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Systematic Review and Meta-Analysis of Randomized Trials Testing Interventions to Reduce Physician Burnout

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ABSTRACT

BACKGROUND: Physicians deal with intense professional pressures, which may contribute to increasing burnout. We sought to evaluate the efficacy of interventions designed to reduce burnout in physicians, physicians-in-training, and other health care professionals.

METHODS: We searched PubMed and Embase (through January 6, 2023) and reference lists. We included all randomized studies assessing an intervention designed to reduce professional burnout in physicians and other health care personnel. We adhered to the PRISMA reporting guidelines. We abstracted data on study and participant characteristics, study outcomes, and study quality. We used a random-effects model to pool mean differences in burnout change (pre- and post-intervention) between intervention and control arms.

RESULTS: Thirty-one of the 38 eligible studies (81.6%) used the Maslach Burnout Inventory (MBI) questionnaire to assess burnout. When comparing the intervention and control groups, the mean difference in the emotional exhaustion component of the MBI was −1.11 (95% confidence interval [CI], −2.14 to −0.09; I2: 74.5%; 20 studies); the mean difference in the depersonalization component of the MBI was −0.32 (95% CI, −0.63 to −0.01; I2: 54.2%; 17 studies); and the mean difference in the personal accomplishment component of the MBI was 1.11 (95% CI, −0.21 to 2.43; I2: 94.3%; 16 studies).

CONCLUSIONS: Studies testing interventions to decrease physician burnout led to significant numerical improvements in some domains of burnout, but it is unlikely that these changes result in meaningful changes in clinical burnout. Further, the limited follow-up time, biased assessments, and heterogeneity in intervention efficacy suggest that a more nuanced understanding of the causes of burnout is needed to develop more effective interventions.

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KEYWORDS: Coaching; Physicians; Professional burnout

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Authorship: VP and AH conceptualized study design; AH, JT, and SLM reviewed and abstracted data; VP reviewed and confirmed abstracted data; AH wrote first draft of manuscript; and VP, SLM, and JT reviewed and revised subsequent and finalized draft of manuscript.

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INTRODUCTION

Professional burnout, including among physicians, has been increasing in the past few years, with the prevalence of burnout symptoms in physicians rising from 38.2% in 2020 to 62.8% in 2021.[1] Increasing burnout, which may be contributing to a higher number of physicians leaving the practicing care,[2] is a concerning trend, especially considering the increasing number of people with chronic conditions who need care.[3]

Some of the reasons for feeling stressed at work, cited by physicians in surveys, include time pressure, chaotic environments, low control over work, and unfavorable organizational culture.[4] Working in health care—where the environment can be fast paced, critical decisions

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about patient treatment are common, and there is a need to balance both the personal connection with patients and the demands of business-minded insurance companies—is often inherently stressful. To minimize the stress that physicians and other health care workers experience, several strategies have been suggested, including professional coaching, mindfulness programs, discussion groups, and changes to the work environment or scheduling.[5]

Considering the enthusiasm for these types of programs, we sought to evaluate the efficacy of interventions designed to reduce burnout in physicians, physicians-in-training, and other health care professionals.

CLINICAL SIGNIFICANCE

- Interventions to reduce physician burnout led to numerically significant but clinically unmeaningful improvements in emotional exhaustion.
- Interventions to reduce physician burnout led to numerically significant but clinically unmeaningful improvements in depersonalization.
- There were no significant differences in the personal accomplishment domain of the Maslach Burnout Inventory.
- Any improvements were mainly driven by coaching interventions, rather than other intervention types, such as scheduling, discussion groups, or mindfulness activities.

METHODS

Data Sources and Searches

We searched PubMed for randomized studies using the search terms, "Burnout, Professional" [Mesh]) AND "Physicians"[Mesh]. We also searched Embase for randomized studies using the search terms ('burnout'/exp OR burnout) AND ('physician'/exp OR physician). The date of the search was January 6, 2023. Included studies needed to be a randomized trial of an intervention to reduce burnout in physicians. Studies could also include other health care personnel but needed to include physicians or physicians-in-training. We excluded studies that were non-inferior design, included animals, only reported qualitative outcomes, were protocol only, or were not available as full text.

Data Extraction and Quality Assessment

From each study, we abstracted data on journal and year of study publication; participant demographics; number of participants randomized and analyzed; type of intervention (broadly categorized as mindfulness/meditation, coaching, discussion, education on coping/stress resilience strategies, schedule changes, or drug); treatment control arm received (broadly categorized as waitlist, active comparator, unclear, or none); type of questionnaire used for assessing burnout; and efficacy data on burnout.

