

# **Effectiveness of interventions on the stress management of schoolteachers - A systematic review and meta-analysis**

Netra Raj Paudel<sup>1</sup>, Bidhya Acharya Adhikari<sup>1</sup>, Prakash K.C. <sup>1,2,3</sup>, Saila Kyrönlahti<sup>1,4</sup>, Clas-Håkan Nygård<sup>1,4</sup>, Subas Neupane<sup>1,4, 5</sup>

<sup>1</sup>Unit of Health Sciences, Faculty of Social Sciences, Tampere University, Tampere, Finland

<sup>2</sup>Department of Public Health, University of Turku, Turku, Finland

<sup>3</sup>Department of Psychology, Stress Research Institute, Stockholm University, Sweden

<sup>4</sup>Gerontology Research Center, Tampere University, Finland

<sup>5</sup>Tampere University Hospital, Tampere, Finland

## **Corresponding author:**

Netra Raj Paudel

Unit of Health Sciences, Faculty of Social Sciences

FI-33104 Tampere University, Tampere, Finland

Tel: +358 46 6201686

e-mail: [netra.paudel@tuni.fi](mailto:netra.paudel@tuni.fi)

**PROSPERO registration:** CRD42021225098

## **Word count:**

Abstract: 239

Main text: 4442 (without box, tables, figures and the references)

## **Tables and figures:**

Number of Tables: 2

Number of Figures: 3

Supplementary files: 4

## **Key message**

### **What is already known about this subject?**

- Teaching profession is one of the most stressful jobs with a high level of psychological morbidity.
- Stress may occur together with mental health problems, such as common mental disorder, which is one of the leading causes of disability worldwide.
- Several interventions have been designed to help schoolteachers cope with the stress associated with their job.

### **What are the new findings?**

- A positive effect of interventions was found among teachers to manage their stress level.
- Cognitive behavioural therapy had the strongest positive effect followed by meditation among the types of interventions studied to manage teachers' stress levels.
- We found evidence of a moderate quality for the interventions aiming to reduce the stress level of schoolteachers.

### **How might this impact on policy or clinical practice in the foreseeable future?**

- Through effective intervention tools, workplace health can be enhanced, and the individual wellbeing of schoolteachers maintained.

## **Abstract**

**Background:** This systematic review aimed to analyze the effectiveness of interventions on the stress management of schoolteachers.

**Methods:** We searched the Medline, Psyc-INFO, CINAHL and Education Research Complete until November 30, 2021, to identify relevant studies using relevant key words. Job or occupational stress was used as the outcome measure. Stress was defined as perceived stress (PSS), teacher stress inventory (TSI), Maslach Burnout Inventory (MBI), teacher's distress, brief symptoms inventory (BSI), or global severity index (GSI). Study selection, data extraction, risk of bias assessment was performed by two independent reviewers. The pooled estimate of the effect by the type of outcome measurement tool and by type of interventions used was calculated using random effects meta-analysis. We used Grades of Recommendations, Assessment, Development and Evaluation (GRADE) to assess the overall quality of the evidence.

**Results:** We reviewed 26 studies, of which 24 were randomized trials and 2 pre-test/post-test studies. Based on meta-analysis, a positive effect of intervention (pooled estimate -1.13, 95% CI -1.52 to -0.73) with high heterogeneity among studies ( $\text{Chi}^2=426.88$ ,  $P<0.001$ ,  $I^2=94\%$ ) was found by type of interventions used. Cognitive behavioural therapy had the strongest positive effect, followed by meditation among the types of interventions studied. We identified evidence of a moderate quality for interventions aiming to manage the stress level of schoolteachers.

**Conclusions:** The meta-analysis showed a positive effect of interventions, suggesting that interventions might reduce the stress level among teachers. The quality of the evidence was moderate.

## **Introduction**

Stress is the feeling of being overwhelmed or unable to cope with mental or emotional pressure which can happen together with mental health problems, such as depression [1]. Depression is one of the leading causes of disability worldwide: approximately 264 million people of all ages suffer from depression globally [2]. In 2019, depressive disorders were the sixth leading contributor for disability adjusted life years (DALYs) among 25-49-year-olds [3].

Occupational stress is the most common form of stress, and the degree of stress varies among different occupations. A study from the UK [4] found that teaching was one of the most stressful occupations, because of its direct human-oriented nature [4, 5]. The afore-mentioned study measured stress in terms of physical health, psychological wellbeing and job satisfaction. Likewise, a follow-up study in West England reported a higher level of psychological distress among a cohort of teachers than among comparable professionals from the general population [6].

Teaching is an occupation with high work demands and it requires a diverse range of tasks under complex working conditions, dealing with students, school authorities, colleagues, and parents [4]. Potential stressors for teachers are low job support, student apathy, overcrowded and noisy working environments, excessive paperwork, low wages, unsupportive parents and changing curricula [7]. Stress can be suppressive and hinder thought processes and somatic stimuli [8]. It is characterized by physical and psychological exhaustion, depersonalization and cynicism, a sense of helplessness and low self-efficacy [6, 9]. Lacking management of chronic workplace stress may result in Burnout syndrome. Prolonged stress becomes permanent, over time, because it is hard to recover and as a result, the individual faces chronic fatigue, musculoskeletal problems or CVD and professional burnout syndrome [10].

Previous studies have recommended stress management and coping strategy interventions to reduce and prevent stress among teachers [11-13]. Such interventions include a variety of approaches like mindfulness training [14] cultivating awareness and resilience [13], standardized meditation [15], and gratitude interventions [11].

Although several interventions have been designed to help schoolteachers cope with the stress associated with their profession, the evidence based on a systematic examination and synthesis

is limited. Each intervention represents a distinctive strategy to cope with stress, providing plentiful prospects to compare the strategies used for stress management among schoolteachers. Such comparisons could be helpful in investigating key strengths of the interventions in terms of effectiveness, delivery method and design. Further, determining the most effective intervention strategies and content could be helpful in planning new strategies or improving existing delivery methods and strategies aimed at helping schoolteachers cope with and manage occupational stress. Therefore, the main aim of this systematic review is to examine the effectiveness of interventions targeted at schoolteachers' stress management.

## **Methods**

The study protocol was registered in the international Prospective Register of Systematic Reviews (PROSPERO) with the registration number CRD42021225098 [16]. This study was performed in accordance with the criteria of the Preferred Reporting for Systematic Reviews and Meta-Analysis (PRISMA) statement [17].

### **Search strategy**

We conducted a systematic literature search to identify the relevant studies on interventions for schoolteachers' stress management. The literature search was undertaken on the following electronic databases: Medline, Psyc-INFO, CINAHL and Education Research Complete. The search strategy includes a comprehensive list of key terms and combinations of Medical Subject Headings (MeSH) describing the outcome and the interventions. The search was limited to English-language publications. No limit in year of publication was used to capture all /eligible past and contemporary work environment interventions. We also searched the bibliographies of the included studies to find relevant studies potentially missed in the systematic search. The search strategy was modified for each electronic database (Supplementary file 1).

