measure)	Other psychological outcomes (measure)
Frank et al., 2013	External providers	MBSR	Breathing, body scan, yoga, meditation, discussion (5)	No improvements in burnout (MaBI-ES) in MBI group compared to controls	Improvements in mindfulness (FFMQ), self-compassion (SCS), and self-efficacy for emotion regulation (ASRES), except in acceptance, but no improvement in psychological symptoms (BSI) in MBI group compared to the control group
Gouda et al. (2016)	Psychiatrist	MBSR	Psychoeducation, self-regulation, yoga, meditation (4)	–	Improvements in mindfulness (FMI), teaching self-efficacy (SES-T), and emotion regulation (ERSQ). No improvements in anxiety and depression (HADS; TAI), and work engagement (UWES)
Guss (2020)	External providers	mindfulness-based training	–	Reduction in stress (DASS) in the MBI group in relation to controls	Reduction in depression and anxiety (DASS) in MBI group vs. controls
Harris et al. (2016)	Yoga instructor	CALM	Breathing, self-regulation, yoga, meditation, discussion (5)	Reductions in the depersonalization in burnout (MaBI), but no change in perceived stress (PSS), other aspects of burnout (MaBI) in MBI group compared to the control group	Improvements in mindfulness (FFMQ), self-efficacy (TSES), distress tolerance (DTS), and positive affect (PANAS), but no change in negative affect (PANAS) and emotion regulation (ERQ) in MBI group compared to controls
Harrison (2014)	External providers	Mindfulness Training	Psychoeducation, guided reflection, self-regulation, yoga, meditation, discussion (5)	No change in stress, and emotional exhaustion in burnout (MaBI-ES) in the MBI group compared to the control group	–
Hwang et al., 2019a	External providers	Reconnected	Psychoeducation, guided reflection, breathing, self-regulation, yoga, discussion (6)	Reduction in stress (PSS-10) in MBI group in relation to controls	Improvements in mindfulness (FFMQ-SF18), self-compassion (SCS-SF), and emotion regulation (ERQ) in MBI group compared to controls
Hwang et al. (2019b)	External providers	mindfulness-based program	Psychoeducation, guided reflection, breathing, self-regulation, discussion (5)	Reductions in stress (PSS-10) in the MBI group compared to controls	Improvements in mindfulness (FFMQ-SF18) and self-compassion (SCS-SF) in the MBI group relative to controls
James (2016)	Self-administered, digital-based application	Headspace	Breathing, body scan, meditation (3)	Reductions in stress (DASS) in MBI group in relation to controls	Increased mindfulness (MAAS) and emotion regulation (DERS) in MBI group compared to the control group
Jennings et al. (2017)	External providers	CARE	Psychoeducation, breathing, self-regulation (3)	–	Improvements in mindfulness (FFMQ, IMTS) and emotion regulation (ERQ), reductions in psychological distress (GAD-7), no change in affect (PANAS) and self-efficacy (TSES) in MBI group vs. controls
Jennings et al. (2019)	External providers	CARE	Psychoeducation, breathing, self-regulation (3)	–	Increased mindfulness (FFMQ) and emotion regulation (ERQ); reduced psychological distress (PHQ-8) over time in relation to reduced negative affect (PANAS); but no difference in self-efficacy (TSES) in the MBI group compared to controls
Kemeny et al. (2012)	Meditation expert	Meditation/ emotion regulation training	Psychoeducation, guided reflection, self-regulation, yoga, meditation (5)	–	Improvements in mindfulness (MAAS) and positive affect (PANAS), as well as reductions in depression (BDI), anxiety (TAI), rumination (RRQ), and negative affect (PANAS) in MBI group in relation to controls
Luong et al. (2019)	Psycho-therapists	MBSR	Psychoeducation, body scan, yoga, discussion, meditation (5)	No change in stress (PSQ) in the MBI group compared to the control group	Improvements in mindfulness (FMI), but no change in anxiety (HADS), emotion regulation (ERSQ), self-regulation (SRS), and self-efficacy (SES-T) in the MBI group compared to the control group
O'Connor, 2020	Self-administered, digital-based application	Stress Intelligence app	Psychoeducation, guided reflection, self-regulation, meditation (4)	Reductions in stress (TSI) and emotional exhaustion in burnout (MaBI-ES) in both the MBI and control groups	Improvements in mindfulness (MAAS) and coping (CS) in the MBI group compared to the control group, with no change in emotion regulation (ERQ) in MBI nor controls
Rodrigues de Oliveira et al. (2021)	External providers	MBHPEduca	Guided reflection, breathing, self-regulation, body scan, meditation (5)	Reductions in stress (PSS) in MBI group in comparison to controls	Increased positive affect (PANAS), resilience (CD-RISC). Reductions in negative affect (PANAS) in MBI group compared to controls
Roeser et al. (2021)	External providers	MBEB	Psychoeducation, breathing, self-regulation, body scan, meditation, discussion (6)	Reductions in job stress (modified CARD) and emotional exhaustion in	No change in mindfulness (FFMQ). Improvements in occupational self-compassion (SCS), and reduction in

(*continued on next page*)

Table 2 (*continued*)

Study	Facilitators	Intervention	Components (number)	Stress and burnout outcomes (measure)	Other psychological outcomes (measure)
				burnout (MaBI) in MBI group compared to controls	depression (BDI) and anxiety (STAI) in MBI group in relation to the control group
Roeser et al. (2013)	External providers	Mindfulness training	Psychoeducation, breathing, self-regulation, body scan, yoga, journaling, meditation, discussion (8)	Reductions in stress and burnout (MaBI) in MBI group compared to controls	Improvements in mindfulness (FFMQ) and self-compassion (SCS), reductions in anxiety (STAI), and depression (BDI) in MBI group compared to controls
Rupprecht et al. (2017)	External providers	MBSR	Breathing, body scan, yoga, meditation (4)	Reductions in stress (AVEM) in the MBI group compared to the control group	Improvements in mindfulness (FMI), emotional competence (SEK-27), and self-efficacy (TSES), as well as reductions in teacher strain (IS), fear, rumination (AVEM), and negative affect (SEK-27) in MBI group compared to controls
Salas, 2018	External providers	MAP	Psychoeducation, guided reflection, breathing, meditation (4)	No change in stress (PSS-10, TSI) and burnout (MaBI) in both the MBI and control group	No change in mindfulness (FFMQ, MAAS), self-efficacy (TSES), and self-compassion (SCS) in both the MBI and control groups
Shanbour (2019)	–	Applied Mindful Pedagogy for Educators	Psychoeducation, breathing, self-regulation, journaling, discussion (5)	Reductions in stress (PSS), personal accomplishment and depersonalization in burnout (MaBI) in the MBI group compared to the control group	Improvements in mindfulness (FFMQ), emotion regulation (ERQ), and decentering (EQ); reductions in rumination (EQ); no change in self-efficacy (TSES), self-compassion (SCS), and satisfaction with life (SWL) in MBI group vs. controls
Song et al. (2020)	External providers	4-day intensive MT	Psychoeducation, self-regulation, body scan, meditation (4)	Reductions in stress (CPSS) in MBI group compared to controls	Improvements in mindfulness (MAAS) and reductions in negative affect (PANAS) in MBI vs. controls
Tarrasch et al. (2020)	–	C2CIT	Psychoeducation, guided reflections, breathing, self-regulation, body scan, meditation, discussion (7)	Reductions in stress (PSS) in MBI group compared to the control group	Improvements in mindfulness (FFMQ, IMTS), self-efficacy (TSES), and self-compassion (SCS), and reduction in anxiety (STAI) and rumination (RRQ) in the MBI group vs. controls
Taylor et al. (2016)	External providers	SMART	Psychoeducation, guided reflection, breathing, self-regulation, body scan, meditation (6)	Reductions in occupational job stress scale, through increased efficacy for emotion regulation, compassion, and forgiveness	–
Van Doren & Roeser, 2021 (Study 1)	External providers	SMART	Psychoeducation, self-regulation, body scan (3)	–	Reductions in depression (BSI) but no change in anxiety (BSI) in MBI in relation to the control group
Van Doren & Roeser, 2021 (Study 2)	External providers	SMART	Psychoeducation, self-regulation, body scan (3)	–	Reductions in depression (BDI-II) and anxiety (STAI-S) in MBI compared to controls
Varona, 2019	Self-administered, web-based	MTME	Psychoeducation, self-regulation, body scan, meditation (4)	Reductions in stress and burnout (MMTOSB) in MBI group compared to controls	–

Note. (–) = missing information.

