Addressing Health Care Workers' Mental Health: A Systematic Review of Evidence-Based Interventions and Current Resources

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Background. Mental health is declining in health care workers.

Objectives. To provide a comprehensive assessment of intervention literature focused on the support and treatment of mental health within the health care workforce.

Search Methods. We searched online databases (e.g., Medline, PsycINFO).

Selection Criteria. We selected manuscripts published before March 2022 that evaluated the target population (e.g., nurses), mental health outcomes (e.g., burnout, depression), and intervention category (e.g., mindfulness).

Data Collection and Analysis. Of 5158 publications screened, 118 interventions were included. We extracted relevant statistics and information.

Main Results. Twenty (17**%**) earned study quality ratings indicating design, analysis, and implementation strengths. Randomized controlled trials were used by 52 studies (44**%**). Thirty-eight percent were conducted in the United States (n = 45). Ninety (76**%**) reported significant changes, and 46 (39**%**) reported measurable effect sizes. Multiple interventions significantly reduced stress (n = 29; 24**%**), anxiety (n = 20; 17**%**), emotional exhaustion or compassion fatigue (n = 16; 14**%**), burnout (n = 15; 13**%**), and depression (n = 15; 13**%**).

Authors' Conclusions. Targeted, well-designed mental health interventions can improve outcomes among health care workers.

Public Health Implications. Targeted health care–focused interventions to address workers' mental health could improve outcomes within this important and vulnerable workforce. (*Am J Public Health*. 2024;114(S2):S213–S226. https://doi.org/10.2105/AJPH.2023.307556)

PLAIN-LANGUAGE SUMMARY

We searched research publications to locate interventions that aimed to improve mental health among health care workers, such as nurses and medical doctors. The interventions were designed to offer support, such as training or counseling, to health care workers who were having symptoms of poor mental health, such as burnout, stress, or anxiety. We screened 5158 science journal articles and found 118 different interventions that had been offered to health care workers. Each article was evaluated to rate the degree to which they used accepted scientific methods of research. Most studies used strong research designs and contained valuable information about methods to improve mental health among health care workers. More than one third of the interventions were conducted in the United States, and most of the others were conducted in in Canada or Europe. Several interventions were successful in improving symptoms of stress, burnout, anxiety, and depression among health care workers.

Since 2020, mental health in the workplace has ranked among the most critical areas of research and practice by major organizations worldwide.[1,2] In any given year, mental health issues create an economic burden in the United States of $225 billion attributable to costs associated with medical care and lost productivity.[3] In the general workforce, mental

health issues (e.g., distress, burnout) and mental illnesses (e.g., anxiety, depression) are associated with increased absenteeism and presenteeism (i.e., lost productivity or reduced performance), turnover, and increased rates of short- and long-term disability.[4–6]

Within the health care sector, the consequences of poor worker mental health have never been more troubling. Before COVID-19, more than 50% of clinicians reported experiencing some level of burnout because of challenges associated with short staffing, long hours, high job demands, and compassion fatigue.[7–9] This number rose to 76% within the first year of the pandemic.[10] Benefits surrounding mental illness (i.e., diagnosable psychological disorders classified within the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* [*DSM-5*; Washington, DC: American Psychiatric Association; 2013]) have grown substantially, with many organizations now offering funding for psychological services.[11] Those who invest in mental health support and intervention see an estimated return on investment (ROI) of $4 per dollar invested.[12]

The purpose of this systematic review is to provide information from evidence-based literature describing mental health interventions that have been evaluated within health care populations and to evaluate the quality of those interventions. The target audience for implementation of this review is academicians and practitioners in public health, health care administrators, leaders, and safety and human resources professionals.

METHODS

For this review, we considered all relevant peer-reviewed and gray literature describing workplace mental health interventions targeting health care workers. We defined 3 key operational definitions by the following search terms (* indicates truncation, which allows for inclusion of all terms that begin with a specified string of characters):

- Target population: physician, nurse, doctor, surgeon, provider, clinician, resident, "first responder," "health care worker," "healthcare worker," "care provider," "home care worker," "homecare worker," "home health aide," "hospice worker," "health aide"
- Mental health: depress*, burnout, anx*, fatigue, stress, distress, strain, satisfaction, "quality of life," well-being/wellbeing/"well being"/"well-being," "mental health"
- Intervention: intervention, program, training, computer-based, online, resource, app, program, "peer support," "support group," "social support," "supervisor support," policy, redesign, "work redesign," "organization level," "individual level," "system level"

Key terms were made intentionally broad to include all medical professions, intervention types, and health care settings. Articles were gathered and initially screened for relevance by a senior research associate with advanced expertise in systematic review methodology (LA). The following sources were searched to identify potentially relevant publications, using an OR/AND search strategy combining the terms listed previously:

- Ovid MEDLINE ALL
- PsycINFO
- PubMed
- National Institute for Health and Care Excellence
- Agency for Healthcare Research and Quality Project Database
- Patient-Centered Outcomes Research Institute Project Database
- National Institute for Occupational Safety and Health Project Database
- Effective Healthcare Program
- Google Scholar and DuckDuckGo

The initial search placed no restrictions on language, location, or time, searching all peer-reviewed and gray literature up to March 2022. We considered all studies employing either a pre–post or post-only design to evaluate an intervention (broadly defined), including randomized controlled trials, quasi-experimental studies, qualitative post hoc evaluations, case studies, and program descriptions that included a data collection component. We mined systematic reviews and meta-analyses in health care mental health for additional references.[13–29]

We imported all relevant literature into Zotero[30] and Covidence[31] (systematic review software). Articles were rated by at least 2 senior researchers (WKA, JD, LA). In the first screening phase, articles were rated for inclusion or exclusion based on titles and abstracts (scale: Yes, No, Maybe). Second, a full-text review was conducted for articles rated as "Yes" or "Maybe" during the abstract review phase. Full publications were reviewed in depth to determine whether they met inclusion criteria: (1) recruited health care workers (broadly defined), (2) measured 1 or more mental health–related outcomes, and (3) introduced a mental health–focused intervention (e.g., resource, tool, exercise, policy, program, training) of some form. Exclusion criteria were (1) the intervention was not specific to mental health (e.g., job performance, patient care skills training), (2) the

sample did not include at least 1 type of medical personnel, and (3) the full publication was not available in English.

Included articles underwent a quality rating process using a slightly adapted version of the validated Downs and Black (D&B) measure.[32] The final D&B measure consisted of 25 items to rate articles' study quality, external validity, internal validity—bias, internal validity—confounding, and power. A final item was added to the rating process to assess the raters' confidence (1 = not at all confident; 4 = very confident) that the true intervention effect lies close to the authors' estimate of the effect. This item was derived from the GRADE rating protocol.[33]

We analyzed level of agreement (percentage) and interrater reliability (IRR; Cohen's κ)[34,35] to assess whether raters met the desired threshold of 80% agreement at each phase of the process. Initial IRR (Cohen's κ) was 0.79 during abstract review, 0.76 during full-text review, and 0.42 for the D&B study quality rating assessment (initial % agreement = 85%; R^2 = 0.76). Following completion of the D&B rating and analysis phase, the team discussed points of disagreement, reconsidered the literature quality, and produced a revised consensus used in the final data tables (revised D&B IRR = 0.84).

RESULTS

The search yielded 5158 publications (4951 peer-reviewed) for preliminary screening (single-reviewer). After removing duplicates and irrelevant publications (e.g., patient-focused, nonwork setting), 628 abstracts were screened for inclusion, and 211 articles underwent full-text review (Figure 1).

One hundred twenty-two publications (describing 118 interventions) met inclusion criteria. All included publications were peer-reviewed articles.

Study quality, assessed by the D&B criteria, had a maximum of 25 points available; the 3 highest rated[36–38] received 22 points. Seventeen publications earned D&B quality ratings between 20 and 21 (14%).[39–55] Forty-eight (41%) were rated between 15 and 19[56–103]; the remaining 42% were rated 14 or below.[104–153] Overall, 13 articles (11%) received the highest confidence rating (4) while 19 (16%) received a rating of 3.5 (Table 1).

Study Design

Most interventions employed a randomized controlled (n = 552; 44%) trial or quasi-experimental design (n = 50; 42%), defined as either (1) a single-group study design (no comparison group) with 2 data collection timepoints or (2) a multigroup study with a single timepoint for data collection (postintervention only).