### **Selection of studies**

We selected literature that have studied the effect of interventions on schoolteachers' stress management. The following inclusion criteria were applied: a) randomised control trials, controlled trials, quasi experimental or pre-test/post-test studies, b) literature published until 30<sup>th</sup> November, 2021, c) studies conducted among school (primary or secondary) teachers, d) interventions provided for stress management or to reduce teachers' stress levels, e) interventions provided during/after school hour and f) studies including perceived stress, job stress, occupational stress or burn out as outcome. We excluded studies, if the intervention was delivered by teachers, not to teachers.

All citations were exported to RefWorks software and duplicates removed. Two reviewers (NRP and BAA) independently screened each study title and abstract for their eligibility. In case of disagreement between reviewers, a third reviewer (SN) was consulted. The same two reviewers assessed the full texts of all the selected studies for their eligibility. The third reviewer was consulted to resolve any disagreements during the study selection process.

## Outcome measure

The included studies used various definitions of stress, summarized below in Box 1.

**Box 1:** Definition of the outcomes used.

Name of the tool	Definition/Items	Final score
Perceived stress scale (PSS)	4-14 items on perceived stress, each measured in a 5-point scale: 0 (never) to 4 (very often).	Total score, where higher scores indicate increased levels of stress.
Teacher stress inventory (TSI) [18]	10 factors comprising the construct of teacher's stress (5 factors represent the sources of stress and another 5 factors represent the manifestations of stress) and composed of 49 items, each item measured on a 5-point Likert scale.	The total score on a continuum determines the stress level of teacher.
Maslach burnout inventory (MBI) [19]	22-item from three subscales (Emotional Exhaustion (EE), Personal Accomplishment (PA) and Depersonalization (D)) were used to define stress/burnout. Each sub-scale measured on a scale of 0-6: 0 (never) to 6 (every day).	Higher scores on EE and D and low levels of PA subscale indicate a higher amount of the construct.
Subjective distress	"How much do you perceive stress at work?" on a scale of 1-10:1 (not at all) to 10 (very strongly).	1-10, higher score indicates more distress.
Brief symptoms inventory (BSI) [20]	Comprising 53 distress symptoms rated on a 5-point scale regarding frequency of experience in the past week. Three subscales, emotional exhaustion, personal accomplishment and depersonalization indicate stress, measured on a scale of 0-4.	Higher scores indicate distress (range 0-4).
Global severity index (GSI)	GSI quantifies the severity-of overall psychological distress level and provides a single composite score derived from the average of 90 items. The severity score was defined on a scale of 0 (never) to 4 (always).	Higher scores on the GSI indicate greater psychological distress.

## Data extraction

Data was extracted from all the included studies using customized form. Two reviewers (NRP and BAA) independently extracted data from each individual study on research characteristics (authors, year of publication, country of origin), study population (sample size, age and gender distribution), intervention and comparison (type of intervention used, procedure, controls), follow-up time, outcome (definition, methods/tool used), study results (number of participants

analyzed, mean value and standard deviation of the outcome at baseline and follow-ups for intervention and controls), and the effect measure (if the intervention effect was positive or negative). Discrepancies were resolved through discussion with the third reviewer (SN).

### **Quality assessment**

We used the Cochrane Handbook [21] recommendation for systematic reviews of intervention of randomized control studies to assess the quality (risk of bias) of the included studies. Two reviewers (NRP and BAA) independently assessed the studies. The risk of bias was assessed for six major domains: selection bias, performance bias, detection bias, attrition bias, reporting bias and other bias. Each domain contains one or more items: a) random sequence generation, b) allocation concealment, c) group similarity at baseline, d) blinding of outcome, e) timing of outcome assessments, f) outcome data complete, g) free of selective reporting, h) co-interventions avoided, i) compliance acceptable, and j) intention to treat (ITT) performed. Each item was assessed as high, low or unclear risk. The risk of bias associated with ITT analysis was assessed as high if >20% loss to follow-up occurred with no ITT analysis present [22]. Studies were classified as overall low risk of bias if all items were rated as low risk of bias according to the Cochrane Handbook recommendation.

Two of the included studies were non-randomized which comprised only pre-test and post-test measurement; therefore, we used ROBINS-I [23] tool to assess the risk of bias in non-randomized intervention studies. ROBINS-I includes domains dealing with pre-intervention, at intervention and post-intervention in seven items (pre-intervention: bias due to confounding, bias in selection of participants into the study; at intervention: bias in classification of interventions; post-intervention: bias due to deviations from intended interventions, bias due to missing data, bias in measurement of outcomes and bias in selection of the reported results). Each of these seven items were rated as low, moderate, serious, critical risk of bias or no information. Overall risk of bias was classified as low, if all seven items were rated as low, and otherwise as high risk [23].

### **Data synthesis**

A meta-analysis was conducted to pool the results from the included studies using Review Manager 5.3 developed by the Cochrane Community. Studies used different questions to measure the stress outcome, however, most studies reported stress as an outcome with mean values and standard deviation (SD) from the baseline (pre-test) and one or more follow-ups (post-test). Included in the meta-analysis are studies reporting mean, SD or standard error (SE)



and sample size for both the intervention and control from the last round of follow-up, and studies reporting changes in mean and SD from baseline to follow-up. The pooled mean difference (intervention minus control) and their 95% confidence intervals (CIs) are reported as an overall synthesized measure of effect size using random effect models. Heterogeneity (0-100%) among studies was assessed via Chi<sup>2</sup> test indicating heterogeneity when  $P < 0.05$ . We first synthesized the effect size from all studies included in the meta-analysis, grouped by type of tool used to measure teachers' stress, then by type of intervention used. As a sensitivity analysis, we analyzed studies among special education teachers separately. To see the long-term effectiveness of the intervention, we analyzed studies stratified by time of follow-up (1-4 months vs 5-12 months). We separately synthesized the effect size of two studies using only pre-test and post-test with no comparison group. The results are presented as a forest plot. Publication bias was determined using funnel plots.

### **Evidence synthesis**

We used the Cochrane Handbook Grading of Recommendations Assessment, Development & Evaluation (GRADE) [24] to synthesize the quality of evidence. Evidence quality was assessed in relation to study design, risk of bias or study limitations, consistency of results, indirectness, precision, and publication bias [25]. Four authors (SN, NRP, BAA and PKC) undertook the GRADE process with consensus reached by discussion.

Starting level of evidence was high for randomized studies. We then downgraded the quality of evidence for the above six criteria. An overall level of evidence was assessed for each study in four ratings: a) high quality - further research is very unlikely to change our confidence in the estimate of effect or accuracy; b) moderate quality - further research is likely to have an important impact on our confidence in the estimate of effect or accuracy and may change the estimate; c) low quality - further research is very likely to have an important impact on our confidence in the estimate of effect or accuracy and is likely to change the estimate; d) very low quality - any estimate of effect or accuracy is very uncertain. Accordingly, for two non-randomized studies a low grade was given as the starting level and was upgraded due to the quality of evidence for the above six criteria.