ASRES = Affective Self -Regulatory Efficacy Scale; AVEM = Occupation Stress and Coping Inventory; BDI = Beck Depression Inventory; BDI-II = Beck Depression Inventory–II; BFI = Big Five Personality Inventory; BSI = Bischof Adult Symptom Inventory; BSI = Brief Symptom Inventory; C2CIT = Call to Care – Israel for Teachers; CALM = Community Approach to Learning Mindfully; CARD = Classroom Appraisal of Resources and Demands; CARE = Cultivating Awareness and Resilience in Education for Teachers; CBI = Copenhagen Burnout Inventory; CD-RISC = Connor-Davidson Resilience Scale; CIT = The Comprehensive Inventory of Thriving; CPSS = Chinese Perceived Stress Scale; CS = Coping Scale; DASS-21 = Depression Anxiety Stress Scale–21; DERS = Difficulties in Emotion Regulation Scale; DTS = Distress Tolerance Scale; EQ = Experience Questionnaire; ERQ = Emotion Regulation Questionnaire; ERSQ = Emotion Regulation Skills Questionnaire; FFMQ = Five-Facet Mindfulness Questionnaire; FFMQ-SF18 = Five Facet Mindfulness Questionnaire-Short Form 18; FMI = Freiburg Mindfulness Inventory; GAD-7 = Generalized Anxiety Disorder 7-item Scale; GHQ = General Health Questionnaire; GSES = General Self-Efficacy Scale; HADS = Hospital Anxiety and Depression Scale; HEP = Health Enhancement Program; HLF = Holistic Life Foundation teacher program; IMTS = Interpersonal Mindfulness in Teaching; IRI = Interpersonal Reactivity Index; IS = Irritation Scale; JSS = Job Satisfaction Scale; MAAS = Mindful Attention Awareness Scale; MaBI = Maslach Burnout Inventory; MaBI-ES = Maslach Burnout Inventory-Educators Survey; MaBI-GS = Maslach Burnout Inventory-General Survey; MAP = Mindful Awareness Practices; MBEB = Mindfulness-Based Emotional Balance; MBHPEduca = Mindfulness-Based Health Program for Educators; MBI = mindfulness-based intervention; MBSR = Mindfulness-Based Stress Reduction; MHC-SF = Mental Health Continuum—Short Form; mMBSR = modified Mindfulness-Based Stress Reduction; MMTOSB = Measure of Music Teacher Occupational Stress and Burnout; MOM = Mindfulness-Oriented Meditation; MT = Mindfulness Training; MTME = Mindfulness Training for Music Educators; PANAS = Positive and Negative Affect Schedule; PHLMS = Philadelphia Mindfulness Scale; PHQ-8 = Patient Health Questionnaire 8-item Depression Scale; PSQ = Perceived Stress Questionnaire; PSS = Perceived Stress Scale; PSS-10 = Perceived Stress Scale-10; RRQ = Rumination and Reflection Questionnaire; SCL-90-R = Symptom Checklist 90-R; SCS = Neff Self Compassion Scale; SCS-SF = Self-Compassion Scale-Short Form; SEK-27 = Scale for Emotional Competence; SES-T = Teacher Self-Efficacy; SLS = Satisfaction with Life Scale; SMART = Stress Management and Relaxation Training; SPAM = Stress Prevention and Mindfulness; SRS = Self-Regulation Scale; STAI = State-Trait Anxiety Inventory; STAI-S = State-Trait Anxiety Inventory-State Version; TAI = Trait Anxiety Inventory; TCHAS = Teaching Anxiety Scale; TSES = Teacher Self-Efficacy Scale; TSI = Teacher Stress Inventory; TTF = Tendency To Forgive; UWES = Utrecht Work Engagement Scale; WEMWBS = Warwick-Edinburgh Mental Well-Being Scale; WLEIS = The Wong and Law Emotional Intelligence Scale; WMT = Workplace Mindfulness Training.

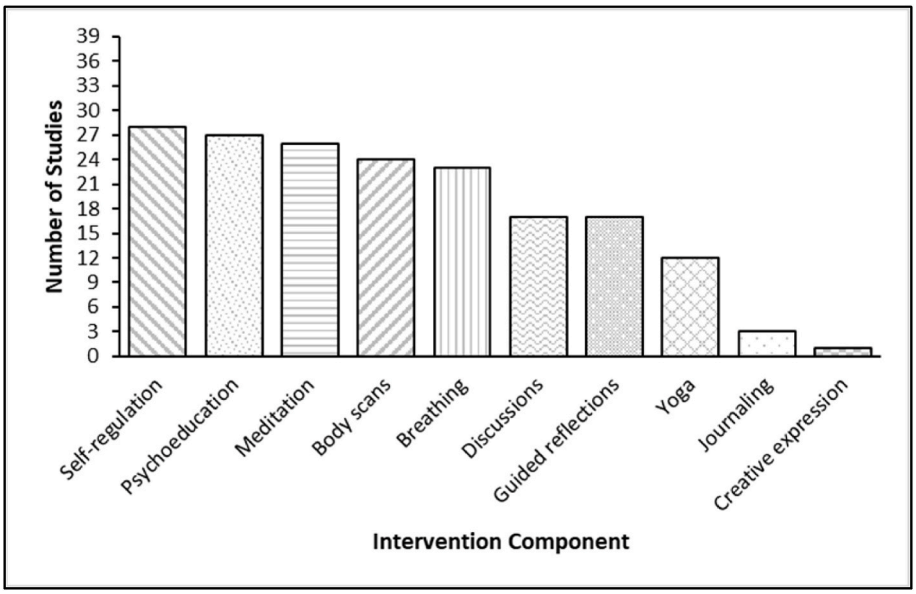

Fig. 2. Intervention components of included studies (N = 39).

3.5. Outcomes

We categorised outcomes as: (a) stress and burnout outcomes and (b) other psychological outcomes (e.g., mindfulness, coping, emotion regulation, forgiveness, job satisfaction, psychological distress, resilience, rumination, satisfaction with life, self-compassion, self-efficacy, work engagements). Of the 39 identified studies, the reduction of stress and burnout were the most reported outcomes, with 26 (67%) measuring stress and 17 (44%) measuring burnout. Most studies assessed other psychological outcomes, with 29 (74%) including mindfulness, 13 (33%) including self-efficacy 13 and 11 (28%) including self-compassion as the most reported.

3.6. Outcome measures

All of the identified studies used self-report measures to detect changes in outcomes following MBIs. Four studies also observed physiological changes in stress, that is, changes in blood pressure (Harris et al., 2016; Kemeny et al., 2012; Roeser et al., 2013), cortisol (Flook et al., 2013; Roeser et al.) and heart rate (Roeser et al.).