Setting

Evaluations were conducted in a hospital setting (n = 85; 72%), online (n = 15; 13%), at a nonhospital facility (n = 10; 8%), or miscellaneous (e.g., multiple; telephone, mail, unspecified; n = 8; 7%). Programs were typically implemented and accessed during work hours. Studies were conducted in 25 countries. Most interventions were conducted in the United States (n = 45; 38%), Italy, and Canada (n = 9 each; 8%).

Sample Sizes

The number of participants in the 118 interventions ranged from 11 to 1575. Forty-six (38%) had fewer than 50 participants (with 7 having fewer than 20); 27 (23%) had between 51 and 100

participants, and 27 (23%) had between 101 and 249 participants. Eighteen interventions (15%) had 250 or more participants; including 4 (3%) with 1000 or more (Table A, available as a supplement to the online version of this article at https://ajph.org).

Health Care Worker Occupation

Nurses were recruited to the interventions most frequently (n = 78; 66%), followed by physicians (n = 41; 35%). Twenty-two (19%) did not provide specific demographics on job titles.

Intervention Category

From the 118 interventions, 7 categories emerged:

1. coping skills development (e.g., resilience-building, help-seeking, responding to stressors),
2. mindfulness (e.g., mindfulness and similar practices such as directed meditation),
3. health literacy and anti-stigma (e.g., mental health or general health-related awareness, stigma reduction),
4. peer support (e.g., focus on teams, relationship building, or support between coworkers),
5. organizational and system level (e.g., focus on policies, cultural change, and large-scale resources),
6. reflection and relaxation (e.g., writing or artistic exercises, creativity, and conveying gratitude), and
7. medical (e.g., medical, including pharmaceutical, treatment).

Thirty-one (26%) of the intervention methods fit into multiple categories. The number and percentage of categories is shown in Table 2 (see note).
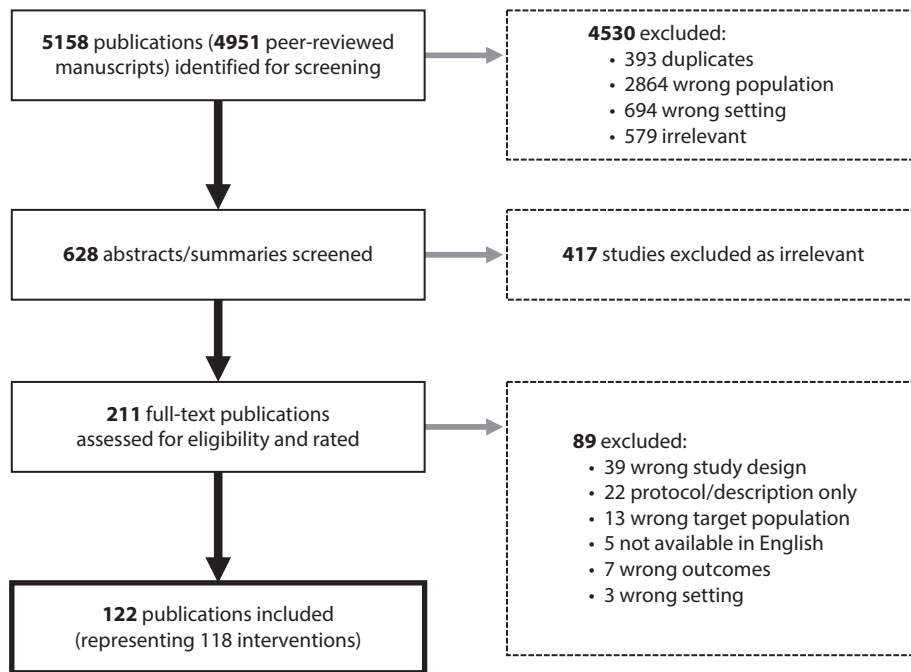
FIGURE 1— **PRISMA Figure Depicting the Articles Examined and Included in the Systematic Review**

Note. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Prevention Category

Workplace mental health interventions are often categorized as primary, secondary, or tertiary prevention. Primary interventions are designed to prevent illness, injury, and disease before they occur.[154] Secondary interventions, often considered "early interventions," are designed to treat an existing illness or injury, slow its progression, and help the individual recover. Tertiary interventions are designed to help people manage the long-term, and often complex, health problems associated with an injury or illness that has progressed to a point that is debilitating.

Most articles did not specify which prevention category they were targeting. To assess this factor, an expert in mental health interventions (JD) coded the literature into prevention categories. Some interventions are categorized as hybrid format, both primary and secondary or secondary and tertiary, because of the dual purpose of the intervention (e.g., an intervention focused on both preventing and reducing symptoms). Twenty interventions provided primary, 40 secondary, and one tertiary prevention. The number and percentage of categories are shown in Table 2.

TABLE 1— **Number of Mental Health Intervention Articles Meeting Quality and Confidence Ratings by Ranges**

	No. of Articles (%, Rounded)
Quality rating[a] (D&B)	
20–22	20 (17)
15–19	48 (41)
6–14	50 (42)
Confidence rating[b]	
4	13 (11)
3.5	19 (16)
3	24 (20)
2.5	22 (19)
2	26 (23)
1.5	8 (7)
1	6 (5)

Note. D&B = Downs and Black.[32] Larger number = better rating.
[a]Quality rating assessed study quality, external validity, internal validity—bias, internal validity—confounding, and power.
[b]Confidence rating assessed raters' confidence that the true intervention effect lies close to the authors' estimate of the effect. Ratings calculated as a mean of two raters.

TABLE 2— Number of Mental Health Interventions by Intervention and Prevention Category

	No. of Interventions (%)
Intervention category	
Coping skills development	38 (32)
Health literacy and anti-stigma	25 (21)
Mindfulness	33 (28)
Peer support	16 (14)
Organizational and system level	11 (9)
Reflection and relaxation	25 (21)
Medical	4 (4)
Prevention category	
Primary	20 (17)
Primary/secondary	44 (37)
Secondary	40 (33)
Secondary/tertiary	13 (11)
Tertiary	1 (1)

Note. Thirty-one intervention methods fit within 2 or more intervention categories. These 31 interventions are counted multiple times within this table, leading to a total of 152.

Individual Versus Organizational Interventions

We coded interventions as organizational (e.g., changes to the work environment to support employee mental health), individual (e.g., education or training on coping or self-help strategies to prevent or reduce mental health symptoms), or a combination of the 2. Individual interventions predominated (n = 98; 83%), while only 8 interventions (7%) were coded as organizational and 12 (10%) judged to address both.

Mental Health Outcomes

Table 3 lists the mental health–related outcomes measured across the intervention articles. The most common mental health outcomes were stress (n = 48; 41%), burnout (n = 40; 34%), and anxiety, depression, and emotional exhaustion or compassion fatigue (each had an n = 31; 26%); this is consistent with the most frequently identified mental health issues reported by health care professionals before and during the COVID-19 pandemic (2020–2022).[9,12]

Statistically Significant Changes and Effect Sizes

Statistically significant improvements were reported by 90 (76%) of the interventions. Measures of the effect size were reported, or in some cases calculated by the authors using reported data and an effect size calculator,[155] by 46 interventions (39%). Effect sizes were calculated with Cohen's d (small = 0.2; medium = 0.5; large = 0.8),[156] η-squared (η^2) or partial η^2 (small = 0.01; medium = 0.06; large = 0.14),[157] the correlation statistic R^2 (small = 0.00; medium = 0.03; large = 0.14),[156,157] and delta (Δ; small = 0.2; medium = 0.5; large = 0.8).[158] See Table 3 for effect sizes by outcome.

Overall, several interventions reported significant changes in key outcome measures: stress (29 interventions; 14 effect sizes, 5 large), anxiety (20 interventions; 12 effect sizes, 6 large), depression (15 interventions; 8 effect sizes; 4 large), emotional exhaustion or compassion fatigue (16 interventions; 11 effect sizes, 4 large), and burnout (15 interventions; 6 effect sizes, 2 large). In addition, multiple interventions improved most measures in the category of general health and well-being. See Table 3 and Table B (available as a supplement to the online version of this article at https://ajph.org).

