

Resilience interventions in physicians: A systematic review and meta-analysis

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Abstract

The aim of this review was to evaluate the effectiveness of interventions in promoting resilience among physicians. Previous reviews concerning resilience did not assess effectiveness in a systematic way using meta-analytic methods. PubMed, PsycINFO, and Cochrane Register of Controlled Trials were searched from inception to January 31, 2020. Randomized clinical trials, non-randomized clinical trials, and repeated-measures studies of intervention designs targeting at resilience in physicians were included. Eleven studies were included in the review ($n = 580$ physicians). Research findings suggest that interventions for resilience in physicians were associated with small but significant benefits. Subgroup analyses suggested small but significantly improved effects for emotional-supportive-coping interventions (Hedges's $g = 0.242$; 95% CI, 0.082–0.402, $p = .003$) compared with mindfulness- meditation-relaxation interventions (Hedges's $g = 0.208$; 95% CI, 0.131–0.285, $p = .000$). Interventions that were delivered for more than a week indicated higher effect (Hedges's $g = 0.262$; 95% CI, 0.169–0.355, $p = .000$) compared with interventions delivered for up to a week (Hedges's $g = 0.172$; 95% CI, -0.010 to 0.355, $p = .064$). Results were not influenced by the risk of bias ratings. Findings suggest that physicians can benefit in their personal levels of resilience from attending an intervention specifically designed for that reason for more than a week. Moreover, policy-makers should view current results as a

significant source of redesigning healthcare systems and promoting attendance of resilience interventions by physicians. Future research should address the need for more higher-quality studies and improved study designs.

KEYWORDS

healthcare quality, interventions, physicians, resilience

INTRODUCTION

Physicians are getting increasingly more burnt out (Shanafelt et al., 2012), with studies reporting prevalence rates of burnout ranging from 49 per cent to 60 per cent among healthcare professionals (Aiken et al., 2012; Kansoun et al., 2019; Lacy & Chan, 2018; Rothenberger, 2017; Shanafelt et al., 2002, 2015; West et al., 2018), while it seems to economically burden healthcare systems (Dewa et al., 2014; Han et al., 2019; OECD, 2008). Failing to deal with burnout results in higher staff turnover, lost revenue associated with decreased productivity, financial risk, and threats to the organisation's long-term viability because of the effects of burnout on quality of care, patient satisfaction, and safety (Shanafelt et al., 2017). Burnout is "a psychological syndrome of emotional exhaustion, depersonalization and reduced personal accomplishment" (Maslach et al., 1997) that according to ICD-11 is due to chronic workplace stress that has not been properly addressed (WHO, 2019). On the contrary, the development of psychological resilience could be considered as a counterbalance in dealing with physicians' burnout (Pollock et al., 2020). Resilience can be defined as "the ability of an individual to respond to stress in a healthy, adaptive way such that personal goals are achieved at minimal psychological and physical cost" (Epstein & Krasner, 2013, p. 301). Although research indicates various conceptualizations of resilience as a fixed personality trait (Maltby et al., 2015), or as a process or a state (Johnson et al., 2011; Tugade et al., 2004) and as a dynamic interplay between the individual and their environment (Magis, 2010), psychological resilience can also be understood as the ability of an individual not only to "bounce back" from challenges but also to flourish despite them (Bernard, 1995; Ryff & Singer, 2003). Resilience in physicians is associated with fewer medical errors and malpractice (Parks-Savage et al., 2018), increased quality of patient care, and burnout (Epstein & Krasner, 2013). In addition, resilience should be viewed as an important indicator both to personal well-being and to organisational growth.

Several interventions have been developed either at the individual or at the organisational level in an attempt to prevent physicians' burnout (Gabbe et al., 2008; Ireland et al., 2017; Steinberg et al., 2017). However, effectiveness of these interventions seems to be very limited (Panagioti et al., 2017).

Moreover, recent research indicates that instead of reducing or preventing burnout we should focus on building resilience to physicians working under extreme critical conditions and challenging environments (Beresin et al., 2016; Winkel et al., 2018). Promoting resilience is not solely the responsibility of physicians. It also depends on active support and investment from healthcare institutions (systems) to enable healthy workplaces. Similarly, with the concept of burnout, today it is widely acknowledged that promoting resilience among physicians is not solely the responsibility of individuals, but it mainly depends on active support and investment from healthcare institutions. System-level resilience in the form of healthy workplaces is what we should be aiming for. Healthy workplaces can enable everyone working within them to thrive, succeed, and make a positive difference (Panagopoulou & Montgomery, 2019).

Until recently, very few interventions targeting the promotion of physicians' well-being and resilience have been developed (Balme & Page, 2015; Murray et al., 2016; Venegas et al., 2019). However, in order to effectively address the mental health issues of physicians the focus should also be at promoting resilience and positive attitudes toward the work environment (Winkel et al., 2018; Zwack & Schweitzer, 2013).