## **Results**

### **Literature search**

The initial search of literature through Medline, Psyc-INFO, CINAHL and Education Research Complete generated 4898 records (Figure 1). After removing duplicates, the titles and abstracts of 4896 records were screened for eligibility. Full text assessment of 123 records was performed. In total, 26 studies (27 articles) met the inclusion criteria and were included in this review. Two studies [13, 26] were regarded as one in the analysis because they involved the same study population, resulting in 26 studies. Out of these, 24 studies were randomized controlled trials and two studies [11, 27] were pre-test and post-test studies. Six of the studies were conducted among special education teachers (Supplementary Table 2). A detailed study selection process is summarized in Figure 1.

### **Study characteristics**

Four studies were conducted in the UK [14, 27-29], seven studies were from the USA [12, 13, 15, 30-33], four from Hong Kong [11, 34-36], four studies from Nigeria [37-40]. Others were from Spain [41], Australia [42], Netherlands [43], Japan [44], India [45], Germany [46] and Poland [47]. These studies were published between 1999 and 2021. The details of the data extraction are provided in supplementary Table 2. Population size in these studies ranged from 18 [12] to 337 participants [46]. Six studies were conducted among special education teachers [33, 37-40], majority conducted in Nigeria. Overall, the study sample was primary-to-secondary-level teachers, or teachers of students with behavioral problems or disabilities (e.g., autism) recruited from public or private schools. One study also included other staff than teachers [33]. Participants were invited through emails, posters, local conferences, and courses offered as stress prevention for teachers, etc. Some studies used a convenience sample, as the target population was not clear in those studies. The randomization was done at school or at individual level. All studies involved both male and female teachers, except the one [45] conducted among female teachers only. The age range of the teachers in the included studies was between 22 to 64 years, except for one [14], where age was not reported.

Nine studies utilized meditation as an intervention. Meditation training may vary in its activity and amount of training recommended, depending upon its purpose. Basic meditation mantra, however, is meant to focus the mind through breathing observation [48]. The most frequently used meditation techniques in literature were Mindfulness-Based Stress Reduction (MBSR), Mindfulness in Schools Project (MiSP), Stress Management and Relaxation

Techniques (SMART), Cultivating Awareness and Resilience in Education (CARE), Mindfulness-Based Emotional Balance (MBEB). Other nine studies used cognitive behavioral therapy, which includes elements such as awareness of stress, relaxation training, identification of dysfunctional thoughts, cognitive restructuring, problem solving process training, anger and time management [49]. Other interventions were Written emotional disclosure (WED) interventions [29], Workplace Triple Positive parenting program and telephone consultation [42], Teacher Classroom Management workshops [30], Teacher-focused coaching intervention (Key2Teach intervention) [43], group session [43], and stress management workshop [47]. The two pre-test/post-test studies involved a Gratitude intervention [11] and teacher classroom management (TCM) training [28]. The last follow-up time reported in studies varies between 1 month [45, 47] and 12 months [11].

Eight of the included studies used Maslach Burnout Inventory tool to measure the teacher's stress, seven used perceived stress scale, three used global severity index and nine studies used other tools (teacher's stress inventory (TSI), Positive Symptoms of Distress Index (PSDI), Teacher Occupational Stress Factor Questionnaire (TOSFQ), Subjective psychological distress, and Depression, Anxiety and Stress Scale). Three studies [12, 15, 41] used two different tools to measure the teacher's stress. Twenty-five studies reported the positive effect of the intervention of reducing the teachers' stress levels, while one [30] reported negative effects.

### **Meta-analysis**

The pooled estimates of intervention effect on teacher's stress were calculated and are presented by the type of stress measurement tool used (Supplementary Figure 1). A total of 2657 subjects were analysed. A positive effect of intervention (overall pooled mean difference -1.09, 95% CI -1.46 to -0.73) with high heterogeneity in the effect size ( $\text{Chi}^2=436.20$ ,  $P<0.001$ ;  $I^2=94\%$ ) was found. The pooled standard mean difference between intervention and control for studies that used MBI, PSS or other tools was positive (favouring intervention), while also positive effect but not statistically significant for studies using GSI.

A pooled estimate from the two studies with no control group (Figure 2) showed small positive effects of the intervention from pre-test to post-test. However, the estimate was not statistically significant.

The standard mean differences of the intervention and control by the type of intervention used are presented in Figure 3. Among 2272 subjects studied, the overall pooled estimate shows

positive effect of intervention (pooled estimate -1.13, 95% CI -1.52 to -0.73) with high heterogeneity among studies ( $\text{Chi}^2=426.88$ ,  $P<0.001$ ,  $I^2=94\%$ ). The pooled estimate from nine studies shows a strong positive effect of meditation interventions on stress management (pooled estimate -1.09, 95% CI -1.60 to -0.59) with very high heterogeneity between the studies ( $\text{Chi}^2=70.05$ ,  $P<0.001$ ,  $I^2=87\%$ ). A strong positive effect of cognitive behavioural therapy (CBT) was also found in the pooled estimate of nine studies (standard mean difference -2.34, 95% CI -3.32 to -1.35) with high heterogeneity between studies ( $\text{Chi}^2=294.74$ ,  $P<0.001$ ,  $I^2=97\%$ ). Six studies used other types of intervention with small positive effects, but the estimate was not statistically significant.

The meta-analysis of the studies among special education teachers (Supplementary Figure 2) shows strong positive effect of intervention (standard mean difference -4.55, 95% CI -6.59 to -2.50) with high heterogeneity between studies ( $\text{Chi}^2=153.69$ ,  $P<0.001$ ,  $I^2=97\%$ ). Further sensitivity analysis by the length of follow-up time shows pooled estimate of -1.58 (95% CI -2.18 to -0.99) among studies with short (1-4 months) follow-up (Supplementary Figure 3). Small positive effects but statistically no significant pooled estimate was found for the long follow-up studies.

Funnel plot (Supplementary Figure 4) shows the risk of publication bias of the included randomized studies by type of interventions used. Standard mean difference is presented in x-axis and standard error of the mean difference in y-axis. The results show that the mean difference was both positive and negative, meaning that the studies had a mixed effect, suggesting a low risk of publication bias.

### **Risk of Bias**

Risk of bias was assessed as low, high or unclear. The summary of the risk of bias assessment is presented in Table 1a-b. Four studies [30, 37, 40, 42] had low risk of bias in ten items while three other studies [13, 39, 44] had low risk of bias in nine items. Other studies had up to three items rated as high risk. Overall, the risk of bias ratings was low in many studies. Whether the study had an 'intention to treat' analysis performed, was the most common item rated 'unclear' as many studies did not report it. Random sequence generation was rated as 'high' risk in eight and allocation concealment in seven studies, respectively. These studies were mostly lacking clear information on population selection or due to inadequate generation of randomised sequence and inadequate concealment of allocations prior to assignments in one of the study groups.