We used the Critical Appraisal Skills Programme Randomised Controlled Trial Standard Checklist,[6] sections A through C, to assess risk of bias in included studies. Assessments were made by 3 independent reviewers (AH, JT, and SLM), and scoring was based on consensus. In other words, where there were disagreements in coding, the response that 2 of the 3 reviewers agreed upon was used.

For efficacy measures, we abstracted pre- and post-mean differences for control and intervention arms. When studies reported 95% confidence intervals, we converted them to standard deviations by using this equation: $\sqrt{n}$*(upper limit-lower limit)/3.92.[7] To calculate standard deviations of the mean change, we used this equation: $\sqrt{(SD_{baseline}^2 + SD_{final}^2) - (2*r*SD_{baseline}*SD_{final})}$,[7] where r is an assumed correlation coefficient used in previous meta-analyses.[8-11] If other uncertainty measures were not available, we back-calculated from the P value and sample size.[12] We excluded one study from the pooled estimates (Weitzman) because there was too little information to reliably use in the analysis.

For each article, we also searched the journal website of where the article was published for the journal's impact factor.

Data Synthesis and Analysis

We calculated frequencies (%) and medians (interquartile range) for study characteristics. We used a Fleiss' Kappa (R package 'irr') for determining agreement in risk of bias scores.

Because of the varied study interventions, we anticipated between-study heterogeneity. As such, we used a random-effects model to pool effect sizes (R package 'meta'), which weighted pooled estimates by measures of uncertainty. To maximize the number of studies that could be included, we pooled the absolute mean difference between study groups, adjusted for baseline values. The restricted maximum likelihood estimator was used to calculate the heterogeneity variance τ^2.[13] We used Knapp-Hartung adjustments[14] in calculating confidence intervals around the pooled effects. We calculated pooled estimates when there were more than 5 studies that reported on a given burnout assessment. All statistical analyses were conducted in R statistical software, version 4.2.1. We used a P value of .05 for statistical significance.

Because our study involved publicly available data and did not involve individual patient data, this study was not submitted for institutional review board in accordance with 45 CFR §46.102(f). We adhered to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) reporting guidelines.

RESULTS

Our search produced 35 PubMed studies and 124 Embase studies (Supplementary Figure). After excluding 25 duplicates, we excluded studies because they were abstract only or the full text was not available (n = 29); studies not examining burnout as an outcome (n = 27); studies that were not randomized (n = 27); were protocol only (n = 10); physicians were not included as participants (n = 9); or other

Table Characteristics of Randomized Studies Evaluating Interventions to Reduce Physician Burnout

Characteristic	Frequencies (%) or Medians (IQR) (N = 38)
Year of publication, n (%)	
2005	1 (2.6)
2006	1 (2.6)
2008	1 (2.6)
2009	1 (2.6)
2010	1 (2.6)
2011	2 (5.3)
2013	1 (2.6)
2014	3 (7.9)
2015	5 (13.2)
2016	2 (5.3)
2017	1 (2.6)
2019	4 (10.5)
2020	3 (7.9)
2021	6 (15.8)
2022	5 (13.2)
2023	1 (2.6)
Journal impact factor, median (IQR)	4 (3, 12)
Intervention type, n (%)	
Coaching/counseling	2 (5.3)
Discussion group	31 (81.6)
Drug (cannabinol)	1 (2.6)
Education on stress reduction/coping strategies	1 (2.6)
Mindfulness/meditation/yoga	1 (2.6)
Schedule changes	1 (2.6)
Control type, n (%)	
Waitlist	18 (47.4)
Active comparator (extra break time, lunch, etc)	8 (21.1)
Nothing	6 (15.8)
Unclear	6 (15.8)
Questionnaire to assess burnout, n (%)	
Copenhagen Burnout Inventory	2 (5.3)
Maslach Burnout Inventory	31 (81.6)
National Study of the Changing Workforce	1 (2.6)
Oldenburg Burnout Inventory	1 (2.6)
Professional Fulfillment Index	1 (2.6)
Professional Quality of Life Scale	1 (2.6)
Shirom-Melamed Burnout Measure	1 (2.6)
Pilot study, n (%)	6 (15.8)
Cluster randomized study, n (%)	4 (10.5)
Crossover study, n (%)	1 (2.6)
Number of participants who completed study, median (IQR)	60 (42, 100)
Age, years (n = 18), median (IQR)	36 (28, 43)
Percentage of male participants (n = 33), median (IQR)	46 (19, 54)
Percentage of white participants (n = 9), median (IQR)	80 (68, 84)
Follow-up time (weeks) from start of intervention, median (IQR)	21.5 (10.8, 50.5)

IQR = interquartile range.

reason (n = 3; non-inferiority, animal, not an intervention to reduce burnout). After reviewing other systematic reviews, we found an additional 9 studies that could be included, resulting in 38 studies for analysis.