In terms of health care, job-related gratification, setting healthy boundaries between their working hours and leisure-time, having social resources, and being flexible have been linked with resilient physicians (Zwack & Schweitzer, 2013). Furthermore, self-compassion and mindfulness have been found to be positively associated with resilience in medical students (Olson et al., 2015). In addition, healthcare professionals' resilience had been positively associated with work engagement (Mache et al., 2014), and the absence of physicians' resilience is regarded to have a negative impact on their patients' health (Mills & McKimm, 2016). Despite the identified importance for promoting physicians' resilience and well-being, there is a lack of a systematic framework for the development, implementation, and evaluation of resilience interventions applied to physicians. Although some recent reviews have been conducted regarding interventions that encourage physicians and healthcare professionals to foster resilience, they did not assess effectiveness in a systematic way using meta-analytic methods. For example, the study of Kunzler et al. (2020) conducted a systematic review regarding psychological interventions that encouraged healthcare professionals to foster resilience. Results from this study indicate that although resilience training shows positive effects for healthcare professionals, evidence remains uncertain due to the quality of those studies (i.e. high heterogeneity among studies, restricted geographical distribution).

The scope of this review was to assess the effectiveness of interventions in promoting resilience among physicians and to determine what types of interventions (mindfulness–meditation–relaxation type, emotional–supportive–coping type) were the most effective. Moreover, the review aimed to examine whether there were any differences in the resilience results based on the duration of interventions (e.g. up to a week, more than a week). The review was not registered prospectively.

METHODS

The review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Table S1). The systematic review protocol is included in Method 1 in Appendix S1.

Eligibility criteria

The study population included physicians or residents of any specialty working in primary, secondary, or tertiary healthcare setting, including fellows. Also, studies with a mix of healthcare professionals of other specialties (e.g. nurses, dieticians) and physicians were included in the review. This was done as the main goal was to include studies with physicians, in the case of studies that included samples of health professionals including physicians we chose not to exclude them. Furthermore, given the small number of existing studies including resilience interventions, studies including mixed samples where physicians were the largest percentage were also included in the study. Moreover, this review did not address specifically different health professional groups.

Although all interventions were eligible to be included in the end, interventions included any type of intervention designed to improve the resilience of physicians and physicians within a mixed health

professional group and reported resilience outcomes. In specific, studies were included if resilience was assessed as an outcome independent if it was a main study goal.

Eligible interventions were mindfulness–meditation–relaxation types and emotional–supportive–coping types. Mindfulness–meditation–relaxation type interventions focused on learning and application of stress reduction techniques at the individual level (e.g. mindfulness stress reduction techniques and training, meditation techniques, relaxation techniques). Emotional–supportive–coping type interventions focused on learning and application of solution-focused techniques at the group level, using experiential exercises (e.g. psycho-education, videos, role-play, cognitive counseling, solution-focused counseling, paced breathing meditation, gratitude practice techniques).

Studies that included any type of control (e.g. no intervention, waiting list) were considered eligible for comparisons. Also, studies with no control group were considered eligible and were included in the review. Only studies with valid outcomes (i.e. resilience measured with validated tools; Methods 1 in Appendix S1) were included. Eligible study designs were quantitative intervention designs as described in the Cochrane handbook including randomized controlled trials, non-randomized controlled trials, and repeated-measures studies. Context was any setting, including healthcare setting of primary and secondary care.

Exclusion criteria

Studies with intervention design not reporting data on resilience outcomes but providing general data on empathy, well-being, and burnout were excluded. Studies not using resilience measures and gray literature were excluded from the review. Moreover, interventions that addressed to healthcare staff not including physicians were also excluded. Any reports not written in the English language were also excluded.

Search strategy and data sources

Three electronic databases were searched: PubMed, PsycINFO, and Cochrane Register of Controlled Trials. The search strategy included combinations of four key terms: *resilience*; *interventions*; *physicians*; *medical students*. Also, a combination of medical subject headings (MeSH terms) and text words were used (Methods 2 in Appendix S1). Furthermore, searches by hand were conducted through the reference list of eligible studies and systematic reviews to supplement findings.

Study selection

Results from the searches were exported, and duplicates were removed. Study selection followed a two-step process, where initially, titles and abstracts of the identified articles were screened for relevance by two independent reviewers. At the second step, full texts of studies that were considered relevant were screened against the eligibility criteria by two independent reviewers.

Data extraction

An Excel data extraction form was developed and piloted in five randomly selected studies. A second Excel extraction sheet was used in order to collect quantitative data for meta-analysis. In case of

missing or incomplete data, authors were informed. The descriptive information that was extracted from the eligible studies included information regarding (a) the study design (research design, using or not control group), (b) participants (sample size, specialty of participants, percentages by gender), (c) intervention type, content, format of delivery (online, in-person, group or individual), intensity, duration, and follow-up time points of intervention, (d) the instruments that have been used in measuring resilience, and (e) outcomes of interventions (resilience scores, result direction either positive, negative, or neutral).