Time Commitment for Participants

Many (n = 90; 76%) of the publications noted the amount of time spent on the intervention at work by the participants (listed in Table A). The range was 0 (conducted outside work time) to 50 hours; 55 interventions (47%) required 10 or fewer hours.

DISCUSSION

The 118 interventions (122 publications) described in this review focused on outcomes related to general mental health and well-being, as well as mental health issues and illnesses, including depression, anxiety, psychological strain, stress, burnout, and compassion fatigue. Findings suggest that targeted, well-designed mental health–focused interventions have the potential to lead to significant improvements in mental health outcomes among health care workers.

Interventions That Improved Outcome Measures

Of the 118 interventions included in this review, 97 were associated with

TABLE 3— Mental Health Outcomes Targeted by Interventions

Outcomes	No. of Interventions	No. With Significant Changes[a]	No. With Effect Sizes[b]	Effect Size, No.		
				Large	Medium	Small
General health and well-being						
Sleep/exhaustion	12	7	3	0	2	1
Mental health	14	5[c]	4[c]	2[c]	1[c]	1
General health	12	8[c]	4	2	1	1
Affect	10	7	6	2	4	0
Well-being	13[c]	10[c]	7	4	1	2
Quality of life	11	8	7	4	2	1
Somatization	3	2	0	0	0	0
Stress and strain						
Stress	48	29	14	5	6	3
Distress	14	9	4	3	0	1
Posttraumatic stress disorder	6	2	1	1	0	0
Strain	5	3	2	1	0	1
Depression	31	15	8	4	3	1
Anxiety	32	20[c]	12[c]	6[c]	2	4
Burnout and compassion fatigue						
Burnout	40	15	6	2	3	1
Emotional exhaustion or compassion fatigue	30	16	11	4	2	5
Emotions and attitudes						
Psychosocial functioning	5	2	1	1	0	0
Happiness	2	1	0	0	0	0
Anger	2	1	0	0	0	0
Mental health stigma	2	2	0	0	0	0
Resilience and coping						
Social support	15	8	2	1	0	1
Coping	10	1	1	0	1	0
Demands	6	1	1	0	1	0
Support seeking	5	2	0	0	0	0
Drinking behaviors	6	3	0	0	0	0
Work–life balance	7	3	2	0	1	1
Resilience	7	6	4	1	2	1
Mindfulness						
Mindfulness	13	8	6	2	3	1
Self-compassion	7	5	4	0	2	2
Psychological flexibility	4	2	1	0	1	0
Awareness	2	2	0	0	0	0
Self-efficacy and self-esteem						
Confidence	10	7	3	1	1	1
Self-efficacy	8	5	2	1	1	0
Inadequacy	1	1	0	0	0	0

Continued

TABLE 3— Continued

Outcomes	No. of Interventions	No. With Significant Changes[a]	No. With Effect Sizes[b]	Effect Size, No.		
				Large	Medium	Small
Civility and relationships						
Trust	1	1	1	1	0	0
Civility/incivility	5	5	2	1	0	1
Empathy	2	2	2	0	2	0
Respect	2	2	1	1	0	0

[a]Number of interventions with at least 1 significant change in a measure over time from baseline to follow-up or in rare cases from postintervention to a subsequent follow-up.
[b]Number of studies that included effect sizes.
[c]Two intervention methods in 3 studies produced 2 differences, and 2 of those produced 2 effect-size results. Effect sizes were defined as follows: Cohen's d: small = 0.2; medium = 0.5; large = 0.8; η^2 or partial η^2: small = 0.01; medium = 0.06; large = 0.14; R^2: small = 0.00; medium = 0.03; large = 0.14; and Δ: small = 0.2; medium = 0.5; large = 0.8. Details are noted in Table A (available as a supplement to the online version of this article at https://ajph.org).

significant reductions in mental health outcome measures highly relevant to the health care sector (i.e., stress: n = 29; anxiety: n = 20]; emotional exhaustion or compassion fatigue: n = 16; burnout: n = 16; and depression: n = 15). Randomized controlled trial designs were used in several of these studies, showing improvement in stress (n = 17), emotional exhaustion or compassion fatigue (n = 10), depression (n = 9), anxiety (n = 9), and burnout (n = 7). Importantly, nearly one fourth (n = 27; 23%) of the observed improvements in mental health outcome measures met the criteria for a large effect size, and 12 (30%) of the 40 interventions rated 18 (D&B) or better produced large effect-size changes in outcome measures including all of the 5 highly relevant outcomes, indicating that the changes reported by participants were large enough to be meaningful in the real world.[156] By participating in interventions associated with large effect sizes in mental health outcomes, health care workers may experience real, perceptible improvements in their mental health.

Interventions that incorporated mindfulness and coping skills development using formal therapeutic approaches (e.g., acceptance and commitment therapy [ACT], cognitive behavioral therapy [CBT]) tended to result in the most significant changes in measures of mental health outcomes. Though there were proportionately fewer, relaxation and reflection interventions with techniques that varied much more widely (e.g., art therapy, expressive writing, yoga) were also associated with positive changes in mental health outcome measures. Mindfulness, coping skills development, and relaxation and reflection interventions repeatedly influenced measures of burnout, stress, depression, emotional exhaustion, and general well-being (Table A).

Interventions that incorporated multiple foci (e.g., increased awareness of mental health and training for workers on how to improve coping skills) were also associated with improvements in mental health outcome measures. For instance, interventions focused solely on education and awareness related to health literacy and anti-stigma rarely resulted in changes to mental health outcome measures. Instead, they tended to be associated with improvement in more general outcomes, such as improved confidence and reduced mental health stigma. However, when combined with other intervention strategies, such as coping skills development, reflection and relaxation, and peer support, interventions using health literacy and anti-stigma strategies were associated with improvements in mental health measures. Although there were few interventions that employed medical intervention methods (e.g., cannabidiol therapy, transcranial magnetic stimulation), these intervention strategies were also associated with significant reductions in measures of anxiety and depression, indicating significant promise.

Several interventions reported multiple outcome measure changes with large effect sizes: Civility, Respect, and Engagement at Work (CREW; 7 outcomes); Stress Management and Resiliency Training (SMART; 5 outcomes); MINDBODYSTRONG and Brief Mindfulness-Based Stress Reduction (MBSR; 4 each); and Mindfulness-Based Resilience Training (MBRT), Acupressure and Emotional Freedom Techniques (EFT), expressive writing, and enhancing resilience (3 each). Considering specific mental health outcomes, 9 interventions produced large effect size changes for measures of stress, strain, or distress (i.e.,

gratitude journaling, ACT+CBT, repetitive transcranial magnetic stimulation (RTMS), Acupressure and EFT, SMART, MINDBO-DYSTRONG, reflective debriefing, enhancing resilience, ACT); 5 produced large effect-size changes in anxiety measures (Acupressure and EFT, SMART, MINDBO-DYSTRONG, stretch-release and cognitive relaxation, Life and Death—The Same Preparation), and in burnout and emotional exhaustion or compassion fatigue measures (MBRT, Mental Health Promotion, Acupressure and EFT, Promote Professionalism and Mental Health, MBSR); and 4 resulted in large changes in depression (RTMS, expressive writing, MINDBODYSTRONG, enhancing resilience). All but 3 of these interventions were designed as randomized controlled trials, and 5 of the interventions listed for stress, 2 for anxiety, 1 for depression, and 4 for emotional exhaustion or compassion fatigue and burnout carry D&B ratings of 18 or more.

Among the most highly rated studies (D&B quality ratings), interventions that focused on coping skills development and mindfulness had the most studies (n = 26; 22% each) to demonstrate improvements in mental health outcome measures. Coping skills development interventions were also associated with the highest number of large intervention effect sizes (n = 6) among the 5 key outcome measures, and mindfulness was associated with 4. Following coping skills development interventions was "reflection and relaxation" (n = 20; 17%; 4 large effect sizes in key outcome measures). The most impactful coping skills development interventions were SMART (7 outcome measures improved, 7 with effect sizes, 5 large; D&B rating = 20; though a quasi-experimental design) and Acupressure and EFT (3 outcomes, 3 with effect sizes, all large; D&B = 19; randomized controlled trial), and the

most impactful mindfulness interventions were Mindfulness-Based Cognitive Therapy for Life (6 outcomes, 6 with effect sizes, 1 large; D&B = 21; randomized controlled trial) and ACT+CBT (4 outcomes, 4 with effect sizes, 2 large; D&B = 19; randomized controlled trial).