Characteristics of the included studies are provided in the Table. Intervention types were often education for stress reduction or coping strategies (n = 15; 39.5%) or mindfulness/meditation practices, including yoga (n = 11; 28.9%). The control groups were often either waitlisted for the intervention (n = 18; 47.4%) or received an active comparator, such as extra lunch time or lunch vouchers (n = 8; 21.1%), but 6 studies (15.8%) were not clear in describing the treatment the control arm received.

Six studies (15.8%) were pilot studies, and 4 studies (10.5%) were cluster randomized studies. The most common questionnaire used to assess physician burnout was the Maslach Burnout Inventory questionnaire (n = 31; 81.6%). The median impact factor of the journals that published included studies was 4 (interquartile range 3, 12).

The studies followed participants for a median of 21.5 weeks, with 28.9% following beyond 6 months.

There was substantial agreement in study quality between 2 of the reviewers (kappa: 0.70; $P < .001$) and fair to good agreement among all 3 reviewers (kappa: 0.42; $P < .001$). The level of risk of bias (yes, unclear, or no) for each of the questions and studies is reported in Figure 1. Most studies had a clear, focused research question (84.2; n = 32), but either no studies or few studies had blinded participants (0%; n = 0), blinded investigators (2.6%; n = 1), or comprehensive reporting of outcomes (18.4%; n = 7). In most studies (57.9%; n = 22), it was unknown if study groups were similar at baseline or had differences at baseline that could lead to confounding. In 61% of studies (n = 23), there was unclear or missing accounting of study participants or loss to follow-up >20%.

Because most studies (81.6%) used the Maslach Burnout Inventory (MBI) to assess burnout, we calculated pooled estimates using only studies that used this assessment. We assessed the 3 main components—emotional exhaustion, depersonalization, and personal accomplishment.

Of the 30 studies that reported on emotional exhaustion, 8 studies (26.7%) reported a lower (more desirable) score or a lower percentage of burnout among those in the intervention group. The positive trials included 2 with a coaching intervention, one with a drug (cannabinol) intervention, 3 with a mindfulness intervention, one with an education intervention, and one with a change in scheduling. For studies reporting mean differences, the mean difference (Figure 2A) in the emotional exhaustion component of the MBI between the intervention arm and the control arm was −1.11 (95% confidence interval [CI], −2.14 to −0.09; I^2: 74.5%; 20 studies). There were significant differences in pooled means (Q = 57.72; $P < .0001$) between intervention types. Studies reporting on coaching or cannabidiol interventions had significant improvements in emotional exhaustion for those receiving the intervention, compared with controls, but there were no significant differences among other intervention types.