Risk of bias assessment

The Effective Practice and Organisation of Care (EPOC) risk of bias tool was used for the critical appraisal of studies that were included in the meta-analysis (Cochrane Effective Practice and Organisation of Care (EPOC), n.d.). The EPOC risk of bias assessment tool includes nine standardised criteria scored in a 3-point scale as: low, unclear, and high risk. Moreover, the EPOC tool has been selected based on its ability to be used across different types of intervention designs, as described in the Cochrane handbook (RCTs, nRCTs, CBA).

Data analysis

Standardised mean differences, sample sizes, and associated effect sizes for resilience outcomes of all eligible studies were calculated in comprehensive meta-analysis (CMA) (Borenstein, 2006). The pooled effect sizes and the forest plots were constructed using the command in the CMA program. The main meta-analysis explored the effectiveness of the identified interventions in improving resilience outcomes. Two prespecified subgroup analyses were carried out:

1. *Types of interventions*—We examined the effectiveness of different types of interventions.
2. *Duration of interventions*—We examined the effectiveness of interventions lasting up to a week and more than a week.

Moreover, all analyses were conducted using a random-effects model to account for heterogeneity. Due to sampling errors, procedures and settings of the studies included in the analysis random-effects models were considered more reliable to indicate variation in effect sizes between studies. Moreover, random-effects models, when compared to fixed-effects models, are generally considered to be preferable and allow generalization beyond the set of studies examined to future studies (Schmidt et al., 2009). Heterogeneity was assessed using the *I* statistic. Conventionally, values of 25 per cent, 50 per cent, and 75 per cent indicate low, moderate, and high heterogeneity. Hedges's *g* was used to pool the results (Hedges & Olkin, 1985). Funnel plots were reviewed to assess small sample bias (which is an indicator of publication bias). Funnel plots were constructed using the command in CMA program.

RESULTS

As shown in Figure 1, initial search indicated 1248 articles. After duplicates were removed, 789 articles were examined for title and abstract screening. Of these, 55 articles were considered relevant and reviewed. Finally, 11 studies were included in the review (Chan et al., 2012; Dyrbye et al., 2017;

Ewen et al., 2018; Fortney et al., 2013; Kemper & Khirallah, 2015; Kemper & Rao, 2017; Mache et al., 2015, 2016, 2017; Romceovich et al., 2018; Sood et al., 2011). One study included medical students, but we decided to include it in the meta-analysis because it was the only study identified in the literature with medical students and run the analyses with and without the study (Dyrbye et al., 2017).

Characteristics of studies and physicians

Table 1 shows descriptive information regarding the studies included in the final review. Seven studies were conducted in United States (64%) (Dyrbye et al., 2017; Ewen et al., 2018; Fortney et al.,