3.6.1. Measures of stress

Of the 26 studies reporting stress as an outcome, seven used the Perceived Stress Scale (PSS; Almaguer-Botero, 2020; Berkovich-Ohana et al., 2020; Beshai et al., 2016; Carroll et al., 2021; Harris et al., 2016; Rodrigues de Oliveira et al., 2021; Tarrasch et al., 2020), three used the PSS-10-item version (PSS-10; i.e., Hwang et al., 2019a; Hwang et al., 2019b; Salas, 2018) and one study used the Chinese version (CPSS; Song et al., 2020). Other stress measures used, included the Teacher Stress Inventory (TSI; $n = 4$; Ancona & Mendelson, 2014; Fabbro et al., 2020; O'Connor, 2020; Salas, 2018), Depression Anxiety Stress Scale (DASS; $n = 4$; Carroll et al., 2021; Czerwinski et al., 2021; Guss, 2020; James, 2016), Perceived Stress Questionnaire (PSQ; $n = 2$; Gouda et al., 2016; Luong et al., 2019), State-Trait Anxiety Inventory (STAI; $n = 2$; Roeser et al., 2021; Roeser et al., 2013), and Occupation Stress and Coping Inventory (AVEM; $n = 1$; Rupprecht et al., 2017). One study measured stress in music teachers using a scale devised by the authors, namely, the Measure of Music Teacher Occupational Stress and Burnout scale (MMTOSB; Varona et al., 2019). Two studies used multiple stress measures (Harrison, 2014; Taylor et al., 2016).

3.6.2. Measures of burnout

Of the 17 studies that reported outcomes of burnout, 14 studies used the Maslach Burnout Inventory (MaBI), with the Maslach Burnout Inventory-Education Survey (MaBI-ES) being the most used version ($n = 13$; Ancona & Mendelson, 2014; Bull-Beddows, 2020; de Carvalho et al., 2021; Fabbro et al., 2020; Flook et al., 2013; Frank, Reibel, Broderick, Cantrell, & Metz, 2013; Harris et al., 2016; Harrison, 2014; Jennings et al., 2017; O'Connor, 2020; Roeser et al., 2021; Roeser et al., 2013; Salas, 2018). Additionally, the Maslach Burnout Inventory-General Survey (MaBI-GS) version was also used in one study (Cheng et al., 2021), while another study (Shanbour, 2019) used the shortened version of the MaBI. Two studies measured burnout using the Copenhagen Burnout Inventory scale (CBI; Carroll et al., 2021; Czerwinski et al., 2021). One study measured burnout using a scale adapted for music teachers, namely the Measure of Music Teacher Occupational Stress and Burnout scale (MMTOSB; Varona et al., 2019).

3.6.3. Measures of other psychological outcomes

Many researchers included assessments of other psychological outcomes (i.e., other than stress and burnout; see Table 2). Mindfulness ($n = 29$; 74%) was the most reported psychological outcome. The Five-Facet Mindfulness Questionnaire (FFMQ) was the most used scale to measure mindfulness ($n = 18$; Almaguer-Botero, 2020; Berkovich-Ohana et al., 2020; Beshai et al., 2016; Carroll et al., 2021; Crain et al., 2017; Czerwinski et al., 2021; de Carvalho et al., 2021; Fabbro et al., 2020; Flook et al., 2013; Frank et al., 2013; Harris et al., 2016; Jennings et al., 2017; Jennings et al., 2019; Roeser et al., 2021; Roeser et al., 2013; Salas, 2018; Shanbour, 2019; Tarrasch et al., 2020), and the Five Facet Mindfulness Questionnaire-Short Form 18 version (FFMQ-SF18; $n = 2$; Hwang et al., 2019a; Hwang et al., 2019b). A total of 20 out of the 29 studies used a version of the FFMQ scale to assess mindfulness. The Mindful Attention Awareness Scale (MAAS; $n = 5$; James, 2016; Kemeny et al., 2012; O'Connor, 2020; Salas, 2018; Song et al., 2020) was the next commonly used measure, followed by the Freiburg Mindfulness Inventory (FMI; $n = 3$; Gouda et al., 2016; Luong et al., 2019; Rupprecht et al., 2017), Interpersonal Mindfulness in Teaching (IMTS; $n = 3$; Cheng et al., 2021; Jennings et al., 2017; Tarrasch et al., 2020), and the Philadelphia Mindfulness Scale (PHMLS; $n = 1$; Bull-Beddows, 2020).

Numerous other psychological outcomes were included in MBI studies which aligned with definitions of well-being (see Collie et al., 2015; Diener, 1984; Forgeard et al., 2011; Ryff & Singer, 2008), such as

positive (self-efficacy, self-compassion) and negative (anxiety, depression, emotion regulation, rumination, psychological distress) affect, personal growth (emotional intelligence, emotional competence, forgiveness, resilience, coping, distress tolerance), subjective satisfaction with life and organizational well-being (job satisfaction, satisfaction with life). A range of psychological measures were used to capture these constructs and are detailed in Table 2.

3.7. Study findings

Table 2 presents the effects of MBIs reported in the identified studies. Results are presented for stress and burnout and other psychological domains.

3.7.1. Stress

Of the 26 studies that measured stress, 20 (77%) of them reported that MBI had significantly reduced teachers' self-reported stress levels (Ancona & Mendelson, 2014; Berkovich-Ohana et al., 2020; Beshai et al., 2016; Carroll et al., 2021; Czerwinski et al., 2021; Fabbro et al., 2020; Guss, 2020; Hwang et al., 2019a; Hwang et al., 2019b; James, 2016; O'Connor, 2020; Rodrigues de Oliveira et al., 2021; Roeser et al., 2021; Roeser et al., 2013; Rupprecht et al., 2017; Shanbour, 2019; Song et al., 2020; Tarrasch et al., 2020; Taylor et al., 2016; Varona, 2019). Table 2 shows reductions in stress levels were detected through various psychometric measures, including the TSI (Ancona & Mendelson, 2014; Fabbro et al., 2020), PSS (Berkovich-Ohana et al., 2020; Beshai et al., 2016), PSS-10 (Hwang et al., 2019a; Hwang et al., 2019b), CPSS (Song et al., 2020), DASS (Carroll et al., 2021; Czerwinski et al., 2021), STAI (Roeser et al., 2013, 2021), AVEM (Rupprecht et al., 2017), and MMTOSB (Varona, 2019). However, some studies showed no improvement in stress levels following MBIs as indexed by the PSS (Almaguer-Botero, 2020; Harris et al., 2016), PSS-10 (Salas, 2018), PSQ (e.g., Gouda et al., 2016; Luong et al., 2019), and the TSI (Salas, 2018). Reductions in stress seem to be detectable through multiple outcome measures, rather than being limited to a specific one.

Studies that resulted in reductions in stress included multiple intervention components, through a combination of psychoeducation, guided reflection, breathing, self-regulation, yoga, journaling, body scan, meditation, discussion, and/or creative expression. More specifically, psychoeducation (n = 14 of 26; 54%), self-regulation (n = 14; 54%), meditation (n = 14; 54%), breathing (n = 13; 50%), and/or body scan (n = 13; 50%) were the most common components of MBIs that reduced stress.