	Clear, focused research question?	Randomization?	Participant follow-up accounted for?	Participants 'blinded'?	Investigators 'blinded'?	Assessment 'blinded'?	Study groups similar?	Groups treated equally?	Comprehensive reporting of effects?	Reporting of the estimate of precision?
Trockel, 2023[21]	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes
Kavanaugh, 2022[22]	Yes	No	No	No	No	Unknown	No	No	No	No
Fainstad, 2022[23]	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Dyrbye, 2022[24]	Yes	Unknown	Yes	No	No	Yes	No	No	Yes	Yes
Prudenzi, 2022[25]	Yes	Unknown	No	No	No	Unknown	Yes	Yes	Yes	Yes
Sexton, 2022[26]	Yes	Unknown	No	No	No	Unknown	No	Yes	Yes	Yes
Fendel, 2021[27]	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes
West, 2021[28]	Yes	Unknown	Yes	No	No	Yes	No	Yes	No	Yes
Lebares, 2021[29]	Yes	Unknown	Yes	No	No	Yes	No	Yes	No	Yes
Weitzman, 2021[30]	No	No	No	No	No	Unknown	Yes	Yes	No	No
Crippa, 2021[31]	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Loewenthal, 2021[32]	Yes	Unknown	No	No	No	Yes	Yes	Yes	No	No
Lambert, 2020[33]	Yes	Unknown	No	No	No	Unknown	No	Yes	No	Yes
Congiusta, 2020[34]	No	Unknown	Unknown	No	No	Yes	Yes	Unknown	No	No
Kesselheim, 2020[35]	Yes	Unknown	No	No	No	Unknown	Yes	Unknown	No	Yes
Dunne, 2019[36]	Yes	Yes	No	No	No	Yes	Unknown	Yes	No	Yes
Axisa, 2019[37]	No	Unknown	No	No	No	Yes	No	Unknown	Yes	Yes
Medisauskaite, 2019[38]	Yes	Unknown	No	No	No	Unknown	Yes	No	No	Yes
Dyrbye, 2019[39]	Yes	Unknown	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Ireland, 2017[40]	Yes	Unknown	Unknown	No	No	Unknown	Unknown	Yes	No	Yes
Ripp, 2016[41]	Yes	No	No	No	No	Unknown	Yes	No	No	No
Dyrbye, 2016[42]	Yes	Unknown	Yes	No	No	Yes	Yes	Unknown	No	Yes
Linzer, 2015[43]	No	Unknown	No	No	No	Unknown	No	Unknown	No	No
Parshuram, 2015[44]	Yes	Yes	Yes	No	No	Yes	Unknown	Yes	No	Yes
Gunasingam, 2015[45]	Yes	Yes	Yes	No	No	Yes	No	Yes	Unknown	Yes
West, 2014[46]	Yes	Yes	Yes	No	No	Yes	No	Yes	No	No
Ali, 2011[47]	Yes	No	Yes	No	No	Unknown	Unknown	Yes	Unknown	Yes
Amutio, 2015[48]	Yes	Unknown	Unknown	No	No	Unknown	Unknown	No	No	No
Asuero, 2014[49]	No	Unknown	Yes	No	No	Unknown	Yes	Yes	No	Yes
Bragard, 2010[50]	Yes	Unknown	No	No	No	No	No	Yes	No	No
Butow, 2015[51]	No	Unknown	No	No	No	Unknown	Yes	Unknown	No	No
Butow, 2008[52]	No	Unknown	No	No	No	Unknown	Yes	Unknown	No	No
Margalit, 2005[53]	Yes	Unknown	Yes	No	No	No	Unknown	Unknown	No	No
Milstein, 2009[54]	No	Unknown	Unknown	No	No	Unknown	Unknown	Yes	No	No
Shae, 2014[55]	Yes	Unknown	No	No	Yes	Yes	Unknown	Yes	No	No
Martins, 2011[56]	Yes	Unknown	No	No	No	Unknown	Yes	Unknown	No	No
Oman, 2006[57]	Yes	Unknown	No	No	No	Unknown	Unknown	Yes	No	No
Moody, 2013[58]	Yes	Yes	No	No	No	Unknown	No	No	No	No

Green shading: study element complete; rust: study element incomplete; gray: study element not evaluable.

Figure 1 Risk of bias assessments for randomized studies testing an intervention to reduce physician burnout, by question and trial. Green shading: study element complete; rust: study element incomplete; gray: study element not evaluable.[21-57]