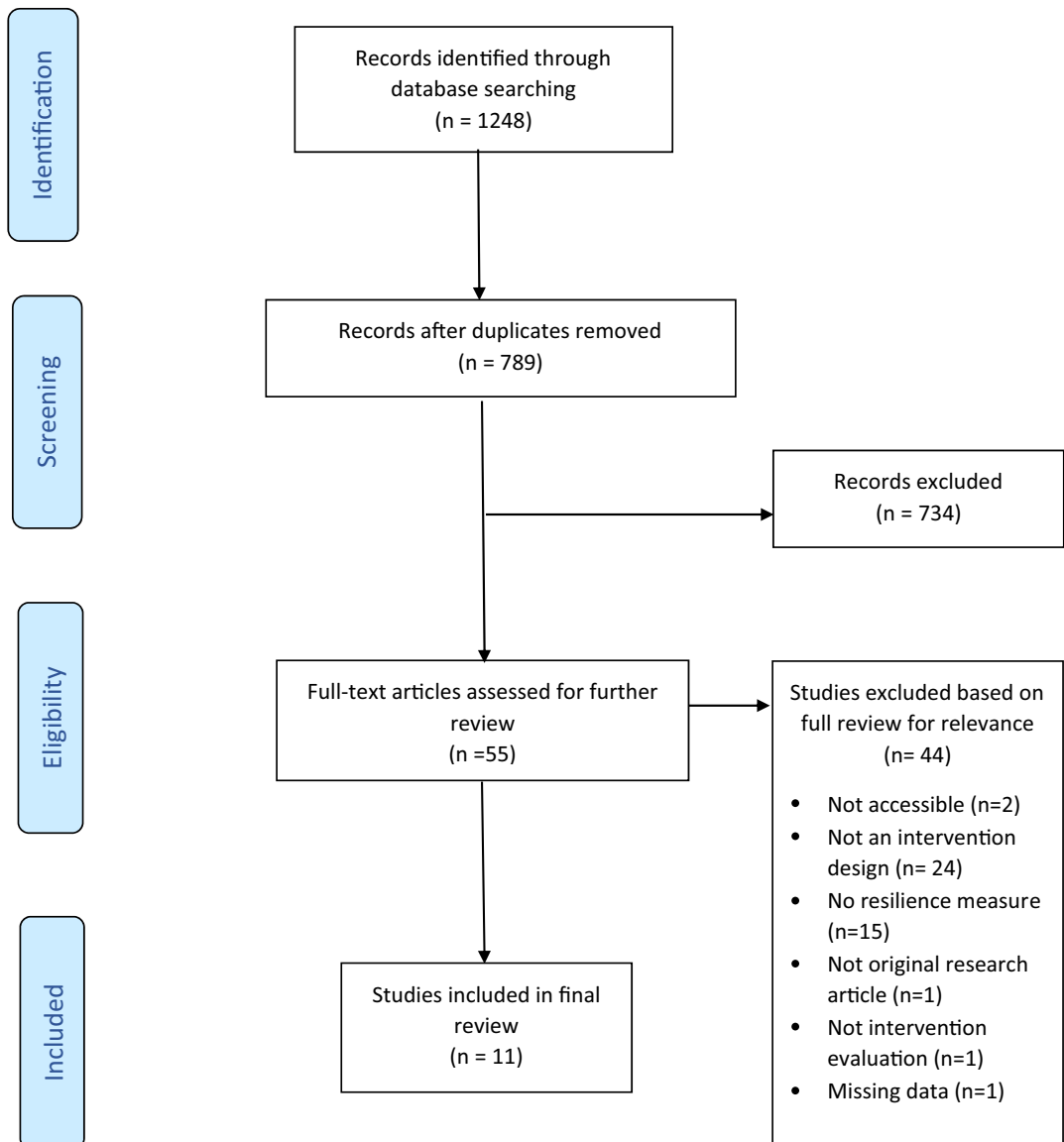


FIGURE 1 Flowchart of search outcome [Colour figure can be viewed at wileyonlinelibrary.com]

2013; Kemper & Khirallah, 2015; Kemper & Rao, 2017; Romcevich et al., 2018; Sood et al., 2011), three studies were conducted in Europe (Mache et al., 2015, 2016, 2017), and one was conducted in Singapore (Chan et al., 2012). Significantly, more women than men were recruited to the majority of studies (Chan et al., 2012; Dyrbye et al., 2017; Ewen et al., 2018; Fortney et al., 2013; Kemper & Rao, 2017; Mache et al., 2015, 2016, 2017; Romcevich et al., 2018).

Four studies recruited physicians working in secondary care (e.g. pediatricians) (Ewen et al., 2018; Mache et al., 2015, 2016; Romcevich et al., 2018), three studies included a mixed of physicians and other allied healthcare professionals (Chan et al., 2012; Kemper & Khirallah, 2015; Kemper & Rao, 2017), two studies recruited physicians working in primary care (Fortney et al., 2013; Mache et al., 2017), one study recruited physicians working in tertiary care (Sood et al., 2011), and one recruited medical students (Dyrbye et al., 2017). In all interventions, the main eligibility criteria were being a physician (regardless of the setting) and willingness to participate to the intervention and follow-up. One study used the 14-item Resilience Scale (Fortney et al., 2013), four studies used the 6-item Smith Brief Resilience Scale (Ewen et al., 2018; Kemper & Khirallah, 2015; Kemper & Rao, 2017; Romcevich et al., 2018), three studies used the Brief Resilient Coping Scale (Mache et al., 2015, 2016, 2017), and three studies used the Connor–Davidson Resilience Scale (Chan et al., 2012; Dyrbye et al., 2017; Sood et al., 2011) (Table S2).

Characteristics of interventions

Interventions varied significantly in their characteristics regarding their content, form of delivery, duration/intensity, and length of follow-up assessment points (Table 1). Six interventions were mindfulness–meditation–relaxation ($n = 6$ [54.5%]) that comprised of mindfulness stress reduction techniques and training, meditation techniques and relaxation techniques, or a combination of these features.

Five interventions were emotional–supportive–coping. Specifically, one study included psycho-education techniques, videos, role-play, and experiential techniques, one study included cognitive counseling and solution-focused counseling, and two studies included paced breathing meditation, and incorporated attention, gratitude, compassion acceptance, meaning, and forgiveness practice techniques. Also, one study included team-building exercises.

The duration of interventions ranged from a single time to two years. Follow-up assessment points ranged from the end of intervention to one year. The majority of interventions were delivered face-to-face ($n = 8$ [73%]), two interventions were delivered online, and one intervention used online session module in adjunct to face-to-face delivery.

Risk of bias characteristics

Results of risk of bias assessment are presented in Figure S1. Seven studies were repeated-measures studies (64%), and four studies were randomized clinical trials. Two comparisons fulfilled the nine risk of bias criteria (18.2%). One comparison fulfilled eight criteria (9.1%), one comparison fulfilled seven criteria (9.1%), and seven comparisons fulfilled five criteria (64%). The elements of baseline outcome measures (for RCT studies), intervention unlikely to affect data collection (for repeated measure studies), and knowledge of the allocated interventions adequately prevented during the study and protection against contamination were most commonly unclear risk in the bias assessments.