3.7.2. Burnout

Of the 18 studies that measured burnout, 16 studies (89%) reported that MBIs had reduced burnout in teachers (Ancona & Mendelson, 2014; Bull-Beddows, 2020; Carroll et al., 2021; Cheng et al., 2021; Czerwinski et al., 2021; de Carvalho et al., 2021; Fabbro et al., 2020; Flook et al., 2013; Harris et al., 2016; Jennings et al., 2017; O'Connor, 2020; Roeser et al., 2021; Roeser et al., 2013; Shanbour, 2019; Varona, 2019). As seen in Table 2, improvements in burnout were detected through various measures, with most studies using the Maslach Burnout Inventory (MaBI) scale. Of the studies that used the MaBI scale, only two found improvements using the total score (Cheng et al., 2021; Roeser et al., 2013). Most MBIs using the MaBI scale revealed changes at the subscale levels compared to the overall/total scores. Specifically, improvements were detected at the Emotional Exhaustion (feelings of being overextended/exhausted emotionally; n = 7; Ancona & Mendelson, 2014; de Carvalho et al., 2021; Fabbro et al., 2020; Flook et al., 2013; Jennings et al., 2017; O'Connor, 2020; Roeser et al., 2021), Depersonalization (lack of feelings, impersonal responses towards others, a sense of detachment from work; n = 5; Cheng et al., 2021; de Carvalho et al., 2021; Harris et al., 2016; Salas, 2018; Shanbour, 2019), and Personal Accomplishment (feelings of competence/success; n = 3; Bull-Beddows, 2020; Flook et al., 2013; Shanbour, 2019) subscales. Improvements in burnout have also been detected through other measures, for example, the CBI (Carroll et al., 2021; Czerwinski et al., 2021) and the MMTOSB (Varona, 2019) scales. The effects of MBIs on teacher burnout does not appear to be sensitive to any particular measure.

Studies that showed reduced burnout used a variety of components, including psychoeducation, guided reflection, breathing, self-regulation, yoga, journaling, body scan, meditation, discussion, and/or creative expression. Self-regulation (n = 11 of 17; 65%), meditation (n = 11; 65%), psychoeducation (n = 8; 47%), breathing (n = 8; 47%), and body scans (n = 8; 47%) were the most used components in MBIs showing reduced burnout.

3.7.3. Other psychological outcomes

Of the 29 studies which assessed mindfulness, 26 studies (90%) reported improvements in mindfulness (Berkovich-Ohana et al., 2020; Beshai et al., 2016; Bull-Beddows, 2020; Carroll et al., 2021; Cheng et al., 2021; Crain et al., 2017; Czerwinski et al., 2021; de Carvalho et al., 2021; Fabbro et al., 2020; Flook et al., 2013; Frank et al., 2013; Gouda et al., 2016; Harris et al., 2016; Hwang et al., 2019a; Hwang et al., 2019b; James, 2016; Jennings et al., 2017; Jennings et al., 2019; Kemeny et al., 2012; Luong et al., 2019; O'Connor, 2020; Roeser et al., 2013; Rupprecht et al., 2017; Shanbour, 2019; Song et al., 2020; Tarrasch et al., 2020). Further, 21 out of the 26 studies (81%) that reported increased mindfulness also reported reductions in stress and/or burnout (Berkovich-Ohana et al., 2020; Beshai et al., 2016; Bull-Beddows, 2020; Carroll et al., 2021; Cheng et al., 2021; Czerwinski et al., 2021; de Carvalho et al., 2021; Fabbro et al., 2020; Flook et al., 2013; Harris et al., 2016; Hwang et al., 2019a; Hwang et al., 2019b; James, 2016; Jennings et al., 2017; Jennings et al., 2019; O'Connor, 2020; Roeser et al., 2013; Rupprecht et al., 2017; Shanbour, 2019; Song et al., 2020; Tarrasch et al., 2020). Table 2 shows improvements in mindfulness were detected through various measures, including the FFMQ (Berkovich-Ohana et al., 2020; Beshai et al., 2016), FFMQ-SF18 (e.g., Hwang et al., 2019a; Hwang et al., 2019b), PHMLS (Bull-Beddows, 2020), FMI (Gouda et al., 2016; Luong et al., 2019), MAAS (James, 2016; Kemeny et al., 2012), and IMTS (Cheng et al., 2021; Jennings et al., 2017; Tarrasch et al., 2020). Nevertheless, some studies showed no change in mindfulness levels using the same measures, for example, FFMQ (Almaguer-Botero, 2020; Roeser et al., 2021) and MAAS (Salas, 2018) scales. As such, positive outcomes of MBIs on mindfulness are not unique to certain measures.

Among the studies capturing changes in mindfulness, the MBIs employed multiple components; psychoeducation, guided reflection, breathing, self-regulation, yoga, journaling, body scans, meditation, discussion, and/or creative expression. From the studies which resulted in increased mindfulness, self-regulation (n = 18 of 26; 69%), meditation (n = 18; 69%), psychoeducation (n = 17; 65%), breathing (n = 15; 58%), and body scan (n = 15; 58%) were included the most as part of the MBIs.

Psychological outcomes aligning with definitions of well-being were noted in 35 of the 39 studies (90%). From the MBI studies which examined positive affect, 3 studies included specific measures of positive affect and all 3 (100%) indicated improvements (Harris et al., 2016; Kemeny et al., 2012; Rodrigues de Oliveira et al., 2021), 14 studies included measures of self-efficacy and 8 (57%) reported improvements (Bull-Beddows, 2020; de Carvalho et al., 2021; Frank et al., 2013; Gouda et al., 2016; Harris et al., 2016; Rupprecht et al., 2017; Salas, 2018; Tarrasch et al., 2020); 11 studies included self-compassion and 9 (82%) reported improvements (Beshai et al., 2016; Bull-Beddows, 2020; de Carvalho et al., 2021; Frank et al., 2013; Hwang et al., 2019a; Hwang et al., 2019b; Roeser et al., 2013; Roeser et al., 2021; Tarrasch et al., 2020). From the studies which included measures of negative affect, 2 out of 6 (33%) showed reductions in specific measures of negative affect (Rupprecht et al., 2017; Song et al., 2020), 8 out of 12 studies (67%) showed reductions in anxiety (Bull-Beddows, 2020; Czerwinski et al., 2021; Guss, 2020; Kemeny et al., 2012; Roeser et al., 2021; Roeser et al.,

2013; Tarrasch et al., 2020; Van Doren & Roeser, 2021 Study 2), 8 out of 9 studies (89%) reported reductions in depression, (Cheng et al., 2021; Czerwinski et al., 2021; Guss, 2020; Kemeny et al., 2012; Roeser et al., 2021; Roeser et al., 2013; Van Doren & Roeser, 2021 Study 1; Van Doren & Roeser, 2021 Study 2), 9 out of 13 studies (69%) reported improved emotion regulation (Carroll et al., 2021; de Carvalho et al., 2021; Gouda et al., 2016; Hwang et al., 2019a; James, 2016; Jennings et al., 2017; Jennings et al., 2019; Luong et al., 2019; Shanbour, 2019), 6 out of 6 studies (100%) showed reduction in rumination (Berkovich-Ohana et al., 2020; Crain et al., 2017; Kemeny et al., 2012; Rupprecht et al., 2017; Shanbour, 2019; Tarrasch et al., 2020), and 3 out of 3 (100%) demonstrated reductions in psychological distress (Franco et al., 2010; Jennings et al., 2017, 2019). From the MBI studies which examined personal growth, one study included emotional intelligence (Cheng et al., 2021), another included emotional competence (Rupprecht et al., 2017), another included distress tolerance (Harris et al., 2016), another included coping (O'Connor, 2020), and two studies included forgiveness (Braun et al., 2020; Taylor et al., 2016), two others included resilience (Czerwinski et al., 2021; Rodrigues de Oliveira et al., 2021). All these studies (100%) found significant increases in these factors related to personal growth. Likewise, MBI studies which investigated subjective satisfaction reported improvements; 1 of 1 study (100%) showed increases in job satisfaction (Crain et al., 2017) and 1 of 1 study (100%) showed increased in satisfaction with life (Shanbour, 2019). Together these findings show much promise for MBIs to improve psychological factors related to well-being.