Interventions that targeted peer support or organizational- and system-level improvements tended to produce mixed findings. Some peer-focused interventions demonstrated medium or large effect size results on multiple work outcome measures (e.g., turnover intentions, job satisfaction) and personal outcomes (e.g., affect; see CREW), but not on mental health outcomes. Others only had small to medium effect-size changes on mental health, but none on work. Patterns of results were similar for organizational- and system-level interventions unless combined with individual intervention strategies, which tended to be associated with mental health improvements—as was the case with multifocused interventions incorporating peer support strategies.

It is important to acknowledge that a statistically significant improvement in a mental health outcome does not necessarily translate to a significant, recognizable, or universal improvement in health for all participants. Organizations must recognize that intervention "effectiveness" will vary among workers depending on outcomes of interest, individual differences, and the status of employees' mental health at the onset of the intervention.

Study Quality

Most reviewed evaluations had high study quality ratings; 20 earned a high-quality rating (greater than 19 on a 25-point scale), and another 48 earned relatively high ratings (15–19) for a total

of 58% of the interventions, based on research methods and design elements, indicating design and implementation strengths. Among the 118 interventions, there were 52 randomized controlled trials and 50 quasi-experimental designs. Thus, 44% of the evaluations used the most robust design methods used in field research, while an additional 42% used strong designs but without the strength of randomization to avoid biases. Similarly, 32 (27%) earned the authors' confidence ratings of 3.5 or higher on a 4-point scale. Findings associated with higher-quality studies, such as those that are adequately powered and used more rigorous evaluation methods (e.g., randomized controlled trials), are more likely to be reflective of true, and potentially replicable, benefits of their associated interventions.

The findings associated with lower-quality study designs may still be valid and reliable, but it is more challenging to determine whether findings, or a lack thereof, were attributable to chance, inadequate power, or confounding variables. For instance, some of the evaluations lacked rigorous designs, used underpowered sample sizes (few reported power analyses), did not use control groups or intent-to-treat analytic strategies, and did not explore the long-term duration of the intervention effects. Most evaluations (62%) relied on 100 or fewer participants, with 39% using 50 or fewer participants. Only 15% recruited more than 250 participants. These methodological challenges make it unclear whether nonsignificant outcomes were the result of underpowered samples or ineffective interventions.

Availability and Cost

Cost-related justifications or ROI calculations were rare among the evaluated

interventions. Of the 6 that included a measure of ROI, 4 saw significant improvements in worker attendance (e.g., absences). When implementing intervention programs, organizations should aim to weigh the ratio of costs to benefits associated with intervention participation.

Nearly one third (32%) of the interventions are described in sufficient detail to enable implementation or are available from the intervention authors. Of those that were not adequately described, several were in-person programs and others were system-wide interventions that required tailored individual efforts for implementation within a specific system. The 37 interventions for which websites, guides, or other source materials are publicly available are identified in Table A.

When planning or selecting an intervention, organizations should (1) select for the specific health outcomes they are trying to improve (e.g., stress reduction, general well-being), (2) consider through what mechanisms their chosen intervention will initiate those improvements (e.g., knowledge gain, better access to work support), and (3) identify who will most benefit from them. To truly assess impact, it is important to continue postintervention measurement over time, as appropriate. For instance, if a health care system is investigating the impact of a counseling program on depression, symptoms may take many weeks or months to improve or resolve. Therefore, the extent to which an intervention will be "effective" can be dependent on its duration, the outcomes of interest, and how and when they are being measured.

Limitations and Future Directions

Only articles published up to March 2022 were reviewed, potentially omitting important research conducted during the COVID-19 pandemic. This review focused solely on mental health interventions conducted within the health care sector. As a result, there are effective mental health interventions applied in other industry sectors that were excluded. Finally, despite the promising nature of this literature, the efficacy of many of these programs remains largely undetermined because of small sample sizes or insufficient evaluation methods. Most interventions focused on the individual, highlighting an important gap in organization-focused mental health intervention research within health care. While this literature has not yet reached the point of providing a "1-stop shop" for health care workers' mental health programs, the growing breadth of the literature is very promising, as is the current prioritization of these issues at organizational, national, and policy levels. *AJPH*

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CONTRIBUTORS

W. K Anger had overall responsibility for accuracy, distributed manuscript responsibilities, reviewed titles and abstracts and full articles, organized the article, assessed intervention availability, was the primary author of the Results section, compiled most tables and both supplementary tables, and contributed to the Discussion section. J. K Dimoff reviewed titles, abstracts and full articles; contributed to the Results section; consulted on the assessment and interpretation of mental health issues; established the categorization schema of prevention, intervention, and individual versus organizational categorizations or focus; and was the primary author of the Discussion section. L. Alley selected review process methods, conducted database searches and initial title review, reviewed titles and abstracts and full articles, wrote the Methods section, and made contributions to sections of the Introduction, Results section, supplementary tables, and the Discussion section.

CONFLICTS OF INTEREST

OHSU and W. K. Anger have a financial interest in Northwest Education, Training and Assessment, a company that may have a commercial interest in the results of this research and technology. This potential conflict of interest has been reviewed and managed by OHSU.

HUMAN PARTICIPANT PROTECTION

This research was based on publicly accessible research publications; no human participants were involved in this systematic review.

REFERENCES

1. Kelloway EK, Dimoff JK, Gilbert S. Mental health in the workplace. *Annu Rev Organ Psychol Organ Behav.* 2023;10(1):363–387. https://doi.org/10.1146/annurev-orgpsych-120920-050527
2. Staglin G. Getting mental health back on the world's agenda. *Forbes*. January 26, 2022. Available at: https://www.forbes.com/sites/onemind/2022/01/26/getting-mental-health-back-on-the-worlds-agenda. Accessed June 9, 2022.
3. Open Minds. The U.S. mental health market: $225.1 billion in spending in 2019: an OPEN MINDS market intelligence report. 2020. Available at: https://openminds.com/intelligence-report/the-u-s-mental-health-market-225-1-billion-in-spending-in-2019-an-open-minds-market-intelligence-report. Accessed May 26, 2022.

4. Dewa CS, Goering P, Goering P, Lin E, Paterson M. Depression-related short-term disability in an employed population. *J Occup Environ Med*. 2002;44(7):628–633. https://doi.org/10.1097/00043764-200207000-00007

5. Dewa CS, Loong D, Bonato S, Thanh NX, Jacobs P. How does burnout affect physician productivity? A systematic literature review. *BMC Health Serv Res*. 2014;14(1):325. https://doi.org/10.1186/1472-6963-14-325

6. Dewa CS, McDaid D. Investing in the mental health of the labor force: epidemiological and economic impact of mental health disabilities in the workplace. In: Schultz IZ, Rogers ES, eds. *Work Accommodation and Retention in Mental Health*. New York, NY: Springer; 2011:33–51. https://doi.org/10.1007/978-1-4419-0428-7_2

7. Fiabane E, Giorgi I, Sguazzin C, Argentero P. Work engagement and occupational stress in nurses and other healthcare workers: the role of organisational and personal factors. *J Clin Nurs*. 2013;22(17-18):2614–2624. https://doi.org/10.1111/jocn.12084

8. Johnson & Johnson Foundation. The mental health of healthcare workers in COVID-19. Available at: https://mhanational.org/mental-health-healthcare-workers-covid-19. Accessed November 17, 2023.

9. Li Y, Scherer N, Felix L, Kuper H. Prevalence of depression, anxiety and post-traumatic stress disorder in health care workers during the COVID-19 pandemic: a systematic review and meta-analysis. *PLoS ONE*. 2021;16(3):e0246454. https://doi.org/10.1371/journal.pone.0246454

10. National Institute for Health Care Management Foundation. Physician burnout & moral injury: the hidden health care crisis. March 22, 2021. Available at: https://nihcm.org/publications/physician-burnout-suicide-the-hidden-health-care-crisis. Accessed June 9, 2022.

11. Miller MW, Wolf EJ, Kilpatrick D, et al. The prevalence and latent structure of proposed *DSM-5* posttraumatic stress disorder symptoms in U.S. national and veteran samples. *Psychol Trauma*. 2013;5(6):501–512. https://doi.org/10.1037/a0029730

12. National Safety Council. Prioritizing employee mental health. June 1, 2022. Available at: https://www.nsc.org/workplace/safety-topics/employee-mental-health. Accessed June 1, 2022.