TABLE 1 Characteristics of study interventions included in the review

Author, year	Country	Sample (N)	Specialty	Male sex (%)	Intervention content
Fortney, Luchterhand, Zakletskaia, Zgierska, & Rakei, 2013	United States	28	Primary care clinicians	40% male	Abbreviated mindfulness course. Modified MBSR training, guided sitting, walking mindfulness practices
Kemper & Khirallah, 2015	United States	261	Dietitians, nurses, physicians, social workers, clinical trainees, health researchers	—	1-h online elective MBST: Introduction to Stress, Resilience and the Relaxation Response (ISRRR), autogenic training (guided imagery), guided imagery and hypnosis for pain, insomnia, and changing habits, introduction to mindfulness, and mindfulness in daily life
Mache, Baresi, Bernburg, Vitzthum, & Groneberg, 2017	Germany	80	Junior Physicians in Gynecology	32.5% male	Pilot randomized controlled trial. Group coping skills training: psycho-education, theoretical input, watching videos, oral group discussions, experiential exercises, role-plays (problem-solving strategies, emotion regulation/ Lazarus's transactional model)
Kemper & Rao, 2017	United States	246	Nurses, physicians, social workers, psychologists, others(dietitians, researchers, dentists, radiology and laboratory technicians, physical and occupational therapists, etc)	15% male	Online training program in focused attention meditation. Modules included (1) Introduction to Stress, Resilience and the Relaxation Response, (2) Clinical Effects of the Relaxation Response, and (3) Physiologic Effects. An initial case followed by a multiple-choice question, followed by 1–3 self-reflection exercises. Each module included links to free downloadable audio recordings of guided relaxation response practices for experiential learning. At the end, 10 multiple-choice questions

Type of intervention	Intensity	Duration	Research design	Measure	Control group	Follow-up point
Mindfulness–relaxation–meditation	18 h	3 days	Repeated-measures study	Resilience Scale-14	No	1 day 8 weeks 9 months
Mindfulness–relaxation–meditation	12 one-hour modules	7 months	Repeated-measures study	6-item Smith Brief Resilience Scale	No	Ending (after intervention)
Emotional–supportive–coping	12 weekly sessions	3 months	RCT	Brief Resilient Coping Scale	Yes (N = 40)	3 months 6 months
Mindfulness–relaxation–meditation	1 h	3 modules	Repeated-measures study	Smith's 6-item Brief Resilience Scale	No	Ending (after intervention)

(Continues)

TABLE 1 (Continued)

Author, year	Country	Sample (N)	Specialty	Male sex (%)	Intervention content
Mache, Vitzthum, Klapp, & Groneberg, 2015	Germany	82	Junior physicians	40% male	Psychosocial resilience program. Sessions offered resilience training combined with cognitive behavioral and solution-focused counseling. Focus was on coping strategies, support between participants, solutions and goals for the future
Mache, Bernburg, Baresi, & Groneberg, 2016	Germany	72	Psychiatrists	29.2% male	Focus was on actual working situations and problems, coping strategies, and support between colleagues and future goals. Main topics were "self," "patient," and "work environment." In each session, a topic was introduced and discussed
Chan, Chan, & Kee, 2012	Singapore	902	Administrator, allied health, doctor, nurse, supervisor/manager, executive, directors and above, unknown	21.6% male	Localized version of crisis intervention training. Using many experiential exercises to help participants identify the source of stress, workplace critical incidents and listening/risk communication skills, role-play scenarios for attending to a person in crisis. Videos were also used in teaching, sharing personal experiences. A module of self-care was included in the end regarding the use of relaxation techniques

Type of intervention	Intensity	Duration	Research design	Measure	Control group	Follow-up point
Emotional–supportive–coping	2 h per week	3 months	Pilot RCT	Brief Resilient Coping Scale	Yes ($N = 43$)	3 months 6 months
Mindfulness–relaxation–meditation	1.5 h	12 weekly sessions	Pilot RCT	Brief Resilient Coping Scale	Yes ($N = 35$)	3 months 6 months
Mindfulness–relaxation–meditation	—	2 days	Repeated-measures study	Using a 5-point Likert scale, there were 3 items for resistance and 4 items for resilience—2 of which were from Connor–Davidson Resilience Scale	No	Ending (after intervention)

(Continues)

TABLE 1 (Continued)

Author, year	Country	Sample (N)	Specialty	Male sex (%)	Intervention content
Romceovich, Reed, Flowers, Kemper, & Mahan, 2018	United States	10	Pediatric residents and internal medicine-pediatric residents	30% male	Brief mind–body skills training intervention, using in-person peer-led training supported by online modules. Modules included the following: intro to relaxation response (breathing response), relaxation response—clinical, cognitive, and emotional effects—intro to mindfulness, mindful breathing, autogenic training, loving–kindness meditation (empathy vs. compassion/guided imagery), mindfulness in everyday life (eating/walking/yoga/tai chi), gratitude meditation
Sood, Prasad, Schroeder, & Varkey, 2011	United States	32	Physicians	approximately 50% male	SMART program: teaches to focus attention in the external world and to defer unrefined judgements. To cultivate and guide their interpretations by five high-order principles: gratitude, compassion, acceptance, meaning, and forgiveness. Participants were trained in a brief structured relaxation intervention (paced breathing meditation): to practice deep diaphragmatic breathing at 5 breaths per minute for 5 or 15 min, once or twice a day. Participants were offered an optional 30- to 60-min follow-up session and 2 follow-up phone calls at weeks 4 and 8