Among the studies capturing changes in psychological well-being, a range of core MBI components were included. Table 2 details these components across studies.

3.8. Fidelity

Table 3 shows the results of the assessment of implementation fidelity using the Treatment Fidelity Tool for MBIs (i.e., design, training, delivery, receipt, and enactment; Kechter et al., 2019). Taken together, Tables 2 and 3 contain the reporting recommendations of Baelen et al. (2023). As shown in Table 3, four (10%) studies assessed only one of the fidelity criteria (i.e., Shanbour, 2019; Tarrasch et al., 2020; Van Doren & Roeser, 2021, Study 1; Van Doren & Roeser, 2021, Study 2), five (13%) studies assessed only two of the fidelity criteria (i.e., Crain et al., 2017; Franco et al., 2010; James, 2016; Song et al., 2020; Taylor et al., 2016), 16 (41%) studies assessed three fidelity criteria (Ancona & Mendelson, 2014; Berkovich-Ohana et al., 2020; Braun et al., 2020; Bull-Beddows, 2020; Cheng et al., 2021; Czerwinski et al., 2021; de Carvalho et al., 2021; Fabbro et al., 2020; Flook et al., 2013; Frank et al., 2013; Harrison, 2014; Hwang et al., 2019b; Luong et al., 2019; O'Connor, 2020; Rodrigues de Oliveira et al., 2021; Varona, 2019), five (13%) studies assessed four fidelity criteria (Beshai et al., 2016; Guss, 2020; Kemeny et al., 2012; Rupprecht et al., 2017; Salas, 2018), and nine (23%) studies assessed all five fidelity criteria (Almaguer-Botero, 2020; Carroll et al., 2021; Gouda et al., 2016; Harris et al., 2016; Hwang et al., 2019a; Jennings et al., 2017; Jennings et al., 2019; Roeser et al., 2013; Roeser et al., 2021). Importantly, all (100%) of the 39 identified studies reported the intervention and dosage used in the studies. Thirty-one (79%) studies reported assessing the training of the facilitators, with most studies using instructors who were trained personnel or professionals (e.g., mindfulness instructors, counsellors, psychologists, or psychiatrists) that received training or certification in mindfulness or related areas, and other studies including facilitators who were the developer of the program or counselling students, as well as self-administered programs through digital or online platforms. Only 11 (28%) studies reported taking measures to assess adherence in delivering the MBI, such as through self- or observer-rated measurements, and having the instructors receive either briefing or debriefing sessions. Twenty-nine (74%) studies reported ensuring participant engagement and adherence to the intervention, such as by recording participant attendance and conducting surveys using questionnaires to assess the acceptability, helpfulness, and benefits of the programs. Eighteen (46%) studies reported assessing participants' compliance to homework assignment, as well as the personal or independent use of mindfulness skills outside of training sessions, such as through mindfulness logs, diaries/journals, reflective interviews/discussions with facilitators.

3.9. Quality and bias

Table 4 shows the quality of the identified studies across the five categories in the Downs and Black (1998) checklist: reporting, external validity, bias, confounding, and power. From the 39 studies, 30 met criteria for *good* (Almaguer-Botero, 2020; Ancona & Mendelson, 2014; Berkovich-Ohana et al., 2020; Beshai et al., 2016; Braun et al., 2020; Bull-Beddows, 2020; Carroll et al., 2021; Cheng et al., 2021; Crain et al., 2017; de Carvalho et al., 2021; Fabbro et al., 2020; Frank et al., 2013; Harris et al., 2016; Harrison, 2014; Hwang et al., 2019a; Hwang et al., 2019b; James, 2016; Jennings et al., 2017; Jennings et al., 2019; Kemeny et al., 2012; Luong et al., 2019; O'Connor, 2020; Rodrigues de Oliveira et al., 2021; Roeser et al., 2021; Roeser et al., 2013; Rupprecht et al., 2017; Salas, 2018; Van Doren & Roeser, 2021 (Study 1); Van Doren & Roeser, 2021 (Study 2); Varona, 2019). The remaining nine studies met criteria for *fair* (Czerwinski et al., 2021; Flook et al., 2013; Franco et al., 2010; Gouda et al., 2016; Guss, 2020; Shanbour, 2019; Song et al., 2020; Tarrasch et al., 2020; Taylor et al., 2016). In general, all identified studies were of moderate to high quality and had control groups, aims and hypotheses, sufficient sample size, representative samples, and reliable measures.

4. Discussion

The present review evaluated the efficacy of MBIs for teacher stress and burnout and other psychological outcomes and assessed implementation fidelity. MBIs have previously shown promise with reduction of stress and burnout, and improvement in emotion regulation in teachers (Emerson et al., 2017; Feagans Gould et al., 2016; Hwang et al., 2017; Klingbeil & Renshaw, 2018; Lomas et al., 2017; Zarate et al., 2019). The most recent review, however, was conducted in April 2018 (see Zarate et al., 2019), while the latest review that included implementation fidelity was conducted in May 2014 (see Feagans Gould et al., 2016). The current review updates this earlier work and is the first to deploy the rigorous Treatment Fidelity Tool for MBIs (Kechter et al., 2019), in order to ensure validity of recommendations. We identified 39 studies, 24 were published after 2018 and 37 were published after 2014.

4.1. Samples

The combined results indicated that MBIs are typically effective, that is, decreased symptoms of stress and burnout in teachers who participated in MBIs compared to those in comparison conditions. Reduced stress and burnout were detected across various groups of teachers, irrespective of their teaching levels and location (country). However, it should be noted that out of the 39 included studies, 34 studies were done in Western contexts. Two studies were conducted in China (Cheng et al., 2021; Song et al., 2020), three studies were conducted in Israel (Berkovich-Ohana et al., 2020; Shanbour, 2019; Tarrasch et al., 2020), and no studies were identified in other Asian, Middle Eastern, or African contexts. As such, there is a lack of evidence on the efficacy of MBIs for teachers across diverse cultures. Drawing on the literature for cross-cultural differences in the feasibility, acceptability, and benefits of developing mindfulness in samples with different backgrounds, it is possible that cultural values play a role in determining the effectiveness of coping mechanisms in maintaining well-being. For example, Raphiphatthana et al. (2018) found that mindfulness levels predicted grit (perseverance and passion for long-term goals) in Western, but not in non-Western students. They suggested that non-Western students

Table 3
Implementation fidelity.