13. Bresesti I, Folgori L, De Bartolo P. Interventions to reduce occupational stress and burn out within neonatal intensive care units: a systematic review. *Occup Environ Med*. 2020;77(8):515–519. https://doi.org/10.1136/oemed-2019-106256

14. Cocchiara RA, Peruzzo M, Mannocci A, et al. The use of yoga to manage stress and burnout in healthcare workers: a systematic review. *J Clin Med*. 2019;8(3):284. https://doi.org/10.3390/jcm8030284

15. Drissi N, Ouhbi S, Marques G, de la Torre Diez I, Ghogho M, Janati Idrissi MA. A systematic literature review on e-mental health solutions to assist health care workers during COVID-19. *Telemed J E Health*. 2021;27(6):594–602. https://doi.org/10.1089/tmj.2020.0287

16. Hooper JJ, Saulsman L, Hall T, Waters F. Addressing the psychological impact of COVID-19 on healthcare workers: learning from a systematic review of early interventions for frontline responders. *BMJ Open*. 2021;11(5):e044134. https://doi.org/10.1136/bmjopen-2020-044134

17. Marine A, Ruotsalainen J, Serra C, Verbeek J. Preventing occupational stress in healthcare workers. *Cochrane Database Syst Rev*. 2006;(4):CD002892.

18. Nicolakakis N, Lafantaisie M, Letellier MC, et al. Are organizational interventions effective in protecting healthcare worker mental health during epidemics/pandemics? A systematic literature review. *Int J Environ Res Public Health*. 2022;19(15):9653. https://doi.org/10.3390/ijerph19159653

19. Nikunlaakso R, Selander K, Oksanen T, Laitinen J. Interventions to reduce the risk of mental health problems in health and social care workplaces: a scoping review. *J Psychiatr Res*. 2022;152:57–69. https://doi.org/10.1016/j.jpsychires.2022.06.004

20. Phillips CS, Becker H. Systematic review: expressive arts interventions to address psychosocial stress in healthcare workers. *J Adv Nurs*. 2019;75(11):2285–2298. https://doi.org/10.1111/jan.14043

21. Pollock A, Campbell P, Cheyne J, et al. Interventions to support the resilience and mental health of frontline health and social care professionals during and after a disease outbreak, epidemic or pandemic: a mixed methods systematic review. *Cochrane Database Syst Rev*. 2020;11(11):CD013779. https://doi.org/10.1002/14651858.CD013779

22. Pospos S, Young IT, Downs N, et al. Web-based tools and mobile applications to mitigate burnout, depression, and suicidality among healthcare students and professionals: a systematic review. *Acad Psychiatry*. 2018;42(1):109–120. https://doi.org/10.1007/s40596-017-0868-0

23. Rao D, Elshafei A, Nguyen M, Hatzenbuehler ML, Frey S, Go VF. A systematic review of multilevel stigma interventions: state of the science and future directions. *BMC Med*. 2019;17(1):41. https://doi.org/10.1186/s12916-018-1244-y

24. Ruotsalainen J, Serra C, Marine A, Verbeek J. Systematic review of interventions for reducing occupational stress in health care workers. *Scand J Work Environ Health*. 2008;34(3):169–178. https://doi.org/10.5271/sjweh.1240

25. Ruotsalainen JH, Verbeek JH, Marine A, Serra C. Preventing occupational stress in healthcare workers [update in *Cochrane Database Syst Rev*. 2023;5(5):CD002892]. *Cochrane Database Syst Rev*. 2015;(4):CD002892. https://doi.org/10.1002/14651858.CD002892.pub5

26. Schoonover KL, Hall-Flavin D, Whitford K, Lussier M, Essary A, Lapid MI. Impact of poetry on empathy and professional burnout of health-care workers: a systematic review. *J Palliat Care*. 2020;35(2):127–132. https://doi.org/10.1177/0825859719865545

27. Yarker J, Lewis R, Sinclair A, Michlig G, Munir F. Meta-synthesis of qualitative research on the barriers and facilitators to implementing workplace mental health interventions. *SSM-Ment Health (Lond)*. 2022;2:100148. https://doi.org/10.1016/j.ssmmh.2022.100148

28. Zace D, Hoxhaj I, Orfino A, Viteritti AM, Janiri L, Di Pietro ML. Interventions to address mental health issues in healthcare workers during infectious disease outbreaks: a systematic review. *J Psychiatr Res*. 2021;136:319–333. https://doi.org/10.1016/j.jpsychires.2021.02.019

29. Zhang X, Sun F, Wang Y, Zhu Z. Establishment of a psychological intervention mechanism for healthcare workers facing public health emergencies in the context of the COVID-19 outbreak. *Int J Health Plann Manage*. 2021;36(6):2424–2429. https://doi.org/10.1002/hpm.3306

30. Corporation for Digital Scholarship. Zotero. 2016. Available at: https://www.zotero.org/download. Accessed November 11, 2017.

31. Veritas Health Innovation. Covidence Systematic Review Software. Available at: https://www.covidence.org. Accessed March 8, 2021.

32. Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health*. 1998;52(6):377–384. https://doi.org/10.1136/jech.52.6.377

33. Guyatt GH, Oxman AD, Vist GE, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*. 2008;336(7650):924–926. https://doi.org/10.1136/bmj.39489.470347.AD

34. Cohen J. A coefficient of agreement for nominal scales. *Educ Psychol Meas*. 1960;20(1):37–46. https://doi.org/10.1177/001316446002000104

35. Prieto L, Lamarca R, Casado A, Alonso J. The evaluation of agreement on continuous variables by the intraclass correlation coefficient. *J Epidemiol Community Health*. 1997;51(5):579–581. https://doi.org/10.1136/jech.51.5.579-a

36. Cheng ST, Tsui PK, Lam JHM. Improving mental health in health care practitioners: randomized controlled trial of a gratitude intervention. *J Consult Clin Psychol*. 2015;83(1):177–186. https://doi.org/10.1037/a0037895

37. Clemow LP, Pickering TG, Davidson KW, et al. Stress management in the workplace for employees with hypertension: a randomized controlled trial. *Transl Behav Med*. 2018;8(5):761–770. https://doi.org/10.1093/tbm/iby018

38. Maatouk I, Müller A, Angerer P, et al. Healthy ageing at work—efficacy of group interventions on the mental health of nurses aged 45 and older: results of a randomised, controlled trial. *PLoS One*. 2018;13(1):e0191000. https://doi.org/10.1371/journal.pone.0191000

39. Alexander GK, Rollins K, Walker D, Wong L, Pennings J. Yoga for self-care and burnout prevention among nurses. *Workplace Health Saf*. 2015;63(10):462–470. https://doi.org/10.1177/2165079915596102

40. Barrett K, Stewart I. A preliminary comparison of the efficacy of online acceptance and commitment therapy (ACT) and cognitive behavioural therapy (CBT) stress management interventions for social and healthcare workers. *Health Soc Care Community*. 2021;29(1):113–126. https://doi.org/10.1111/hsc.13074

41. Crippa JAS, Zuardi AW, Guimaraes FS, et al. Efficacy and safety of cannabidiol plus standard care vs standard care alone for the treatment of emotional exhaustion and burnout among frontline health care workers during the COVID-19 pandemic: a randomized clinical trial. *JAMA Netw Open*. 2021;4(8):e2120603. https://doi.org/10.1001/jamanetworkopen.2021.20603

42. Errazuriz A, Schmidt K, Undurraga EA, et al. Effects of mindfulness-based stress reduction on psychological distress in health workers: a three-arm parallel randomized controlled trial.