Type of intervention	Intensity	Duration	Research design	Measure	Control group	Follow-up point
Mindfulness–relaxation–meditation	Up to four 90-min sessions in-person, 8 assigned online modules	more than 1 month	Repeated-measures study	Smith's Brief Resilience	No	6 months
Emotional–supportive–coping	One 90 min	Single time	RCT	Connor–Davidson Resilience Scale	Yes (N = 12)	8 weeks

(Continues)

TABLE 1 (Continued)

Author, year	Country	Sample (N)	Specialty	Male sex (%)	Intervention content
Dyrbye, Shanafelt, Werner, Sood, Satele, & Wolanskyj, 2017	United States	95	First-year medical students	43.2% male	Stress Management and Resilience Training (SMART) program: introduction and SMART program, attention (joyful attention, kind attention), gratitude, compassion, acceptance, meaning (higher purpose), forgiveness, relationships, reflection
Ewen, Gardiner, Palma, Whitley, & Schneider, 2018	United States	19	Residents, fellows (SNHs)	0% male	Sessions included team-building exercises and several sessions aimed at addressing the physical and mental health of attendees ("Window of tolerance")

Main meta-analysis: effectiveness of interventions in levels of resilience

Interventions were associated with significant improvements in resilience (Hedge's $g = 0.237$; 95% CI, 0.154–0.320, $p = .000$) (Figure S2; Figure 2).

Subgroup analyses

Types of interventions

Emotional–supportive–coping interventions were associated with significant improvements in resilience (Hedges's $g = 0.242$; 95% CI, 0.082–0.402, $p = .003$), as well as mindfulness–meditation–relaxation interventions, which also indicated statistically significant changes in resilience (Hedges's $g = 0.208$; 95% CI, 0.131–0.285, $p = .000$). The effects of emotional–supportive–coping interventions were small but significantly larger than the effects of mindfulness–meditation–relaxation interventions (Hedges's $g = 0.242$, $p = .003$) (Figure S3; Figure 3).

Duration

Interventions delivered for more than a week (Hedges's $g = 0.262$; 95% CI, 0.169–0.355, $p = .000$) indicated higher effects compared with interventions delivered for up to a week (Hedges's $g = 0.172$; 95% CI, –0.010–0.355, $p = .064$) (Figure S4; Figure 4).

Type of intervention	Intensity	Duration	Research design	Measure	Control group	Follow-up point
Emotional–supportive–coping	22 h (12 h for 2014, 10 h for 2015)	2 years	Repeated-measures study	Connor–Davidson Resilience Scale	No	Ending (end of year 1)
Emotional–supportive–coping	6 h	Single time	Repeated-measures study	Smith's Brief Resilience Scale	No	3 months

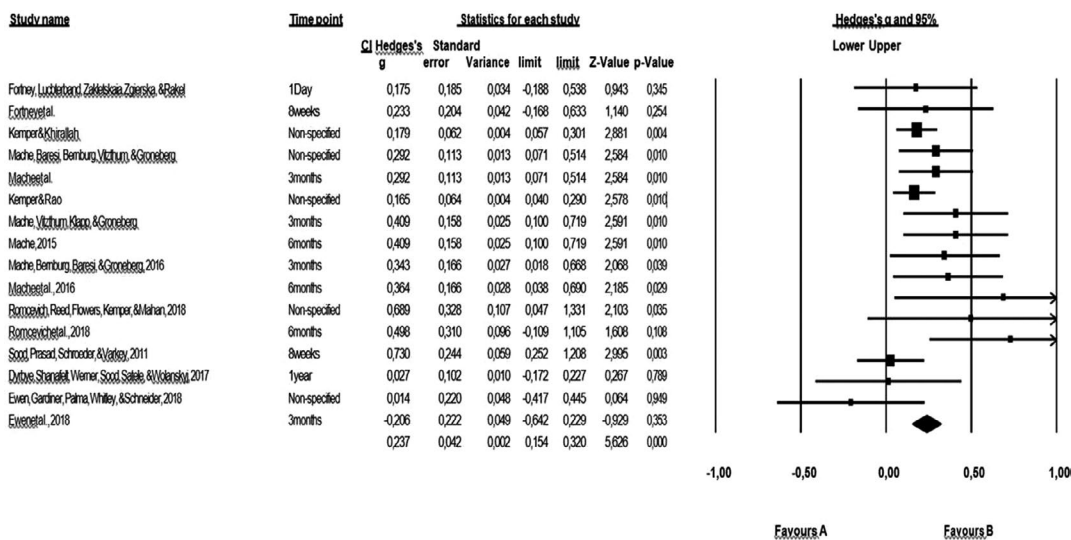


FIGURE 2 Forest plot of the effects of interventions on resilience scores

Sensitivity analyses

The treatment effect derived by studies at lower risk of bias (Figure S1). The results were not influenced by the risk of bias ratings.

Small-study bias

No evidence on funnel plot asymmetry was found, which might indicate publication bias for the main or subgroup analysis (Figure S4).