## **Quality of the evidence**

We evaluated the quality of evidence of the studies by the type of intervention used (Table 2). We used integrative GRADE criteria to assess the quality of evidence considering six criteria: study design, risk of bias or study limitations, consistency of results, indirectness, precision, and publication bias. For nine studies (n=635) using meditation interventions, a moderate quality of evidence was assessed. We started with a high grade as a starting point and downgraded it by one step due to high risk of bias in five out of ten studies. No down- or upgrade was considered due to inconsistency, indirectness, imprecision, or publication bias, as there was no difference in outcome measures in studies, the pooled effect estimate was precise (although the effect estimates of each individual study varied but still all had positive effect), and no publication bias was detected. Similarly, the quality of evidence for other nine studies (n=946) using a CBT intervention was rated as moderate. A one-step downgrade was considered due to high risk of bias, but no further downgrade due to inconsistency, indirectness, imprecision, or publication bias. The effect size based on meta-analysis had a strong positive effect with huge variation between studies. For studies with other types of intervention, including two non-randomized studies, the quality of evidence was rated as low. A one-step downgrade was considered due to serious risk of bias in four studies and another step was downgraded due to inconsistencies and indirectness of the effect estimates, as the pooled effect was small and inconsistent.

## Discussion

This systematic review evaluated the available evidence for interventions designed to reduce schoolteachers' stress levels. Twenty-six studies (27 articles) met our inclusion criteria, of which 24 were randomized controlled trials and two were pre-test/post-test studies, and six out of 26 were conducted among special education teachers. Overall, meta-analysis shows that the interventions are effective in reducing the stress level of schoolteachers with meditation (nine studies) and CBT (nine studies) being more effective than other types (eight studies) of interventions. We found moderate quality of evidence for meditation and CBT interventions, whereas low quality of evidence was found for other interventions to reduce teachers' stress. The follow-up from baseline to post-intervention in the included studies varied between one month to 12 months and studies with shorter follow-up were found more effective in reducing teachers' stress.

Earlier, a Cochrane review evaluating organizational intervention effectiveness in reducing work-related stress in teachers found low-quality evidence of the interventions leading to improvement in teacher wellbeing [50] based on four studies. We found no other systematic review evaluating the effectiveness of interventions for reducing teacher's stress. Two non-systematic reviews of interventions for teacher wellbeing suggested self-directed interventions [51]. All the included studies in our review used individual-focused interventions.

Various types of interventions have been in practice for the last few decades to reduce teachers' stress. Overall, ten different types of intervention were used in these studies. Meditation is one of the most effective interventions in producing wellbeing and reducing teachers' stress [12, 14, 15]. These studies show that even in a short duration (2-5 times /week) of meditation practice, teachers became more relaxed, organized, and gained a greater sense of emotional balance and confidence. However, the intervention seems to be less effective in a long follow-up. Teachers were less worried, had improved sleep, and realized their increased capacity for dealing with problems. Yet, the willingness of participants is a determining factor for the achievement of mediation [15]. This obviously indicates that meditation produces positivity in a person and, in turn, reduces stress. This argument is consistent with other earlier studies, which found that mindfulness meditation is effective in teachers' occupational stress management [52] and enhancing their wellbeing [14]. Moreover, mental health and wellbeing of teachers were reported to be positively affected in the studies that used multicomponent interventions [53]. Meditation reduces personal distress such as depression, anxiety, hostility,

interpersonal sensibility, and promotes wellbeing [41]. Another study reported that mindfulness meditation reduces stress and enhances wellbeing and sleep quality but does not improve workability [54].

Interventions integrating individually directed behavioural and cognitive approaches have become popular [55]. These cognitive-behavioural approaches integrate stress appraisal with physiological stress reduction [56]. In schools, this approach may be particularly effective due to the multifaceted nature of teacher stress. A significant amount of teacher stress arises from teachers' cognitive perception of student behaviour and difficulty with classroom management [57]. Nine of the included studies employed CBT intervention in teachers' stress management. The authors of these studies claimed that the conducted training enhanced coping skills, and reduced stress and stressors that teachers were facing. A similar finding was reported in a previous study which stated that teachers experienced reducing dysfunctional thoughts and enhanced stress management behaviours [58]. However, paradoxically, three studies [34, 35, 44] also stated that CBT did not improve mental and physical wellbeing or teaching efficacy. Because teaching is one of the more stressful occupations, several technical measures at individual and organizational levels should be considered, in order to reduce teachers' stress and improve their job satisfaction and wellbeing [50, 47].

Likewise, studies employing Gratitude Interventions (GI) as a stress reducing technique found it effective on occupational stress. Gratitude training gave effective results in promoting teacher wellbeing and life satisfaction and mitigating teacher burnout [11]. The authors highlighted that for those who favoured and valued a meaningful life and happiness, the intervention resulted in reducing stress, and vice versa. This finding corresponds to the findings of a previous study [59], which reported that a GI program was effective for improving psychological distress and job performance among workers.

All the included studies employed individual-directed interventions, which means that no studies using organization-directed interventions were found. Studies with a meditation or mindfulness intervention were conducted in the USA (7 studies), UK, Spain, Hong Kong and India with no studies identified from Africa and Latin America which may further limit the applicability of the evidence. Studies that employed CBT were from Nigeria (4 studies), Hong Kong (2 studies) and Japan only, which means that studies from other than Asian and African regions were not found. All four African studies were from Nigeria and all were conducted using a similar approach among special education teachers. These studies from Nigeria found

huge, unusual reduction in the mean level of stress among those who received an intervention. Studies that utilized other types of interventions were mostly from Europe (UK, Netherlands, Germany, Poland) and one study from Australia. Two studies, Haslam et al. [42], and Hayes et al. [30], were well-conducted trials with low risk of bias in all domains and provided clear justification for the choice of study design and had adequate sample sizes. Haslam et al. [42] employed a ‘workplace triple positive parenting program’ as their main intervention technique which focused on parents who are better able to predict and manage work-family conflict. Moreover, a second set of mindfulness techniques for stress prevention and management, such as identifying and challenging unhelpful thoughts, progressive muscle relaxation, diaphragmatic breathing, diet guidance and exercise tips, were also provided. This study found positive effects of the intervention at four months of the follow-up period. Hayes et al. [30] found negative effects of an intervention in stress management at 9 months follow-up (2 months after the intervention ended). A teacher’s classroom management workshop was provided to teachers in Hayes et al. [30] as the intervention.

We included randomized controlled studies and pre- and post-test studies published in English language only, which probably means that we missed studies published in other languages. Randomized controlled design is considered as a golden standard to study the effectiveness of interventions as well as highly regarded in systematic reviews over other designs [60]. Further limitations that may limit the generalizability of our findings is the use of different tools and interventions, as well as the high female domination among the study subjects. A short duration of follow-up in some of the studies may have affected the outcome which we have analysed stratified by follow-up time. The heterogeneity of the tools used to measure the stress of teachers was one of the challenges to undertake the meta-analysis. Various tools such as PSS, TSI, MBI, or teacher’s distress, BSI, GSI etc. were used to measure the stress in different studies. Although these are well-established and validated tools, the number of items used, the measurement scale of each item, as well as total scores, differed between studies. Nevertheless, we undertook meta-analysis stratified by types of tools used to see the separate pooled effects of the studies using different tools. We compared all studies that used randomized controlled design to assess the risk of publication bias and ascertain direction of results. The direction of results was mixed, many with positive effect, and some with negative effect which suggests a low risk of publication bias. We utilized structural groupings in our main results by types of intervention versus no interventions by study group to study which interventions are more effective in reducing stress. Grouping



studies in another way is also possible. The variation of tools used to measure stress across studies may influence the study findings. Furthermore, the effectiveness of interventions may differ between teachers with low stress-levels compared with teachers with high stress which we could not separate out in this study which would probably require methodologically stricter criteria in recruiting studies. This may limit the generalizability of the results for a specifically defined group of teachers.