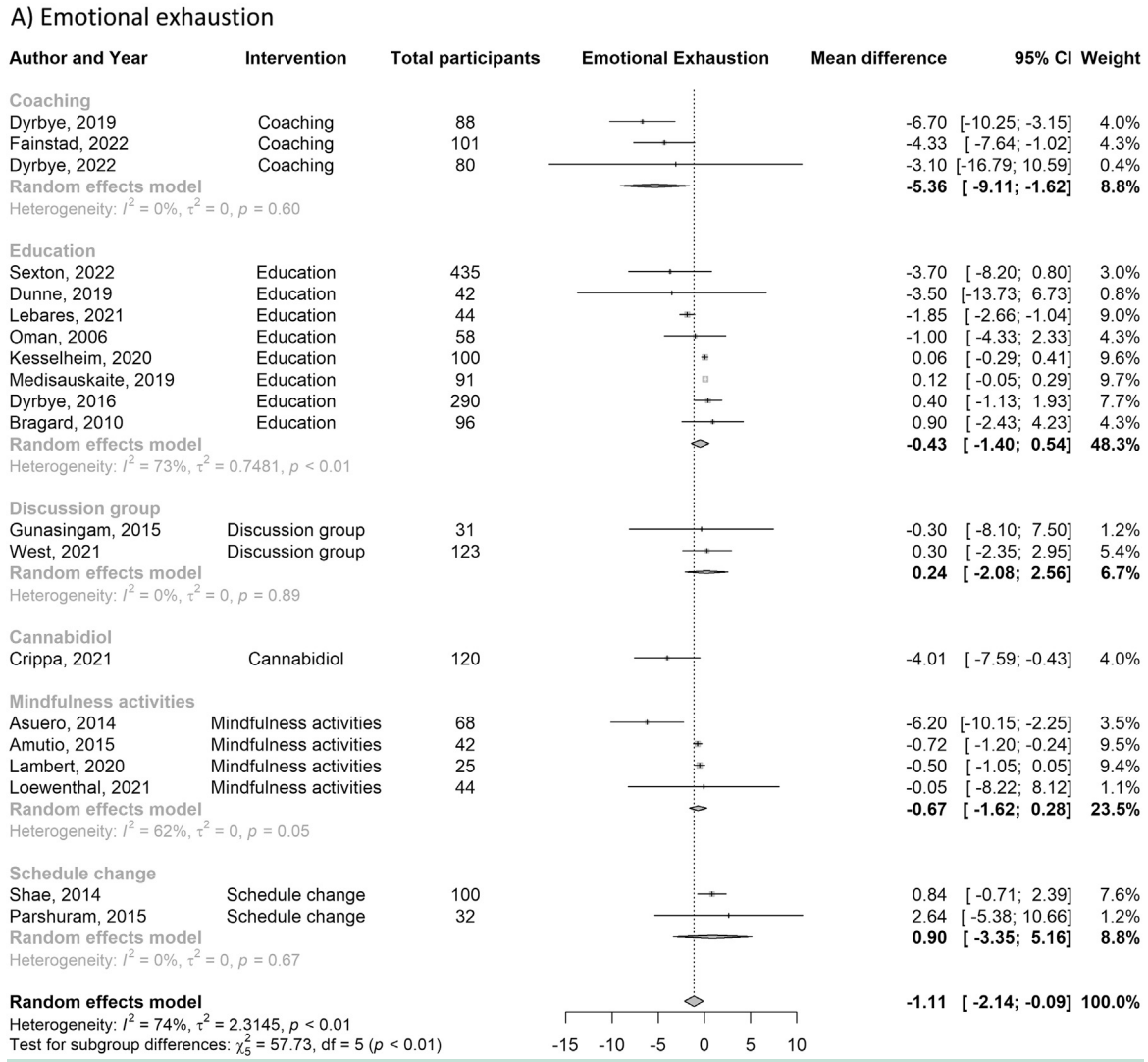

Figure 2 Pooled mean differences in burnout scores (Maslach Burnout Inventory domains) between intervention and control groups included in randomized trials assessing interventions aimed at reducing burnout in physicians and other healthcare workers.

Of the 25 studies that reported on depersonalization, 4 (16.0%) reported a lower (more desirable) score or a lower percentage of burnout among those in the intervention group. The positive trials included one with a coaching intervention, one with education, and 2 with a mindfulness intervention. The mean difference (Figure 2B) in the depersonalization component of the MBI between the intervention arm and the control arm was −0.32 (95% CI, −0.63 to −0.01; I^2: 54.2%; 17 studies). There were significant differences in pooled means (Q = 44.24; P < .0001) between intervention types. Studies reporting on coaching interventions had significant improvements in emotional exhaustion for those receiving the intervention, compared with controls, but there were no significant differences among other intervention types.

Of the 21 studies that reported on personal accomplishment, one reported a higher (more desirable) score or a lower percentage of burnout among those in the intervention group. The positive trial tested an education intervention. The mean difference (Figure 2C) in the personal accomplishment component of the MBI between the intervention arm and the control arm was 1.11 (95% CI, −0.21 to 2.43; I^2: 94.3%; 16 studies). There were no significant differences in pooled means (Q = 1.99; P = .74) between intervention types.

Of the 6 studies that used a burnout assessment other than the MBI, 3 studies (50%) reported significant improvements in burnout among those assigned to the intervention arm, compared with those assigned to the control arm.