Meta Analysis

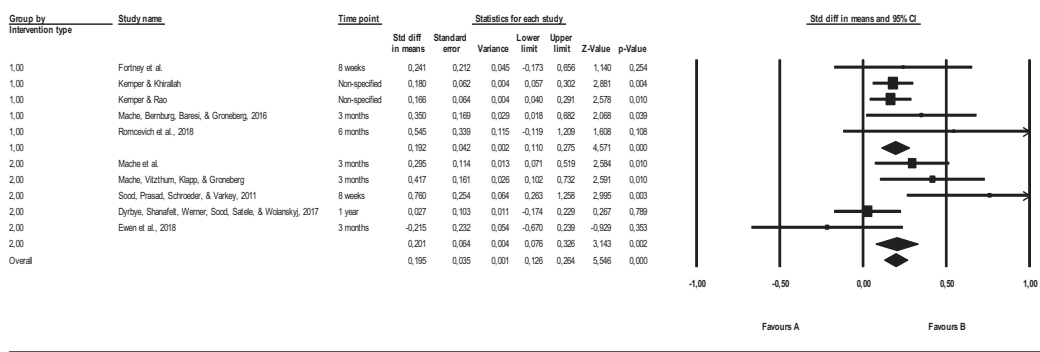


FIGURE 3 Forest plot of the effects of intervention types on resilience scores

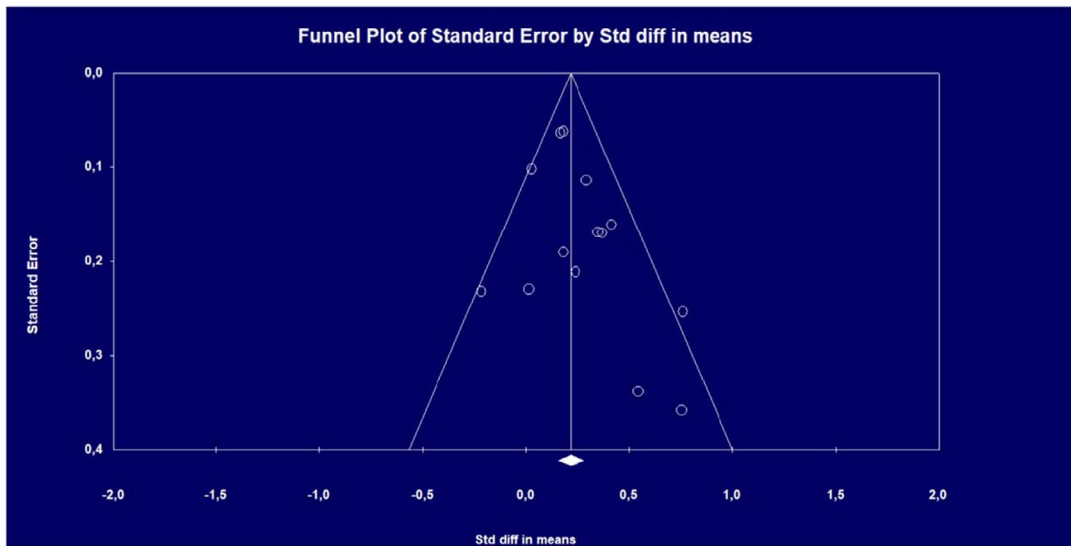


FIGURE 4 Forest plot of standardised mean differences versus standard error for resilience scores [Colour figure can be viewed at wileyonlinelibrary.com]

DISCUSSION

Summary of main findings

This meta-analysis indicated that interventions for resilience in physicians were associated with small but significant benefits. Subgroup analyses suggested small but significantly improved effects for emotional-supportive-coping interventions compared with mindfulness-meditation-relaxation interventions. In relation to duration of interventions, the effect was higher for interventions delivered for more than a week compared with interventions delivered for up to a week.

Although there have been previous reviews conducted regarding resilience interventions to foster resilience in physicians, they did not assess effectiveness in a systematic way using meta-analytic methods.

Future reviews addressing the effectiveness of resilience interventions should include core outcomes, such as recovery indicators, sick days from work, and indicators of healthcare quality

assessment and patient satisfaction. The triangulation of outcomes will provide a comprehensive picture of the effectiveness of resilience interventions.

Strengths and limitations

To our knowledge, this is the first meta-analysis measuring solely resilience outcomes in interventions addressed to physicians. Furthermore, this study applied a set of inclusion criteria allowing different types of intervention and study designs to be included. Also, the size of meta-analysis permitted us to effectively assess publication bias (Sterne et al., 2000). Though publication bias tests' power is limited, the funnel plot did not indicate any bias.

Nevertheless, heterogeneity and publication bias are considered to be the most important threats to the validity of a meta-analysis (Rothstein et al., 2005). In regard to this work, the majority of the included studies ($n = 7$) did not include a control group in their intervention design. However, this percentage is in accordance with the majority of meta-analyses (Panagioti et al., 2017).