J Psychiatr Res. 2022;145:284–293. https://doi.org/10.1016/j.jpsychires.2020.11.011

43. Gärtner FR, Nieuwenhuijsen K, Ketelaar SM, van Dijk FJH, Sluiter JK. The Mental Vitality @ Work Study: effectiveness of a mental module for workers' health surveillance for nurses and allied health care professionals on their help-seeking behavior. *J Occup Environ Med*. 2013;55(10):1219–1229. https://doi.org/10.1097/JOM.0b013e31829f310a

44. Gupta S, Kumar M, Rozatkar AR, et al. Feasibility and effectiveness of telecounseling on the psychological problems of frontline healthcare workers amidst COVID-19: a randomized controlled trial from central India. *Indian J Psychol Med*. 2021;43(4):343–350. https://doi.org/10.1177/02537176211024537

45. Hammer LB, Johnson RC, Crain TL, et al. Intervention effects on safety compliance and citizenship behaviors: evidence from the work, family, and health study. *J Appl Psychol*. 2016;101(2):190–208. https://doi.org/10.1037/apl0000047

46. Hersch RK, Cook RF, Deitz DK, et al. Reducing nurses' stress: a randomized controlled trial of a web-based stress management program for nurses. *Appl Nurs Res*. 2016;32:18–25. https://doi.org/10.1016/j.apnr.2016.04.003

47. Kozasa EH, Lacerda SS, Polissici MA, et al. An intervention to increase situational awareness and the culture of mutual care (Foco) and its effects during COVID-19 pandemic: a randomized controlled trial and qualitative analysis. *Front Psychiatry*. 2020;11(101545006):570786. https://doi.org/10.3389/fpsyt.2020.570786

48. Mache S, Bernburg M, Baresi L, Groneberg D. Mental health promotion for junior physicians working in emergency medicine: evaluation of a pilot study. *Eur J Emerg Med*. 2018;25(3):191–198. https://doi.org/10.1097/MEJ.0000000000000434

49. Maunder RG, Lancee WJ, Mae R, et al. Computer-assisted resilience training to prepare healthcare workers for pandemic influenza: a randomized trial of the optimal dose of training. *BMC Health Serv Res*. 2010;10(1):72. https://doi.org/10.1186/1472-6963-10-72

50. Mistretta EG, Davis MC, Temkit M, Lorenz C, Darby B, Stonnington CM. Resilience training for work-related stress among health care workers: results of a randomized clinical trial comparing in-person and smartphone-delivered interventions. *J Occup Environ Med*. 2018;60(6):559–568. https://doi.org/10.1097/JOM.0000000000001285

51. Moll SE, Patten S, Stuart H, MacDermid JC, Kirsh B. Beyond silence: a randomized, parallel-group trial exploring the impact of workplace mental health literacy training with healthcare employees. *Can J Psychiatry*. 2018;63(12):826–833. https://doi.org/10.1177/0706743718766051

52. Olson R, Wright RR, Elliot DL, et al. The COMPASS pilot study: A Total Worker Health™ intervention for home care workers. *J Occup Environ Med*. 2015;57(4):406–416. https://doi.org/10.1097/JOM.0000000000000374

53. Ozgundondu B, Gok Metin Z. Effects of progressive muscle relaxation combined with music on stress, fatigue, and coping styles among intensive care nurses. *Intensive Crit Care Nurs*. 2019;54:54–63. https://doi.org/10.1016/j.iccn.2019.07.007

54. Peterson U, Bergstrom G, Samuelsson M, Asberg M, Nygren A. Reflecting peer-support groups in the prevention of stress and burnout: randomized controlled trial. *J Adv Nurs*. 2008;63(5):506–516. https://doi.org/10.1111/j.1365-2648.2008.04743.x

55. Strauss C, Gu J, Montero-Marin J, Whittington A, Chapman C, Kuyken W. Reducing stress and promoting well-being in healthcare workers using mindfulness-based cognitive therapy for life. *Int J Clin Health Psychol*. 2021;21(2):100227. https://doi.org/10.1016/j.ijchp.2021.100227

56. Adair KC, Rodriguez-Homs LG, Masoud S, Mosca PJ, Sexton JB. Gratitude at work: prospective cohort study of a web-based, single-exposure well-being intervention for health care workers. *J Med Internet Res*. 2020;22(5):e15562. https://doi.org/10.2196/15562

57. Axisa C, Nash L, Kelly P, Willcock S. Burnout and distress in Australian physician trainees: evaluation of a wellbeing workshop. *Australas Psychiatry*. 2019;27(3):255–261. https://doi.org/10.1177/1039856219833793

58. Bartels-Velthuis AA, van den Brink E, Koster F, Hoenders HJR. The Interpersonal Mindfulness Program for health care professionals: a feasibility study. *Mindfulness (NY)*. 2020;11(11):2629–2638. https://doi.org/10.1007/s12671-020-01477-5

59. Bormann JE, Becker S, Gershwin M, et al. Relationship of frequent mantram repetition to emotional and spiritual well-being in healthcare workers. *J Contin Educ Nurs*. 2006;37(5):218–224. https://doi.org/10.3928/00220124-20060901-02

60. Brooks DM, Bradt J, Eyre L, Hunt A, Dileo C. Creative approaches for reducing burnout in medical personnel. *Arts Psychother*. 2010;37(3):255–263. https://doi.org/10.1016/j.aip.2010.05.001

61. Browning ED, Cruz JS. Reflective debriefing: a social work intervention addressing moral distress among ICU nurses. *J Soc Work End Life Palliat Care*. 2018;14(1):44–72. https://doi.org/10.1080/15524256.2018.1437588

62. Chen SF, Fang YW, Wang MH, Wang TF. Effects of an adaptive education program on the learning, mental health and work intentions of new graduate nurses. *Int J Environ Res Public Health*. 2021;18(11):5891. https://doi.org/10.3390/ijerph18115891

63. Chesak SS, Bhagra A, Cutshall S, et al. Authentic connections groups: a pilot test of an intervention aimed at enhancing resilience among nurse leader mothers. *Worldviews Evid Based Nurs*. 2020;17(1):39–48. https://doi.org/10.1111/wvn.12420

64. Dincer B, Inangil D. The effect of emotional freedom techniques on nurses' stress, anxiety, and burnout levels during the COVID-19 pandemic: a randomized controlled trial. *Explore (N Y)*. 2021;17(2):109–114. https://doi.org/10.1016/j.explore.2020.11.012

65. Ducar DM, Penberthy JK, Schorling JB, Leavell VA, Calland JF. Mindfulness for healthcare providers fosters professional quality of life and mindful attention among emergency medical technicians. *Explore (N Y)*. 2020;16(1):61–68. https://doi.org/10.1016/j.explore.2019.07.015

66. Duchemin AM, Steinberg BA, Marks DR, Vanover K, Klatt M. A small randomized pilot study of a workplace mindfulness-based intervention

for surgical intensive care unit personnel: effects on salivary α-amylase levels. *J Occup Environ Med*. 2015;57(4):393–399. https://doi.org/10.1097/JOM.0000000000000371

67. Dyrbye LN, West CP, Richards ML, Ross HJ, Satele D, Shanafelt TD. A randomized, controlled study of an online intervention to promote job satisfaction and well-being among physicians. *Burn Res*. 2016;3(3):69–75. https://doi.org/10.1016/j.burn.2016.06.002

68. Dyrbye LN, Shanafelt TD, Gill PR, Satele DV, West CP. Effect of a professional coaching intervention on the well-being and distress of physicians: a pilot randomized clinical trial. *JAMA Intern Med*. 2019;179(10):1406–1414. https://doi.org/10.1001/jamainternmed.2019.2425

69. Edmonds C, Lockwood GM, Bezjak A, Nyhof-Young J. Alleviating emotional exhaustion in oncology nurses: an evaluation of Wellspring's "Care for the Professional Caregiver Program." *J Cancer Educ*. 2012;27(1):27–36. https://doi.org/10.1007/s13187-011-0278-z

70. Ghawadra SF, Lim Abdullah K, Choo WY, Danaee M, Phang CK. The effect of mindfulness-based training on stress, anxiety, depression and job satisfaction among ward nurses: a randomized control trial. *J Nurs Manag*. 2020;28(5):1088–1097. https://doi.org/10.1111/jonm.13049

71. Glass N, Hanson GC, Anger WK, et al. Computer-based training (CBT) intervention reduces workplace violence and harassment for home-care workers. *Am J Ind Med*. 2017;60(7):635–643. https://doi.org/10.1002/ajim.22728

72. Gunasingam N, Burns K, Edwards J, Dinh M, Walton M. Reducing stress and burnout in junior doctors: the impact of debriefing sessions. *Postgrad Med J*. 2015;91(1074):182–187. https://doi.org/10.1136/postgradmedj-2014-132847