DISCUSSION

We found that interventions to reduce physician burnout were diverse in intervention type, were often tested in small or pilot studies, were tested in studies with notable bias,

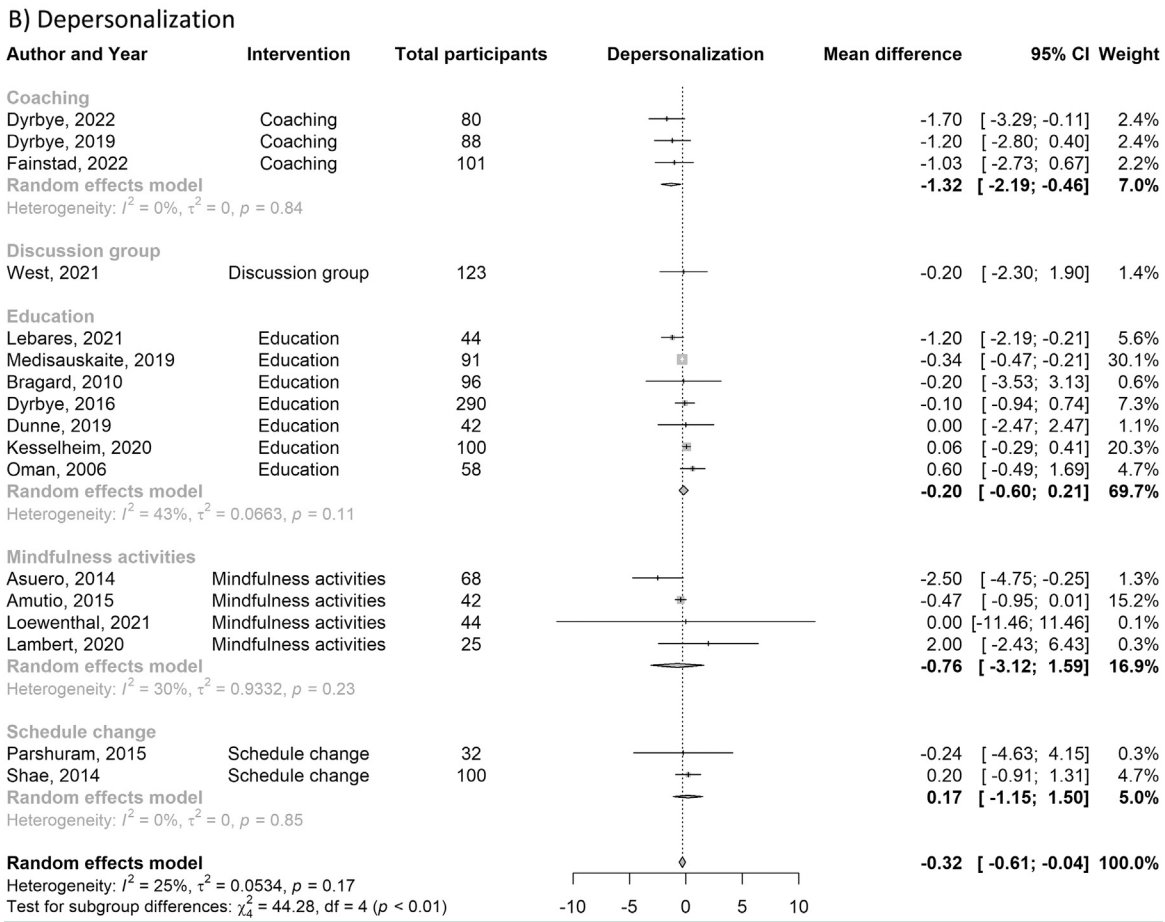

Figure 2. Continued

and rarely led to meaningful clinical improvements in burnout scores.

Physicians and other health care workers are faced with tremendous professional pressures, and time is extremely valuable for people, especially overburdened physicians. Strategies to reduce burnout need to consider the extra time participants need to devote to an intervention. Strategies that require physicians to spend extra hours attending classes, which could have been spent completing work tasks, may not offset the extra stress that is created by an extended workday. Further, strategies for reducing burnout may be more of a band-aid for reducing burnout and may not address the root cause of burnout.

There are multiple ways to assess burnout. Most studies on interventions to reduce physician burnout use the MBI, which has 3 components (emotional exhaustion, depersonalization, and personal accomplishment). Emotional exhaustion scores of ≥27 (scale of 0-54), depersonalization scores of ≥13 (scale of 0-30), and personal accomplishment scores of ≥39 (scale of 0-48) are considered "high" and indicate a high degree of burnout.[15,16] Overall, we found that there were significant differences in emotional exhaustion (mean difference of −1.11) and depersonalization (mean difference of −0.32), but the overall differences were small and unmeaningful, especially in the context of "high" scores. Further, the benefit was largely limited to interventions of a personal coaching nature, which were more likely to result in meaningful differences.