This study included interventions that differed significantly in terms of their content, study design, length of time of application, and/or follow-up; as a result, conclusions should be made with caution regarding overall effectiveness of resilience interventions in physicians. However, this is in accordance with other research findings indicating that resilience interventions in physicians seem to be very limited including a range of intervention designs and forms of application (Moorfield & Cope, 2020).

Moreover, this meta-analysis included interventions with physicians in different stages on their career and of different specialties; thus, it is possible that the needs for resilience training could be different for different population of practitioners (Gogo et al., 2019). However, due to the small number of included studies we could not run separated analysis for separated health professionals' groups.

Estimates of heterogeneity in pooled analyses were assessed with the use of random-effects model. Results indicated low-to-moderate heterogeneity. Furthermore, heterogeneity was addressed by conducting prespecified subgroup analyses (Gøtzsche, 2000). Nevertheless, conclusions from subgroup analyses should be drawn with caution due to other uncontrolled factors between studies that might impact on the results (Burke et al., 2015; Sedgwick, 2013).

Furthermore, due to the potential issue of small-study bias that can be raised by the studies included in this meta-analysis it is possible that the effects of resilience were overestimated.

Comparison with previous systematic reviews

Five other systematic reviews were conducted regarding interventions targeting resilience in physicians. One review addressed resilience interventions only in psychiatrists (Howard et al., 2019), and four reviews addressed resilience interventions to physicians (Fox et al., 2018; Kunzler et al., 2020; McKinley et al., 2019; Venegas et al., 2019). However, we did not find any meta-analysis regarding effectiveness of interventions in physicians' levels of resilience.

Our findings regarding the overall effectiveness of interventions in physicians' levels of resilience are also in accordance with previous reviews. Also, our finding regarding lower effectiveness of mindfulness–meditation–relaxation interventions in comparison with emotional–supportive–coping interventions is also supported in McKinley et al. (2019), where the second type of interventions was found to be more promising in future time regarding interventions to promote resilience in physicians. However, none of the identified researches examined the duration of interventions and what effect that might have in physicians' levels of resilience.

Furthermore, we specifically examined interventions that included at least one measure of resilience, thus allowing us to conduct a meta-analysis on the identified researches and overcoming the difficulty of previous reviews regarding the plethora of different kinds of outcome measures and types of interventions.

Implications for researchers, clinicians, and policy-makers

Until recently, the vast majority of interventions regarding physician well-being has been focused on reducing burnout, while relatively few intervention programs have been developed and evaluated regarding resilience enhancement and promotion. The main finding of this meta-analysis indicates that physicians can be benefited from attending a resilience intervention program for more than a week. Although due to the methodological heterogeneity of the studies included in this meta-analysis we cannot offer practical recommendations, results can offer useful insights for future research and clinical application.

Emotional–supportive–coping interventions indicated to have small but significant effects in resilience enhancement; however, there were important differentiations in intervention designs, ingredients, and format of delivery (healthcare setting, online, etc). Specifically, interventions that focused on learning and application of solution-focused techniques at group level, using experiential exercises, tended to be more effective in enhancing resilience in physicians. However, there are concerns regarding the practical and economic feasibility of those types of interventions in health care, especially taking into consideration individual and organisational factors such as workload, poor hospital management, and overall availability of physicians in attending an resilience program (Montgomery et al., 2013). Accordingly, Johns Hopkins Hospital has developed the RISE (Resilience In Stressful Events) program, which provides psychological and emotional support to healthcare staff following medical errors and/or adverse events at an organisational level (Edrees et al., 2016). Future high-quality studies (randomized clinical trials) regarding the application of such relevant programs at institutional and/or national level could provide better acknowledgment regarding resilience promotion and enhancement in physicians in healthcare settings. Mindfulness–meditation–relaxation interventions also indicated to benefit physicians in their levels of resilience. However, the content of those interventions seems to have lower effect in resilience levels of physicians in comparison with the above type of interventions.

Duration of interventions seems to impact significantly on physicians' resilience. Specifically, physicians benefitted more from attending interventions that lasted for more than a week. This finding is in accordance with other findings indicating positive effects of interventions in participants six months to one year post-intervention (Awa et al., 2010; Krasner, 2009). However, our knowledge regarding the post-intervention or long-term duration of positive effects of interventions in physicians is limited due to scarce research evidence (West et al., 2016). Interventions focused on long-term application designs, including also post-intervention re-exposure in order to sustain or maximize positive effects in resilience levels' of participants, should be considered in future clinical research.

CONCLUSIONS

This meta-analysis highlights that physicians can be benefited in their personal levels of resilience from attending an intervention specifically designed for that reason for more than a week. However, results of this study derived from interventions developed and evaluated in different kinds of groups of physicians and settings (healthcare, online, etc.); as such, it should be viewed with caution.

Policy-makers should view current results from resilience interventions as a significant source of redesigning healthcare systems and promoting the attendance of resilience interventions by physicians.

In regard to future research, there is a need for more core outcomes and outcome measures that could further help to the process of meta-analysis of research findings and increase their value.

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ETHIC APPROVAL

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CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the findings of this study are available within the article and its supplementary materials.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.
Appendix S1

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