Study	Design		Training	Delivery	Receipt	Enactment	Domains reported (range 1–5)
	Intervention	Dosage					
Almaguer-Botero (2020)	SPAM	8 wks, 8 h	Counselling students and a licensed counsellor	Debriefing (weekly basis), study of the intervention manual., and briefing from program creator	Reflection questionnaire	Homework discussion and reflection	5
Ancona and Mendelson (2014)	HLF	3 wks, 4.5 h	Program developer, with in-depth knowledge of the targeted community	–	Attendance	–	3
Berkovich-Ohana et al. (2020)	Applied Mindful Pedagogy for Educators, primarily based on MBSR	12 wks, 30 h	–	–	Attendance (72%) of four out of six classes	Journals and reflections	3
Beshai et al. (2016)	Foundations Course, based on MBSR and MBCT and Mindfulness: Finding Peace in a Frantic World	8 wks, 11 h +10–40 min home exercises	Trained instructors	Partially scripted lesson plans	Attendance (92%) of at least five out of eight sessions. Reflection questionnaire (enjoyment and perceived learning)	–	4
Braun et al. (2020)	MBEB, primarily adapted from MBSR	9 wks, 36 h	Program developer	–	Attendance. Evaluation questionnaires (helpfulness and benefits of the intervention).	–	3
Bull-Beddows, 2020	Headspace	8 wks	An online healthcare company	–	Number of logins, Logs of minutes spent on the intervention program	–	3
Carroll et al. (2021)	MBSR, adapted for teachers	8 wks, >16 h + home exercise	Trained instructors	Observations by research officers	Attendance. Make-up sessions for any missed sessions	Home practice logs and journals	5
Cheng et al. (2021)	Mindfulness training, primarily based on MBSR and MBCT	4 wks, 6 h + home exercises	Trained instructor	–	Attendance	–	3
Crain et al. (2017)	WMT, primarily based on MBSR	8 wks, 36 h	Program developer	–	–	–	2
Czerwinski et al. (2021)	Mindful colouring	1 wk	Self-administered, using video recordings	–	Reflection questionnaire	–	3
de Carvalho et al. (2021)	Atentamente	10 wks, 30 h	Trained instructor, in MBSR	–	Reflection questionnaire and observation	–	3
Fabbro et al. (2020)	MOM	8 wks, 12 h + home exercises	–	–	Attendance. Meditation diary	Home practice logs	3
Flook et al. (2013)	mMBSR, based on MBSR	8 wks, 26 h + home exercises	Trained instructors, in MBSR.	–	–	Home practice logs	3
Franco et al. (2010)	Flow Meditation	10 wks, 15 h	Trained instructor	–	–	–	2
Frank et al., 2013	MBSR	8 wks, 16 h + home exercises	Trained instructor, in MBSR	–	–	Home practice logs	3
Gouda et al. (2016)	MBSR	8 wks, 16 h, + 1 day retreat	Trained instructor	Briefing with course teacher and psychometric mindfulness measure	Attendance and interview about satisfaction and engagement with the course	Interview about the frequency and extent of independent practice	5
Guss (2020)	mindfulness-based training	12 wks, 3 h	A trained instructor	–	Exit tickets and questionnaire about mindfulness-based strategies	Home practice logs	4
Harris et al. (2016)	CALM	16 wks, 21 h	Trained instructor	Self-evaluated and observer-rated ratings of adherence	Attendance and perception of feasibility	Home practice logs	5
Harrison (2014)	Mindfulness training, primarily based on MBSR	9 wks, 33.5 h + home exercises	–	–	Attendance	Home practice logs	3
Hwang et al., 2019a	Reconnected	8 wks, 12 h	Trained instructor	Study and adherence to manual and scripts,	Attendance and weekly reminders.	Observer-rated checklist	5

(*continued on next page*)

Table 3 (*continued*)

Study	Design		Training	Delivery	Receipt	Enactment	Domains reported (range 1–5)
	Intervention	Dosage					
				debriefing (weekly) sessions and observation by researcher			
Hwang et al. (2019b)	mindfulness-based program	8 wks, 12 h	Trained instructor	Study and adherence to manual and scripts, debriefing and observer-rated fidelity checklist.	–	–	3
James (2016)	Headspace	10 days, 1.7 h	Digital application	–	A buddy system.	–	2
Jennings et al. (2017)	CARE	5 days, 30 h	Trained instructor	Observer-rated fidelity checklist	Attendance and coaches to check participants' understanding	Coaches to check participants' personal practice and fidelity in between sessions	5
Jennings et al. (2019)	CARE	5 days, 30 h	Trained instructor	Observer-rated fidelity checklist	Attendance	Coaches to check on participants' practice and application of the mindfulness skills	5
Kemeny et al. (2012)	Meditation/emotion regulation training	8 wks, 42 h	Trained instructor	–	Attendance.	Home practice logs	4
Luong et al. (2019)	MBSR	8 wks, 22 h	Trained instructor	–	Interviews (to collect information on participants' understanding of mindfulness, course experience, and perceived outcome in the schools)	–	3
O'Connor, 2020	Stress Intelligence app	8 wks, 6–10 h	Digital application	–	Progress tracker, reflection questionnaire (usability, usefulness, and feasibility of the program)	–	3
Rodrigues de Oliveira et al. (2021)	MBHPEduca	8 wks, 16 h + home exercises	Trained instructor	–	Attendance	–	3
Roeser et al. (2021)	MBEB, based on MBSR	8 wks, 28 h	Program developer	The intervention sessions were delivered by the same instructor.	Attendance. Questionnaire (measure of acceptability)	Home practice logs	5
Roeser et al. (2013)	Mindfulness training	8 wks, 36 h	Program developer	The intervention sessions were delivered by the same instructor.	Questionnaire (intervention acceptability and feasibility)	Home practice logs	5
Rupprecht et al. (2017)	MBSR	5 wks, 26 h.	Trained instructor	–	Attendance.	Home practice logs	4
Salas, 2018	MAP	6 wks, 6 h	Trained instructor	–	Attendance of a minimum of 5 out of 6 sessions	Home practice logs	4
Shanbour (2019)	Applied Mindful Pedagogy for Educators	3 mts, 30 h	–	–	–	–	1
Song et al. (2020)	4-day intensive MT, adapted from MBSR	4 days, 32 h	Trained instructor	–	–	–	2
Tarrasch et al. (2020)	C2CIT	20 wks, 30 h	–	–	–	–	1
Taylor et al. (2016)	SMART, primarily based on MBSR	9 wks, 36 h	–	–	Attendance. Questionnaire (to evaluate helpfulness, benefit, satisfaction and acceptability)	–	2
Van Doren & Roeser, 2021 (Study 1)	SMART	7 wks	–	–	–	–	1
Van Doren & Roeser, 2021 (Study 2)	SMART	8 wks	–	–	–	–	1
Varona, 2019	MTME	4 wks, >2.3 h	Digital program	–	Logs of minutes on the program, questionnaire (on the feasibility and participant experience)	–	3

Note. (−) = No report.
C2CIT = Call to Care – Israel for Teachers; CALM = Community Approach to Learning Mindfully; CARE = Cultivating Awareness and Resilience in Education for Teachers; HLF = Holistic Life Foundation teacher program; MAP = Mindful Awareness Practices; MBCT = Mindfulness-Based Cognitive Therapy; MBEB = Mindfulness-Based Emotional Balance; MBHPEduca = Mindfulness-Based Health Program for Educators; MBSR = Mindfulness-Based Stress Reduction; mMBSR = modified Mindfulness-Based Stress Reduction; MOM = Mindfulness-Oriented Meditation; MT = Mindfulness Training; MTME = Mindfulness Training for Music Educators; SMART = Stress Management and Relaxation Training; SPAM = Stress Prevention and Mindfulness; WMT = Workplace Mindfulness Training.

experience more pressure to plan for the future than their Western counterparts and may find focusing on the present moment in mindfulness practices, more challenging (Raphiphatthana et al.). Other work, however, suggested that due to increased globalisation, coping mechanisms developed in Western contexts have become more relevant to younger people in non-Western contexts (Auerbach, Abela, Zhu, & Yao, 2010; Li & Yang, 2016). More research is needed to confirm the applicability and benefits of MBIs in teachers from non-Western backgrounds.

4.2. Interventions

The identified studies used different MBIs with varying characteristics, protocols, and standards. Facilitators, durations, and components varied across studies and seem less specific to the efficacy of MBIs for reduction of teacher stress and burnout. Since studies found positive outcomes from MBIs, regardless of facilitator, the present findings suggest that MBIs could be delivered by either trained personnel (external providers), expert professionals, or through self-administered programs. Dosage appeared to be unrelated to the outcomes, as no differences in reduction of stress and/or burnout were observed across the studies with varying durations or contact hours. Given the skewed distribution we argue that the median duration and contact hours may be a better representation of central tendency (i.e., 3.5 weeks; 18.5 h). Nonetheless, our finding was consistent with previous reviews which found outcomes of MBIs did not vary with dosage or duration. For example, Demarzo et al. (2017) reported no differences between 4- and 8-week MBI interventions and Carmody and Baer (2009) reviewed 30 MBI studies of varying durations and found no relationship between duration of intervention and symptom reduction.