Coaching interventions may be unique from other interventions studied because they are often administered at the individual level, and the coaching can address specific issues that the individual is experiencing or concerns that the individual may have. Alternatively, group discussion activities may be less helpful because of the generic nature of the discussions, or the discussions being driven by a single individual with concerns less relevant to the group at large. Mindfulness activities, while maybe helpful in the moment, may only delay feelings of stress and burnout.

The single study that included a drug intervention (cannabidiol) showed a positive effect.[17] It should be noted that even though the intervention reduced burnout, there were serious adverse events among those taking cannabidiol, including increased liver enzymes (>3-fold higher than upper limit). Further, the study did not examine whether taking cannabidiol affected work performance and patient quality of care.

We noted bias in the study design of many studies. Most studies did not have blinding by either the participant or the

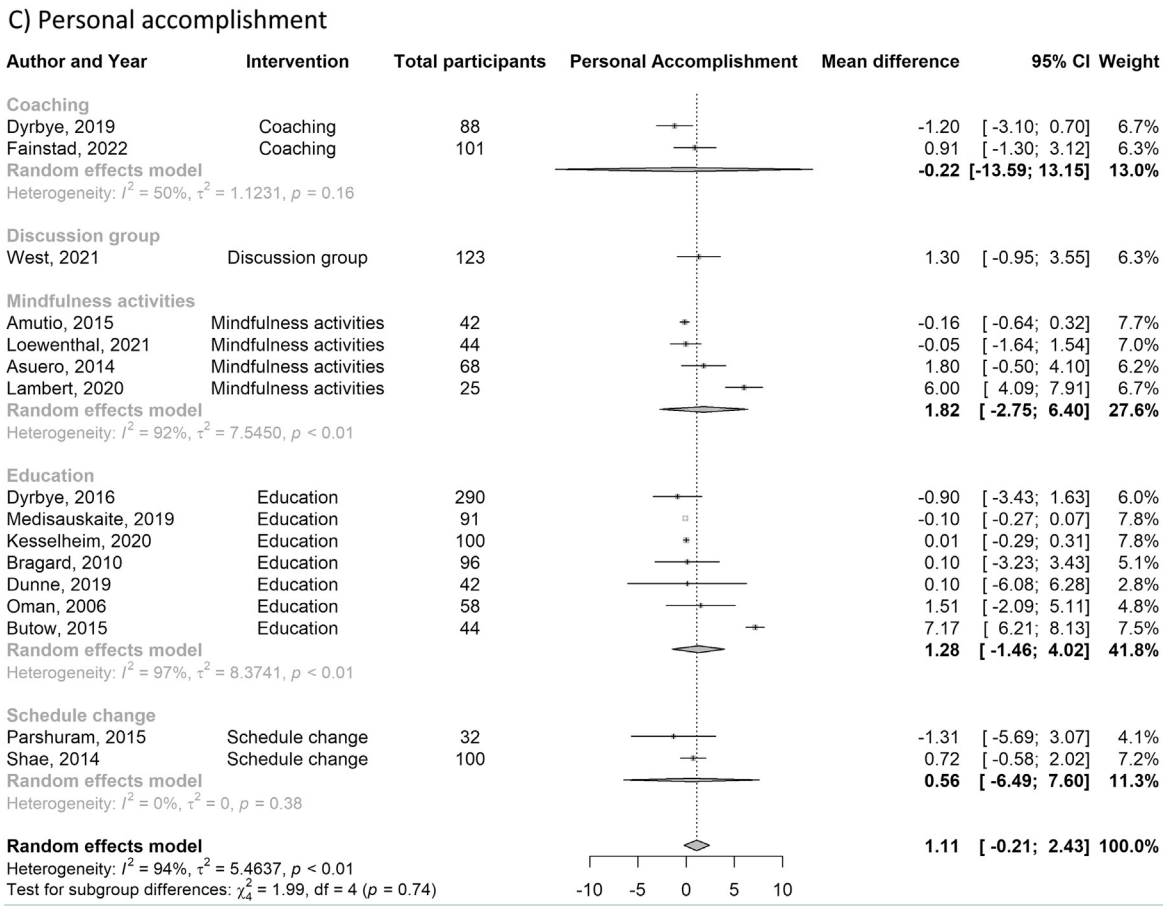

Figure 2. Continued

investigator; most studies had multiple outcomes, with reporting focused on only the significant findings; most studies were unclear on the number of study participants at each stage; and most either had differences in baseline characteristics between intervention and control group or did not assess differences. Each of these elements can bias the results, often resulting in a type I error.