73. Guo YF, Lam L, Plummer V, Cross W, Zhang JPA. WeChat-based "Three Good Things" positive psychotherapy for the improvement of job performance and self-efficacy in nurses with burnout symptoms: a randomized controlled trial. *J Nurs Manag*. 2020;28(3):480–487. https://doi.org/10.1111/jonm.12927

74. Holt J, Del Mar C. Reducing occupational psychological distress: a randomized controlled trial of a mailed intervention. *Health Educ Res*. 2006;21(4):501–507. https://doi.org/10.1093/her/cyh076

75. Hsu MF, Wang C, Tzou SJ, Pan TC, Tang PL. Effects of Zentangle art workplace health promotion activities on rural healthcare workers. *Public Health*. 2021;196:217–222. https://doi.org/10.1016/j.puhe.2021.05.033

76. Kersemaekers WM, Vreeling K, Verweij H, et al. Effectiveness and feasibility of a mindful leadership course for medical specialists: a pilot study. *BMC Med Educ*. 2020;20(1):34. https://doi.org/10.1186/s12909-020-1948-5

77. Ketelaar SM, Nieuwenhuijsen K, Gärtner FR, Bolier L, Smeets O, Sluiter JK. Effect of an e-mental health approach to workers' health surveillance versus control group on work functioning of hospital employees: a cluster-RCT. *PLoS One*. 2013;8(9):e72546. https://doi.org/10.1371/journal.pone.0072546

78. Kim YI, Kim SM, Kim H, Han DH. The effect of high-frequency repetitive transcranial magnetic stimulation on occupational stress among health care workers: a pilot study. *Psychiatry*

Investig. 2016;13(6):622–629. https://doi.org/10.4306/pi.2016.13.6.622

79. La Torre G, Raffone A, Peruzzo M, et al. Yoga and mindfulness as a tool for influencing affectivity, anxiety, mental health, and stress among healthcare workers: results of a single-arm clinical trial. *J Clin Med*. 2020;9(4):1037. https://doi.org/10.3390/jcm9041037

80. Lavoie-Tremblay M, Bourbonnais R, Viens C, Vezina M, Durand PJ, Rochette L. Improving the psychosocial work environment. *J Adv Nurs*. 2005;49(6):655–664. https://doi.org/10.1111/j.1365-2648.2004.03339.x

81. Leary S, Weingart K, Topp R, Bormann J. The effect of mantram repetition on burnout and stress among VA staff. *Workplace Health Saf*. 2018;66(3):120–128. https://doi.org/10.1177/2165079917697215

82. Leiter MP, Laschinger HKS, Day A, Oore DG. The impact of civility interventions on employee social behavior, distress, and attitudes. *J Appl Psychol*. 2011;96(6):1258–1274. https://doi.org/10.1037/a0024442

83. Lin L, He G, Yan J, Gu C, Xie J. The effects of a modified mindfulness-based stress reduction program for nurses: a randomized controlled trial. *Workplace Health Saf*. 2019;67(3):111–122. https://doi.org/10.1177/2165079918801633

84. Linzer M, Poplau S, Grossman E, et al. A cluster randomized trial of interventions to improve work conditions and clinician burnout in primary care: results from the Healthy Work Place (HWP) study. *J Gen Intern Med*. 2015;30(8):1105–1111. https://doi.org/10.1007/s11606-015-3235-4

85. Mache S, Baresi L, Bernburg M, Vitzthum K, Groneberg D. Being prepared to work in gynecology medicine: evaluation of an intervention to promote junior gynecologists professionalism, mental health and job satisfaction. *Arch Gynecol Obstet*. 2017;295(1):153–162. https://doi.org/10.1007/s00404-016-4223-6

86. Mackenzie CS, Poulin PA, Seidman-Carlson R. A brief mindfulness-based stress reduction intervention for nurses and nurse aides. *Appl Nurs Res*. 2006;19(2):105–109. https://doi.org/10.1016/j.apnr.2005.08.002

87. Mahdizadeh M, Jaberi AA, Bonabi TN. Massage therapy in management of occupational stress in emergency medical services staffs: a randomized controlled trial. *Int J Ther Massage Bodywork*. 2019;12(1):16–22. https://doi.org/10.3822/ijtmb.v12i1.421

88. Matsugaki R, Kuhara S, Saeki S, et al. Effectiveness of workplace exercise supervised by a physical therapist among nurses conducting shift work: a randomized controlled trial. *J Occup Health*. 2017;59(4):327–335. https://doi.org/10.1539/joh.16-0125-OA

89. McGonagle AK, Schwab L, Yahanda N, et al. Coaching for primary care physician well-being: a randomized trial and follow-up analysis. *J Occup Health Psychol*. 2020;25(5):297–314. https://doi.org/10.1037/ocp0000180

90. Medisauskaite A, Kamau C. Reducing burnout and anxiety among doctors: randomized controlled trial. *Psychiatry Res*. 2019;274:383–390. https://doi.org/10.1016/j.psychres.2019.02.075

91. Mellins CA, Mayer LES, Glasofer DR, et al. Supporting the well-being of health care providers during the COVID-19 pandemic: the CopeColumbia response. *Gen Hosp Psychiatry*.

2020;67:62–69. https://doi.org/10.1016/j.genhosppsych.2020.08.013

92. Nepper MJ, McAtee JR, Chai W. Effect of a workplace weight-loss program for overweight and obese healthcare workers. *Am J Health Promot*. 2021;35(3):352–361. https://doi.org/10.1177/0890117120960393

93. O'Brien WH, Singh R, Horan K, Moeller MT, Wasson R, Jex SM. Group-based acceptance and commitment therapy for nurses and nurse aides working in long-term care residential settings. *J Altern Complement Med*. 2019;25(7):753–761. https://doi.org/10.1089/acm.2019.0087

94. Procaccia R, Segre G, Tamanza G, Manzoni GM. Benefits of expressive writing on healthcare workers' psychological adjustment during the COVID-19 pandemic. *Front Psychol*. 2021;12(101550902):624176. https://doi.org/10.3389/fpsyg.2021.624176

95. Salyers MP, Garabrant JM, Luther L, et al. A comparative effectiveness trial to reduce burnout and improve quality of care. *Adm Policy Ment Health*. 2019;46(2):238–254. https://doi.org/10.1007/s10488-018-0908-4

96. Sampson M, Melnyk BM, Hoying J. The MIND-BODYSTRONG intervention for new nurse residents: 6-month effects on mental health outcomes, healthy lifestyle behaviors, and job satisfaction. *Worldviews Evid Based Nurs*. 2020;17(1):16–23. https://doi.org/10.1111/wvn.12411

97. Stansfeld SA, Kerry S, Chandola T, et al. Pilot study of a cluster randomised trial of a guided e-learning health promotion intervention for managers based on management standards for the improvement of employee well-being and reduction of sickness absence: GEM Study. *BMJ Open*. 2015;5(10):e007981. https://doi.org/10.1136/bmjopen-2015-007981

98. Uchiyama A, Odagiri Y, Ohya Y, Takamiya T, Inoue S, Shimomitsu T. Effect on mental health of a participatory intervention to improve psychosocial work environment: a cluster randomized controlled trial among nurses. *J Occup Health*. 2013;55(3):173–183. https://doi.org/10.1539/joh.12-0228-OA

99. Watanabe N, Horikoshi M, Shinmei I, et al. Brief mindfulness-based stress management program for a better mental state in working populations—Happy Nurse Project: a randomized controlled trial. *J Affect Disord*. 2019;251:186–194. https://doi.org/10.1016/j.jad.2019.03.067

100. Waters CS, Frude N, Flaxman PE, Boyd J. Acceptance and commitment therapy (ACT) for clinically distressed health care workers: waitlist-controlled evaluation of an ACT workshop in a routine practice setting. *Br J Clin Psychol*. 2018;57(1):82–98. https://doi.org/10.1111/bjc.12155

101. Werneburg BL, Jenkins SM, Friend JL, et al. Improving resiliency in healthcare employees. *Am J Health Behav*. 2018;42(1):39–50. https://doi.org/10.5993/AJHB.42.1.4

102. West CP, Dyrbye LN, Rabatin JT, et al. Intervention to promote physician well-being, job satisfaction, and professionalism: a randomized clinical trial. *JAMA Intern Med*. 2014;174(4):527–533. https://doi.org/10.1001/jamainternmed.2013.14387