Regarding components of MBIs, self-regulation, breathing, body scans, meditation and psychoeducation were the most common inclusions in MBIs in the current review, and they were mostly used in combination with one another. Previous studies have attempted to explain how these core components bring about positive outcomes. For example, research suggests that self-regulation is integral to an individual's response and/or acceptance of an adverse event to reduce stress, through the removal of negative judgements to provide an adaptive response (Chin et al., 2019; Lindsay & Creswell, 2017; Stein & Witkiewitz, 2020). Further, breathing and body scans are aimed at focusing one's attention on the present moment and disengaging the mind from wandering away and refocusing it back to the present experience (Harrison, 2014; Lindsay & Creswell). Meditation also involves regulating one's focus and awareness and includes the development of positive attitudes (Lutz et al., 2015). Psychoeducation comprises knowledge and awareness of one's actions and attitudes and is considered influential in building skills of mindfully navigating stress (Anderson & Guthery, 2015; Van Daele, Hermans, Van Audenhove, & Van den Bergh, 2012). These commonly included intervention components found in the identified studies, were consistent with the elements of MBIs reported in other reviews (Anderson & Guthery, 2015; Lindsay & Creswell; Lutz et al., 2015; Stein & Witkiewitz).

No differences in the outcomes of MBIs on teacher stress, burnout, and mindfulness were observed across the various outcome measures used. Certain measures were more popular, for example, PSS was the most used measure of stress, MaBI-ES was the most used index of burnout, and the FFMQ was the most common assessment for detecting changes in mindfulness. Researchers deployed measures that were appropriate for their samples. For instance, Song et al. (2020) used the Chinese version of the PSS (CPSS) to assess stress in Chinese teachers, to remove language barriers that may contaminate the results, and Varona (2019) adjusted existing scales for music teachers. These examples could serve as reminders for future studies to use valid and reliable measures that are easily understood and relevant to their samples.

4.3. Findings

The majority of identified studies found reductions in stress and burnout and improvements in other psychological outcomes (see Section 3.7.3). Specially, 20 of the 26 identified studies showed reductions in stress and a further 6 showed a trend for stress reduction (Almaguer-Botero, 2020; Gouda et al., 2016; Harris et al., 2016; Harrison, 2014; Luong et al., 2019; Salas, 2018). These studies support the idea that MBIs might develop skills to increase emotional awareness and regulate responses in certain situations, whereby reducing negative reactions to stressors and in turn increasing resilience (see Fabbro et al., 2020; Rodrigues de Oliveira et al., 2021; Song et al., 2020; Taylor et al., 2016). For instance, Rupprecht et al. (2017) proposed that mindfulness develops teachers' ability to identify their job stressors, enhancing their ability to prioritize and allocate resources in navigating difficult situations and tasks. However, given most studies relied on self-reported stress it could be argued that these data may be prone to response bias (Harrison, 2004). Nevertheless, the benefits of using physiological indicators to determine the effects of MBIs on stress were inconsistent. For example, Harris et al. (2016) found reductions in blood pressure when no subjective stress relief was detected, whereas Roeser et al. (2013) found no decreases in blood pressure, cortisol and heart rate, despite lower stress being self-reported. Therefore, future research may warrant the inclusion of both subjective and objective measures of stress to accurately detect changes following MBIs for teachers.

Regarding teacher burnout, 16 of the 18 studies showed significant reductions following MBIs. The MaBI, was commonly used to capture burnout with changes being detected at the Emotional Exhaustion subscale more often than the Depersonalization and Personal Accomplishment subscales, and least detected by the overall MaBI score. It could be argued that the heightened influence of MBI on the Emotional Exhaustion subscale might relate to one of the main aims of mindfulness which is to improve emotional regulation and reduce emotional exhaustion (Cheng et al., 2021; Lee et al., 2021; Neumann & Tillott, 2021). Most MBIs in the current review included the component of self-regulation, that is, training teachers to regulate their emotions (e.g., Carroll et al., 2021; Cheng et al., 2021). Past studies have proposed that the effect of MBIs on the emotional exhaustion aspect of burnout may be mediated by the development of emotion regulation skills (Hülsheger et al., 2013; Karing & Beelmann, 2019). It seems plausible therefore, that the Emotional Exhaustion subscale of the MaBI might be more sensitive to burnout changes following MBIs than other subscale or overall scores.

Among the studies reporting improvements in mindfulness, 20 also reported reductions in stress and/or burnout. It is likely that positive changes in stress and/or burnout were co-occurring with improvements in mindfulness itself. This finding is consistent with previous studies that found reductions in stress and burnout following MBIs and associated improvements in mindfulness (Baer et al., 2012; Gawrysiak et al., 2018; Lu et al., 2021; Shapiro et al., 2011). For instance, Lu et al. (2012) reported that high levels of mindfulness might have mediated the reductions of teacher Emotional Exhaustion following MBIs, as levels of mindfulness and Emotional Exhaustion were positively correlated with one another. Lu et al. suggested that greater mindfulness might assist individuals to be more accepting and less judgmental of negative

Table 4
Quality and risk of bias.

Author, year	Reporting (0–11)	External validity (0–3)	Bias (0–7)	Confounding (0–6)	Power (0–1)
Almaguer-Botero (2020)	9	3	4	3	1
Ancona and Mendelson (2014)	8	3	4	5	1
Berkovich-Ohana et al. (2020)	8	3	4	4	1
Beshai et al. (2016)	9	3	5	4	1
Braun et al. (2020)	8	3	5	5	1
Bull-Beddows, 2020	9	3	4	4	1
Carroll et al. (2021)	10	3	5	3	1
Cheng et al. (2021)	8	3	4	4	1
Crain et al. (2017)	8	3	4	5	1
Czerwinski et al. (2021)	6	3	4	4	1
de Carvalho et al. (2021)	9	3	4	4	1
Fabbro et al. (2020)	8	3	5	3	1
Flook et al. (2013)	6	3	5	4	1
Franco et al. (2010)	7	3	4	2	1
Frank et al., 2013	8	3	5	3	1
Gouda et al. (2016)	7	3	5	3	1
Guss (2020)	6	3	5	2	1
Harris et al. (2016)	9	3	5	5	1
Harrison (2014)	7	3	5	4	1
Hwang et al., 2019a	7	3	5	5	1
Hwang et al. (2019b)	7	3	4	5	1
James (2016)	8	3	6	3	1
Jennings et al. (2017)	8	3	5	5	1
Jennings et al. (2019)	7	3	5	5	1
Kemeny et al. (2012)	7	3	5	5	1
Luong et al. (2019)	8	3	4	4	1
O'Connor, 2020	9	3	5	5	1
Rodrigues de Oliveira et al. (2021)	9	3	6	6	1
Roeser et al. (2021)	8	3	5	5	1
Roeser et al. (2013)	7	3	5	5	1
Rupprecht et al. (2017)	9	3	5	4	1
Salas, 2018	9	3	4	4	1
Shanbour (2019)	7	3	4	3	1
Song et al. (2020)	8	3	4	3	1
Tarrasch et al. (2020)	8	3	4	3	1
Taylor et al. (2016)	7	3	3	4	1
Van Doren & Roeser, 2021 (Study 1)	8	3	5	5	1
Van Doren & Roeser, 2021 (Study 2)	8	3	5	5	1
Varona, 2019	8	3	4	5	1

experiences, allowing them to be more adaptive towards negative experiences and be less emotionally exhausted. Similarly, it was suggested that changes in mindfulness may precede and/or mediate changes in stress levels, as the participants were able to disengage from unproductive thoughts and direct attention towards creating adaptive responses towards stress (Baer et al., 2012; Gawrysiak et al., 2018; Shapiro et al., 2011). Further, Roeser et al. (2013) reported that mindfulness and self-compassion—a skill often practised in MBIs—have been found to mediate the influence of MBIs on reducing stress and burnout. Taken together, these studies indicate that higher levels of mindfulness may play a role in eliciting positive outcomes for teachers following MBIs.