In conclusion, we found moderate quality of evidence for meditation (e.g., mindfulness, mind relaxation, etc.) interventions and CBT interventions, and low quality of evidence for other intervention types to reduce teachers' stress. Further studies focusing on a larger sample size and wider population of teachers, a longer follow up, a larger variety of demographic backgrounds, and the counterweight of confounding variables are recommended for stronger evidence.

**Contributors:**

Concept and design: SN, NRP. Acquisition, analysis or interpretation of data: NRP, BAA, SN, PKC. Drafting of the manuscript: NRP, BAA, PKC, SN. Critical revision of the manuscript: SN, SK, CHN, PKC. Statistical analysis: SN. Administrative, technical or material support: SN, CHN. Supervision: SN, CHN.

**FUNDING:** This work was supported by Juho Vainio Foundation Finland (grant number: 202100245 to KCP). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

**Competing interests:**

None declared

## References

1. Mental Health Foundation. Good mental health for all. “Stress- What is stress?” 2021 Available at <https://www.mentalhealth.org.uk/a-to-z/s/stress> 2021.
2. World Health Organization (WHO) Depression, Key facts. 2020 Available at <https://www.who.int/news-room/fact-sheets/detail/depression> 2020
3. GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet* 2020. doi:10.1016/S0140-6736(20)30925-9.
4. Johnson S, Cooper C, Cartwright S, et al. The experience of work-related stress across occupations. *Journal of Managerial Psychology* 2005; 20:178–187.
5. Maslach C, Leiter MP. Teacher burnout: A research agenda. In R. Vandenberghe & A. M. Huberman (Eds.), *Understanding and preventing teacher burnout: A sourcebook of international research and practice*. New York, NY: Cambridge University Press. 1999; 295–303.
6. Titheradge D, Hayes R, Longdon B, et al. Psychological distress among primary school teachers: a comparison with clinical and population samples. *Public Health* 2019; 166:53-56. doi: 10.1016/j.puhe.2018.09.022
7. Bernotaite L, Malinauskiene V. Workplace bullying and mental health among teachers in relation to psychosocial job characteristics and burnout. *Int J Occup Med Environ Health* 2017;30(4):629-640. doi: 10.13075/ijom.1896.00943.
8. Abramowitz J S, Tolin DF, Street GP. Paradoxical effects of thought suppression: A meta-analysis of controlled studies. *Clinical Psychology Review* 2001;21: 683–703.
9. Zysberg L, Orenshtein C, Gimmon E, et al. Emotional intelligence, personality, stress, and burnout amo 2017
10. Ahola K, Salminen S, Toppinen-Tanner S, et al. Occupational burnout and severe injuries: An eight-year prospective cohort study among Finnish forest industry workers. *Journal of Occupational Health* 2013;13: 0–21.
11. Chan DW. Burnout and life satisfaction: Does gratitude intervention make a difference among Chinese school teachers in Hong Kong? *Educational Psychology* 2011;31(7):809-823.
12. Flook L, Goldberg SB, Pinger L, et al. Mindfulness for teachers: A pilot study to assess effects on stress, burnout, and teaching efficacy. *Journal compilation internationa mind, brain, and education society and Blackwell publishi8ng* 2013;7(3): 182-195.

13. Jennings PA, Doyle S, Oh Y, et al. Long-term impacts of the CARE program on teachers' self-reported social and emotional competence and wellbeing. *Journal of School Psychology* 2019; 76:186–202.
14. Beshai S, McAlpine L, Weare K, et al. A non-randomised feasibility trial assessing the efficacy of a mindfulness-based intervention for teachers to reduce stress and improve wellbeing. *Mindfulness* 2016;7(1):198-208.
15. Anderson VL, Levinson EM, Barker W, et al. The effects of meditation on teacher perceived occupational stress, state and trait anxiety, and burnout. *School Psychology Quarterly* 1999;14(1):3.
16. Neupane S, Paudel NR, Acharya Adhikari B, et al. The effectiveness of interventions on the stress management of school- teachers: A systematic review and meta-analysis. PROSPERO 2021 CRD42021225098 Available from: [https://www.crd.york.ac.uk/prospERO/display\\_record.php?ID=CRD42021225098](https://www.crd.york.ac.uk/prospERO/display_record.php?ID=CRD42021225098)
17. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med.* 2009;6(7):e1000097.
18. Fimian, M. J. (1988). *The Teacher Stress Inventory Test Manual*, Clinical Psychology Publishing Co., Brandon, VT.
19. Maslach C, Jackson SE, Leiter MP. *Maslach Burnout Inventory* (3rd ed.). Palo Alto, CA: Consulting Psychologists Press. 1996
20. Derogatis LR. *Brief symptom inventory: Administration, scoring and procedures manual* 1993
21. Higgins JP, Green S. *Cochrane handbook for systematic reviews of interventions*: John Wiley & Sons 2011.
22. Fewtrell MS, Kennedy K, Singhal A, Martin RM, Ness A, Hadders-Algra M et al. How much loss to follow-up is acceptable in long-term randomised trials and prospective studies? *Arch Dis Child* 2008 Jun;93(6):458–61.
23. Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, Henry D, Altman DG, Ansari MT, Boutron I, Carpenter JR. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ.* 2016 Oct 12;355.
24. Guyatt GH, Oxman AD, Vist GE, et al.; GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ.* 2008;336(7650):924–6. [doi.org/10.1136/bmj.39489.470347.AD](https://doi.org/10.1136/bmj.39489.470347.AD).