Two prior meta-analyses have reported overall favorable outcomes for interventions to ameliorate physician burnout, but these prior works include nonrandomized studies, which are prone to more bias than randomized studies.[18,19] Moreover, many studies have been published since these prior meta-analyses, adding to the total body of evidence.

Limitations

We note several limitations in our analysis. First, we may not have captured all randomized studies on the topic. We did a systematic and comprehensive search, and we reviewed prior meta-analyses to add to our list. Second, our results may not be generalizable because 1) we included studies that also included other health care professionals, and 2) many studies had a high percentage of females, which are not representative of physicians at large.[20] Third, we relied on information reported by the author. There are differences in reporting between researchers and journals, and most studies were lacking in detail to comprehensively capture all methodology and results.

CONCLUSION

We note that, while interventions to reduce burnout in physicians result in overall significant numerical improvements in emotional exhaustion and depersonalization, these differences are unmeaningful and unlikely to result in changes in clinical burnout, and are largely restricted to coaching interventions, rather than educational, discussion, or mindfulness activities. Further, the notable bias in these studies may result in inaccurate estimates. Future research with better study quality should better examine the root causes of burnout so that effective interventions can be developed.

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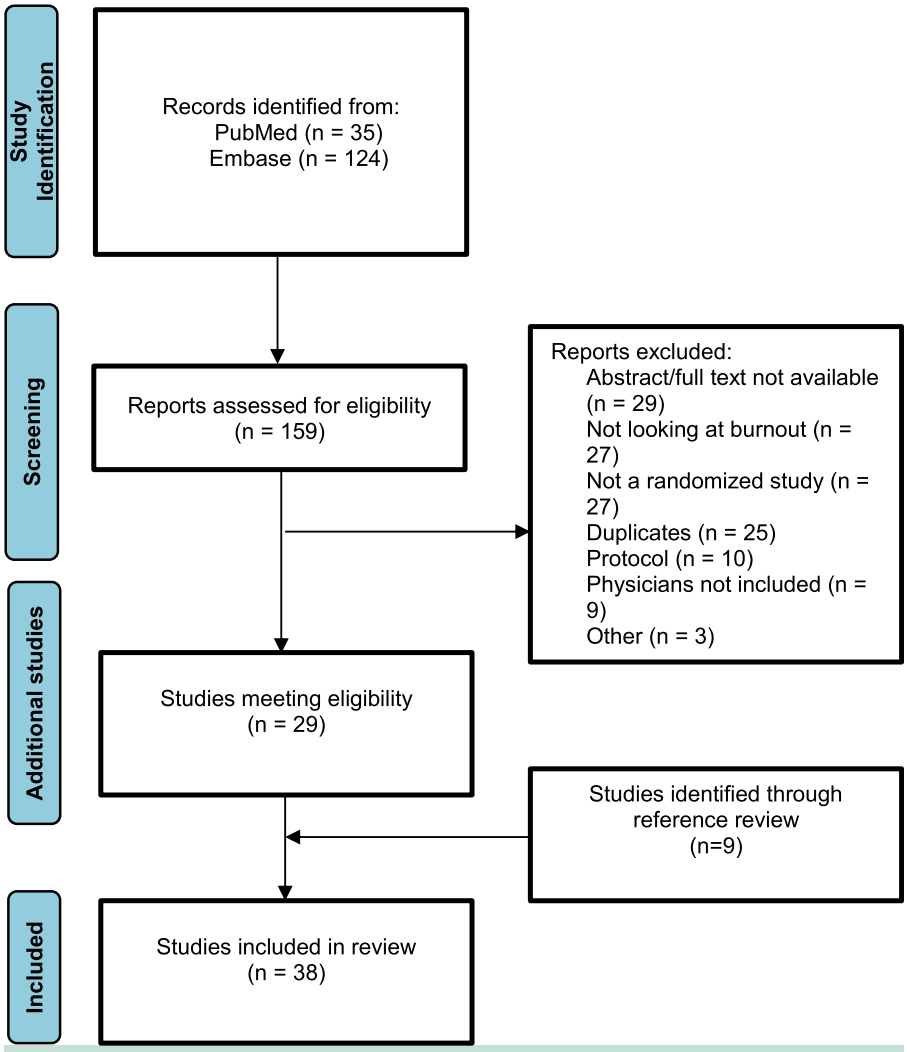
SUPPLEMENTARY DATA

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amjmed.2023.10.003.



Supplementary Figure Flowchart of selecting randomized trials assessing interventions to reduce physician burnout.