4.4. Fidelity

The current findings concur with Kechter et al. (2019), that MBI studies do not typically report fidelity. Of the 39 identified studies, 16 reported fidelity assessments in three domains. Among the five domains of fidelity in the Treatment Fidelity Tool for MBIs, design was reported across all studies followed by training ($n = 31$), receipt ($n = 28$), and enactment ($n = 18$), with delivery ($n = 11$) being the least reported. Although studies assessed intervention, dosage, facilitator training, participant engagement and compliance, most studies did not ensure, or did not report, that the facilitators adhered to the intended manual or protocol in delivering the interventions. Many studies did require participants to complete homework or apply the taught skills outside of the training sessions. Nevertheless, studies reported varying adherence to home practices, with a group of teachers reporting that they only sometimes completed homework (Carroll et al., 2021) and other groups reporting between 50 and 80% adherence to the required dosage—albeit positive MBI outcomes (Guss, 2020; Roeser et al., 2013, 2021; Rupprecht et al., 2017). This result is similar to other work investigating the benefits of mindfulness home-practices, which found 60% of adherence with small to moderate association between home practice and outcomes (Parsons et al., 2017).

Interestingly, regardless of the number of fidelity criteria reported, there seemed to be no relationship with the outcomes observed. Importantly, studies lacking in fidelity assessment open up possibilities for confounding variables to influence the reliability and validity of results (Carroll et al., 2007; Durlak & DuPre, 2008; Kechter et al., 2019).

4.5. Quality and bias

Although all identified studies fell in the *good* ($n = 30$) or *fair* ($n = 9$) range based on our assessment, there are several noteworthy concerns. Not all studies were randomised controlled trials (e.g., Ancona & Mendelson, 2014; Braun et al., 2020; Bull-Beddows, 2020; Crain et al., 2017; Czerwinski et al., 2021); some were quasi-experimental designs (e.g., Almaguer-Botero, 2020; Berkovich-Ohana et al., 2020; Beshai et al., 2016; Carroll et al., 2021; Cheng et al., 2021; Fabbro et al., 2020). Many of the studies did not describe the characteristics of participants who withdrew, although they often adjusted their calculations for attrition (e.g., Almaguer-Botero, 2020; Ancona & Mendelson, 2014; Berkovich-Ohana et al., 2020; Beshai et al., 2016; Braun et al., 2020). In all but one study (Rodrigues de Oliveira et al., 2021) neither the participants nor the facilitators were blinded to the intervention, as they were mostly informed about the study and their allocation into the intervention groups. That is, they fell short of randomisation and blinding of participants, facilitators and researchers, features well-known for improving research quality.

4.6. Limitations and directions for future research

Though the current review was thorough and detailed, there are several areas for future work. First, we concur with Baelen et al.'s (2023) standards for recommended implementation and reporting to ensure future reviews can reconcile findings across studies. Second, the

inclusion of yoga as a core component may present some contention. We followed Klingbeil and Renshaw (2018) who argued that if components are author-identified as mindfulness, they were taken to be MBIs. Despite yoga being described as contemplative practice it has been considered a core component in MBIs in other work (see Felver et al., 2023). Third, although most MBIs comprised multiple intervention components, no studies have investigated whether individual components have an additive effect or interact with one another. That is, future research could determine whether certain combinations of components could yield maximum improvements. Fourth, little is known about the preventive effects of MBIs for teachers, for example, future work could examine levels of internalizing symptomatology or associated cognitive risk factors (e.g., repetitive negative thinking) that are precursors to stress and burnout. Finally, given that most studies investigated the effects of MBIs for teachers within Western contexts, more research is needed to explore the efficacy of MBIs in non-Western contexts.

5. Conclusion

With the increasing rate of burnout, the need to address teacher stress is critical. Past systematic reviews have showed promise for MBIs and the current review has provided an update of empirical work and a robust examination of implementation fidelity. Our findings showed MBIs to be effective in reducing stress and burnout in teachers. The identified studies also indicated that teachers' mindfulness increased in line with reductions in stress and burnout and improvements in other psychological outcomes. This is the first review that we know of to use the Treatment Fidelity Tool for MBIs (Kechter et al., 2019) for studies with teachers. Although previous reviews have examined implementation fidelity (Feagans Gould et al., 2016) the tool provides an MBI-specific and comprehensive assessment. Nonetheless, the additional rigour did not reveal any differences in outcomes. However, given that Feagans Gould et al.'s review included studies with students and teachers and was completed in May 2014, the current review was able to identify a further 33 studies using MBIs for teachers.

In sum, our findings indicate the conceptual elements for effective MBIs for teachers are: (i) facilitators can be trained personnel or external providers, professional experts, or app-based self-administered programs; (ii) duration of 3.5 weeks and 18.5 contact hours (based on median); (iii) inclusion of 4–5 intervention components such as self-regulation, breathing, body scans, meditation, and psychoeducation; and (iv) evaluation of implementation fidelity is essential for results to have validity and integrity. Specifically, future tests of the efficacy of MBIs with teachers should report quality of delivery, acceptability, and responsiveness of participants towards the interventions, to enable a rigorous assessment of implementation fidelity. It is hoped that the current review provides the catalyst for this future research.

Author contributions

TH designed and executed the systematic review and wrote the first draft and assisted with revisions of the manuscript. **EE** collaborated with the design, advised on the execution of the review, and drafted further versions of the manuscript. **RW** collaborated with the design, conducted the searches and screening, and edited the final manuscript. **MC** collaborated with the design, advised on the execution of the review, and edited the final manuscript.

Declaration of competing interest

The authors declare that there is no conflict of interest.

Data availability

No data was used for the research described in the article.

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Appendix

Database searches

Search Date	Database	Search String	Explanation	Number Retrieved
November 14, 2021	ProQuest	((ti(mindfulness OR MBI OR "mindfulness-based intervention") OR ab(mindfulness OR MBI OR "mindfulness-based intervention")) AND (ti(teacher*) OR ab(teacher*))) AND la.exact("English")	Title and abstract for intervention (MBI or related terms) and population (teacher)	1170
November 14, 2021	APA PsycNET	(title: mindfulness OR title: MBI OR title: "mindfulness-based intervention" OR abstract: mindfulness OR abstract: MBI OR abstract: "mindfulness-based intervention") AND (title: teacher* OR abstract: teacher*)	Same as above	942
November 14, 2021	Scopus	TITLE-ABS ((mindfulness OR mbi OR "mindfulness-based intervention") AND (teacher*)) AND (LIMIT-TO (LANGUAGE, "English"))	Same as above	726
November 14, 2021	Web of Science	(TI=(mindfulness OR mbi OR "mindfulness-based intervention") OR AB=(mindfulness OR mbi OR "mindfulness-based intervention")) AND (TI=(teacher*) OR AB=(teacher*)) and English (Languages)	Same as above	636
November 14, 2021	PubMed	(("mindfulness"[Title/Abstract] OR "MBI"[Title/Abstract] OR "mindfulness-based intervention"[Title/Abstract]) AND "teacher*"[Title/Abstract]) AND (english[Filter])	Same as above	258

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