25. Guyatt G, Oxman AD, Akl EA, et al. GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol* 2011;64(4):383–94. [doi.org/10.1016/j.jclinepi.2010.04.026](https://doi.org/10.1016/j.jclinepi.2010.04.026).
26. Jennings, P. A., Brown, J. L., Frank, J. L., Doyle, S., Oh, Y., Davis, R., ... & Greenberg, M. T. (2017). Impacts of the CARE for Teachers program on teachers' social and emotional competence and classroom interactions. *Journal of Educational Psychology*, 109(7), 1010.
27. Marlow R, Hansford L, Edwards V, et al. Teaching classroom management—a potential public health intervention. *Health Education* 2015.
28. Ashley L, O'Connor DB, Jones F. A randomized trial of written emotional disclosure interventions in school teachers: Controlling for positive expectancies and effects on health and job satisfaction. *Psychology, health & medicine* 2013;18(5):588–600.
29. Hayes R, Titheradge D, Allen K, et al. The Incredible Years® Teacher Classroom Management programme and its impact on teachers' professional self-efficacy, work-related stress, and general well-being: Results from the STARS randomized controlled trial. *British Journal of Educational Psychology* 2020;90(2):330–348.
30. Roeser RW, Mashburn AJ, Skinner EA, et al. Mindfulness training improves middle school teachers' occupational health, wellbeing, and interactions with students in their most stressful classrooms. *Journal of Educational Psychology* 2021.
31. Benn R, Akiva T, Arel S, et al. Mindfulness training effects for parents and educators of children with special needs. *Developmental psychology* 2012;48(5):1476.
32. Sharp Donahoo LM, Siegrist B, Garrett-Wright D. Addressing compassion fatigue and stress of special education teachers and professional staff using mindfulness and prayer. *The Journal of School Nursing*, 2018;34(6): 442-448.
33. Jennings PA, Frank JL, Snowberg KE, et al. Improving classroom learning environments by Cultivating Awareness and Resilience in Education (CARE): results of a randomized controlled trial. *School Psychology Quarterly* 2013;28(4):374–390.
34. Au DW, Tsang HW, Lee JL, et al. Psychosomatic and physical responses to a multi-component stress management program among teaching professionals: A randomized study of cognitive behavioral intervention (CB) with complementary and alternative medicine (CAM) approach. *Behaviour research and therapy* 2016; 80:10–16.
35. Tsang HW, Cheung WM, Chan AH, et al. A pilot evaluation on a stress management programme using a combined approach of cognitive behavioural therapy (CBT) and

complementary and alternative medicine (CAM) for elementary school teachers. *Stress and Health* 2015; 31(1):35–43.

36. Tsang KKY, Shum KKM, Chan WWL, et al. Effectiveness and Mechanisms of Mindfulness Training for School Teachers in Difficult Times: A Randomized Controlled Trial. *Mindfulness* 2021;12(11):2820-2831.
37. Akanaeme IN, Ekwealor FN, Ifeluni CN, et al. Managing job stress among teachers of children with autism spectrum disorders: A randomized controlled trial of cognitive behavioral therapy with yoga. *Medicine* 2021;100(46).
38. Ogba FN, Onyishi CN, Victor-Aigbodion V, et al. Managing job stress in teachers of children with autism: A rational emotive occupational health coaching control trial. *Medicine* 2020;99(36).
39. Onuigbo LN, Eseadi C, Ugwoke SC, et al. Effect of rational emotive behavior therapy on stress management and irrational beliefs of special education teachers in Nigerian elementary schools. *Medicine* 2018;97(37).
40. Ugwoke SC, Eseadi C, Onuigbo LN, et al. A rational-emotive stress management intervention for reducing job burnout and dysfunctional distress among special education teachers: An effect study. *Medicine* 2018;97(17).
41. Franco Justo C, Mañas Mañas I, Cangas Díaz AJ, et al. Reducing teachers' psychological distress through a mindfulness training program. *The Spanish Journal of Psychology*, 2010;13(2):655–666.
42. Haslam DM, Sanders MR, Sofronoff K. Reducing work and family conflict in teachers: A randomised controlled trial of Workplace Triple P. *School Mental Health* 2013;5(2):70-82.
43. Hoogendijk C, Tick NT, Hofman WHA, et al. Direct and indirect effects of Key2Teach on teachers' sense of self-efficacy and emotional exhaustion, a randomized controlled trial. *Teaching and Teacher Education* 2018; 76:1–13.
44. Oishi S, Takizawa T, Kamata N, et al. Web-based training program using cognitive behavioral therapy to enhance cognitive flexibility and alleviate psychological distress among schoolteachers: pilot randomized controlled trial. *JMIR research protocols*. 2018; 7 (1): e32. [doi. org/10.2196/resprot8541](https://doi.org/10.2196/resprot8541).
45. Rao M, Metri KG, Raghuram N. Effects of Mind Sound Resonance Technique (Yogic Relaxation) on Psychological States, Sleep Quality, and Cognitive Functions in Female Teachers: A Randomized, Controlled Trial. *Advances in mind-body medicine* 2017;31(1): 4-9.

46. Unterbrink T, Pfeifer R, Krippeit L, Zimmermann L, Rose U, Joos A, Hartmann A, Wirsching M, Bauer J. Burnout and effort–reward imbalance improvement for teachers by a manual-based group program. *International Archives of Occupational and Environmental Health*. 2012 Aug;85(6):667-74.
47. Żołnierczyk-Zreda D. An intervention to reduce work-related burnout in teachers. *International Journal of Occupational Safety and Ergonomics* 2005;11(4): 423–430.
48. Chiesa A, Malinowski P. Mindfulness-based approaches: are they all the same? *J Clin Psychol*. 2011;67(4):404–424.
49. Linden W. Stress management: From basic science to better practice. Sage Publications; 2004 Oct 5.
50. Naghieh A, Montgomery P, Bonell CP, et al. Organisational interventions for improving wellbeing and reducing work-related stress in teachers. *Cochrane Database of Systematic Reviews* 2015;4: Art. No.: CD010306. doi:10.1002/14651858.CD010306.pub2.
51. Bricheno P, Brown S, Lubansky R. Teacher Support Network. Teacher wellbeing: a review of the evidence, Campbell-Sills L, Barlow DH, Brown TA et al. Effects of suppression and acceptance on emotional responses of individuals with anxiety and mood disorders. *Behaviour Research and Therapy* 2006;44:1251-1263.
52. Luken M, Sammons A. Systematic review of mindfulness practice for reducing job burnout. *American Journal of Occupational Therapy* 2016;70(2):7002250020p1-7002250020p10.
53. Barry MM, Clarke AM, Jenkins R, et al. A systematic review of the effectiveness of mental health promotion interventions for young people in low and middle income countries. *BMC Public Health* 2013;13:835. doi.org/10.1186/1471-2458-13-835.
54. Bartlett L, Martin A, Neil AL, et al. A systematic review and meta-analysis of workplace mindfulness training randomized controlled trials. *Journal of occupational health psychology* 2019;24(1):108.
55. Jeffcoat T, Hayes SC. A randomized trial of ACT bibliotherapy on the mental health of K-12 teachers and staff. *Behaviour Research and Therapy*. 2012;50:571–579.
56. Beck, A. T., Rush, J., Shaw, B., & Emery, G. (1979). *Cognitive Therapy of Depression*. New York: Guildford Press
57. Friedman, I. A. (1995). Student behavior patterns Contributing to Teacher Burnout. *Journal of Educational Research*, 88, (5), 281-289.

58. Leung SS, Wah Mak Y, Yu Chui Y, et al. Occupational stress, mental health status and stress management behaviors among secondary school teachers in Hong Kong. *Health Education Journal* 2009;68(4):328-343.  
doi:10.1177/0017896909349255
59. Komase Y, Watanabe K, Imamura K, et al. Effects of a newly developed gratitude intervention program on work engagement among Japanese workers: A pre-and posttest study. *Journal of Occupational and Environmental Medicine* 2019;61(9): e378-e383.
60. Akobeng AK. Understanding randomised controlled trials. *Archives of Disease in Childhood* 2005;90(8):840-4.

### Figure legends

**Figure 1:** Modified PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow chart of the included studies.

**Figure 2:** Forest plot of the standard mean difference (pre-test vs. post-test) and their 95% CIs for teacher's stress.

**Figure 3:** Forest plot of the standard mean difference (intervention minus control) and their 95% CIs for teacher's stress by type of intervention used.

### Supplementary figures

**Supplementary Figure 1:** Forest plot of the standard mean difference (intervention vs control) and their 95% CIs for teacher's stress by type of questions used to measure the stress level.

**Supplementary Figure 2:** Forest plot of the standard mean difference (intervention vs control) and their 95% CIs for teacher's stress among special education teachers.

**Supplementary Figure 3:** Forest plot of the standard mean difference (intervention vs control) and their 95% CIs for teacher's stress by type of questions used to measure the stress level.

**Supplementary figure 4:** Funnel plot of effect estimates included in the meta-analysis by type of intervention used in each individual study.

**Table 1a:** Summary of risk of bias analysis of the randomized control trial studies.

	Random sequence generation	Allocation concealment	Group similarity at baseline	Blinding of outcome assessors	Timing of outcome assessments	Outcome data complete	Free of selective reporting	Co-interventions avoided	Compliance acceptable	Intention-to-treat (ITT) analysis performed
Akanaeme, 2021	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Anderson, 1999	High	High	Low	High	Low	Unclear	Low	Low	Low	Unclear
Ashley, 2013	High	High		Low	Low	High	Low	Low	Low	Unclear
Au, 2016	Low	High		Low	Low	High	Low	Low	Low	Unclear
Benn, 2012	Low	Low	Low	Unclear	Low	High	Low	Low	Low	Unclear
Beshai, 2016	High	High	Low	High	Low	Low	Low	Low	Low	Unclear
Flook, 2013	High	High	Low	Low	Low	Low	Low	Low	Low	Unclear
Franco, 2010	High	High	Low	Unclear	Low	Unclear	Low	Low	Low	Unclear
Haslam, 2013	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Hayes, 2020	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Hoogendijk, 2018	High	High	Low	Unclear	Low	Low	Low	Low	Low	Unclear
Jennings, 2019	Low	Low	Low	Low	Low	Low	Low	Low	Low	Unclear
Jennings, 2013	High	Low	Low	High	Low	Low	Low	Low	Low	Unclear
Ogba, 2020	Low	Low	Unclear	Unclear	Low	Low	Low	Low	Low	Unclear
Oishi, 2018	Unclear	Low	Low	Low	Low	Low	Low	Low	Low	Low
Onuigbo, 2018	High	Low	Low	Low	Low	Low	Low	Low	Low	Low
Rao, 2017	Low	Unclear	Unclear	High	Low	Unclear	Unclear	Low	Low	Unclear
Roeser 2021	Low	Low	Low	Unclear	Low	Unclear	Low	Low	Low	Unclear
Sharp Donahoo, 2018	Low	Unclear	Unclear	Unclear	Low	High	Low	Low	Low	Unclear
Tsang, 2021	Low	Unclear	Low	Unclear	Low	Low	Low	Low	Low	Unclear
Tsang, 2013	High	High	Low	Unclear	low	low	Unclear	low	low	Unclear
Ugwoke, 2018	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Unterbrink, 2011	Low	Low	Low	Unclear	Low	Low	Low	Low	High	low
Zolnierczyk-Zreda, 2005	High	Low	Low	Unclear	Low	Unclear	Low	Low	Unclear	Unclear

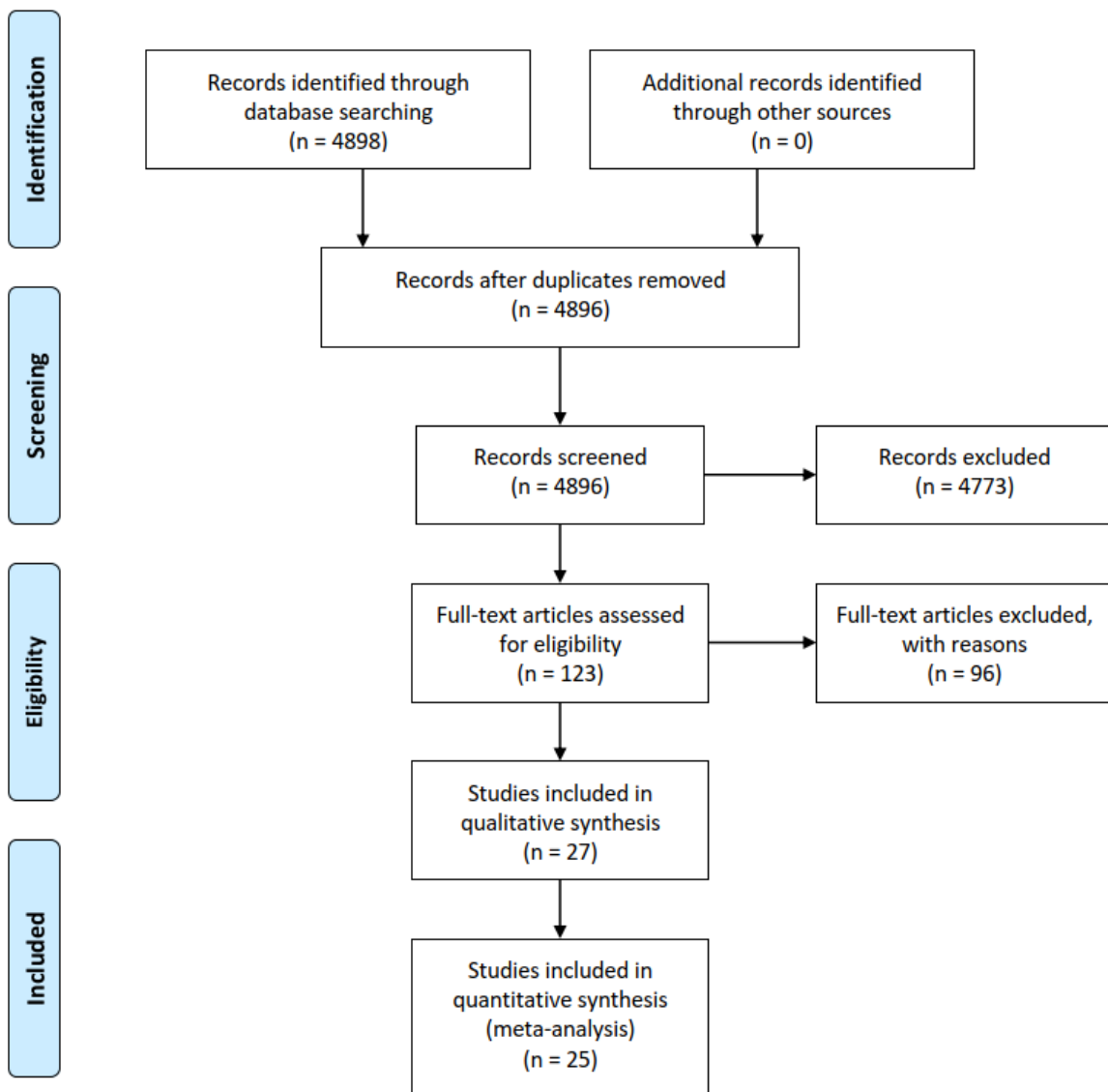


**Table 1b:** Summary of risk of bias analysis of non-randomized (pre-test/post-test) studies.

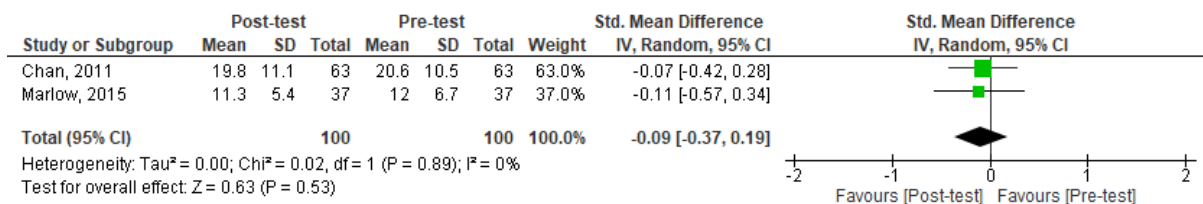
	Confounding	Selection of participants	Classification of intervention	Deviation from intended intervention	Missing data	Measurement of outcome	Free of selective reporting
Chan, 2011	Moderate	Low	Low	Low	Low	Low	Low
Marlow, 2015	Low	Low	Low	Low	Moderate	Low	Low

**Table 2:** Summary of findings GRADE

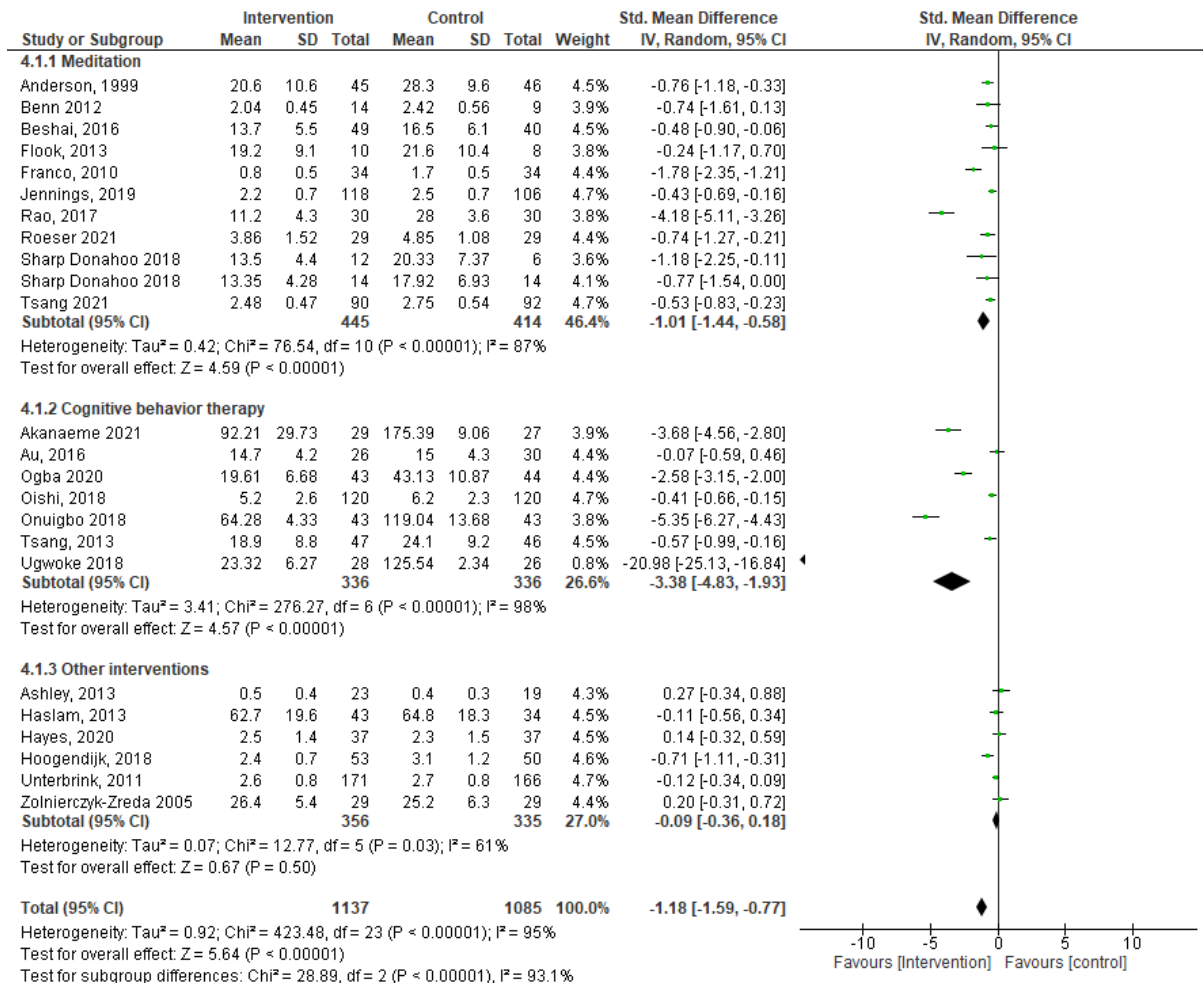
What characteristics of the interventions are most effective in reducing stress level of schoolteachers?			
<b>Patients or population:</b> School teachers			
<b>Settings:</b> Schools			
<b>Intervention:</b> Mindfulness and other task-based stress management intervention versus no intervention			
<b>Outcomes</b>	<b>Impacts</b>	<b>Number of studies</b>	<b>Quality of the evidence (GRADE)</b>
Meditation	Meditation intervention may reduce the stress level of schoolteachers.	9 studies, N=635	⊕⊕⊕⊖
Cognitive behavioral therapy	CBT intervention may reduce the stress level of schoolteachers.	9 studies, N=946	⊕⊕⊕⊖
Other interventions	Other interventions may reduce the stress level of schoolteachers.	8 studies, N=891	⊕⊕⊕⊖
<p>⊕⊕⊕⊕ (<b>High</b>): It is very much unlikely that further research will change our confidence in the estimate of effect or accuracy.</p> <p>⊕⊕⊕⊖ (<b>Moderate</b>): Further research is likely to have an important impact on the confidence in the statement in the estimate of effect or accuracy and may change the estimate.</p> <p>⊕⊕⊖⊖ (<b>Low</b>): Further research is very likely to have an important impact on the confidence in the statement in the estimate of effect or accuracy and is likely to change the estimate.</p> <p>⊕⊖⊖⊖ (<b>Very low</b>): Any estimate of effect or accuracy is very uncertain.</p>			



**Figure 1:** Modified PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow chart of the included studies.



**Figure 2:** Forest plot of the standard mean difference (pre-test vs. post-test) and their 95% CIs for teacher's stress.



**Figure 3:** Forest plot of the standard mean difference (intervention minus control) and their 95% CIs for teacher's stress by type of intervention used.