103. Yung PMB, Fung MY, Chan TMF, Lau BWK. Relaxation training methods for nurse managers

in Hong Kong: a controlled study. *Int J Ment Health Nurs*. 2004;13(4):255–261. https://doi.org/10.1111/j.1445-8330.2004.00342.x

104. Aiello A, Young-Eun Khayeri M, Raja S, et al. Resilience training for hospital workers in anticipation of an influenza pandemic. *J Contin Educ Health Prof*. 2011;31(1):15–20. https://doi.org/10.1002/chp.20096

105. Beneria A, Arnedo M, Contreras S, et al. Impact of simulation-based teamwork training on COVID-19 distress in healthcare professionals. *BMC Med Educ*. 2020;20(1):515. https://doi.org/10.1186/s12909-020-02427-4

106. Bennion MR, Baker F, Burrell J. An unguided web-based resilience training programme for NHS keyworkers during the COVID-19 pandemic: a usability study. *J Technol Behav Sci*. 2022;7(2):125–129. https://doi.org/10.1007/s41347-021-00225-3

107. Bottaccioli F, Carosella A, Cardone R, et al. Brief training of psychoneuroendocrinoimmunology-based meditation (PNEIMED) reduces stress symptom ratings and improves control on salivary cortisol secretion under basal and stimulated conditions. *Explore (N Y)*. 2014;10(3):170–179. https://doi.org/10.1016/j.explore.2014.02.002

108. Buselli R, Baldanzi S, Corsi M, et al. Psychological care of health workers during the COVID-19 outbreak in Italy: preliminary report of an occupational health department (AOUP) responsible for monitoring hospital staff condition. *Sustainability*. 2020;12(12):5039. https://doi.org/10.3390/su12125039

109. Cheng W, Zhang F, Liu Z, et al. A psychological health support scheme for medical teams in COVID-19 outbreak and its effectiveness. *Gen Psychiatr*. 2020;33(5):e100288. https://doi.org/10.1136/gpsych-2020-100288

110. Cohen-Katz J, Wiley SD, Capuano T, Baker DM, Shapiro S. The effects of mindfulness-based stress reduction on nurse stress and burnout, part II: a quantitative and qualitative study. *Holist Nurs Pract*. 2005;19(1):26–35. https://doi.org/10.1097/00004650-200501000-00008

111. Cordoza M, Ulrich RS, Manulik BJ, et al. Impact of nurses taking daily work breaks in a hospital garden on burnout. *Am J Crit Care*. 2018;27(6):508–512. https://doi.org/10.4037/ajcc2018131

112. Dalmasso G, Di Prinzio RR, Gilardi F, et al. Effectiveness of psychological support to healthcare workers by the occupational health service: a pilot experience. *Healthcare (Basel)*. 2021;9(6):732. https://doi.org/10.3390/healthcare9060732

113. Dukhanin V, Edrees HH, Connors CA, Kang E, Norvell M, Wu AW. Case: a second victim support program in pediatrics: successes and challenges to implementation. *J Pediatr Nurs*. 2018;41:54–59. https://doi.org/10.1016/j.pedn.2018.01.011

114. Etingen B, Martinez RN, Smith BM, et al. Developing an animal-assisted support program for healthcare employees. *BMC Health Serv Res*. 2020;20(1):714. https://doi.org/10.1186/s12913-020-05586-8

115. Gabbe SG, Webb LE, Moore DE, Mandel LS, Melville JL, Spickard WA. Can mentors prevent and reduce burnout in new chairs of departments of obstetrics and gynecology: results from a prospective, randomized pilot study. *Am J Obstet Gynecol*.

2008;198(6):653.e1–653.e7. https://doi.org/10.1016/j.ajog.2007.11.004

116. Gaupp R, Walter M, Bader K, Benoy C, Lang UE. A two-day acceptance and commitment therapy (ACT) workshop increases presence and work functioning in healthcare workers. *Front Psychiatry.* 2020;11:861. https://doi.org/10.3389/fpsyt.2020.00861

117. Geoffroy PA, Le Goanvic V, Sabbagh O, et al. Psychological support system for hospital workers during the Covid-19 outbreak: rapid design and implementation of the Covid-Psy Hotline. *Front Psychiatry.* 2020;11:511. https://doi.org/10.3389/fpsyt.2020.00511

118. Giordano F, Scarlata E, Baroni M, et al. Receptive music therapy to reduce stress and improve wellbeing in Italian clinical staff involved in COVID-19 pandemic: a preliminary study. *Arts Psychother.* 2020;70:101688. https://doi.org/10.1016/j.aip.2020.101688

119. Giordano F, Cipolla A, Ungar M. Building resilience for healthcare professionals working in an Italian red zone during the COVID-19 outbreak: a pilot study. *Stress Health*. 2022;38(2):234–248. https://doi.org/10.1002/smi.3085

120. Gray M, Monti K, Katz C, Klipstein K, Lim S. A "Mental health PPE" model of proactive mental health support for frontline health care workers during the COVID-19 pandemic. *Psychiatry Res.* 2021;299:113878. https://doi.org/10.1016/j.psychres.2021.113878

121. Haraway DL, Haraway WM. Analysis of the effect of conflict-management and resolution training on employee stress at a healthcare organization. *Hosp Top.* 2005;83(4):11–17. https://doi.org/10.3200/HTPS.83.4.11-18

122. Heyen JM, Weigl N, Muller M, et al. Multimodule web-based COVID-19 Anxiety and Stress Resilience Training (COAST): single-cohort feasibility study with first responders. *JMIR Form Res.* 2021;5(6):e28055. https://doi.org/10.2196/28055

123. Houchens N, L Sivils S, Koester E, Ratz D, Ridenour J, Saint S. Fueling leadership in yourself: a leadership development program for all types of health-care workers. *Leadersh Health Serv (Bradf Engl)*. 2021; epub ahead of print May 10, 2021. https://doi.org/10.1108/LHS-06-2020-0037

124. Katzman JG, Tomedi LE, Everly G, et al. First responder resiliency ECHO: innovative telementoring during the COVID-19 pandemic. *Int J Environ Res Public Health.* 2021;18(9):4900. https://doi.org/10.3390/ijerph18094900

125. Lapham SC, Gregory C, McMillan G. Impact of an alcohol misuse intervention for health care workers–1: frequency of binge drinking and desire to reduce alcohol use. *Alcohol Alcohol.* 2003;38(2):176–182. https://doi.org/10.1093/alcalc/agg047

126. Los FS, van der Molen HF, de Boer AGEM, Hulshof CTJ, Ketelaar SM, Nieuwenhuijsen K. Workers' health surveillance targeting mental health: evaluation of a training. *Occup Med (Lond).* 2022;72(4):244–247. https://doi.org/10.1093/occmed/kqab165

127. Luk LA. Assessment of a leadership enhancement program for nursing managers of an acute general hospital in Hong Kong. *Open Nurs J.* 2018;12(1):133–141. https://doi.org/10.2174/1874434601812010133

128. Madede T, Sidat M, McAuliffe E, et al. The impact of a supportive supervision intervention on health workers in Niassa, Mozambique: a cluster-controlled trial. *Hum Resour Health.* 2017;15(1):58. https://doi.org/10.1186/s12960-017-0213-4

129. McElligott D, Holz MB, Carollo L, et al. A pilot feasibility study of the effects of touch therapy on nurses. *J NY State Nurses Assoc.* 2003;34(1):16–24.

130. Melo CG, Oliver D. Can addressing death anxiety reduce health care workers' burnout and improve patient care? *J Palliat Care.* 2011;27(4):287–295. https://doi.org/10.1177/082585971102700405

131. Muir KJ, Keim-Malpass J. The emergency resiliency initiative: a pilot mindfulness intervention program. *J Holist Nurs.* 2020;38(2):205–220. https://doi.org/10.1177/0898010119874971

132. Muyambi K, Gillam M, Dennis S, Gray R, Martinez L, Jones M. Effect of depression awareness and management training on the attitudes of rural primary health care workers. *Aust J Rural Health*. 2021;29(3):449–454. https://doi.org/10.1111/ajr.12685

133. Palumbo MV, Wu G, Shaner-McRae H, Rambur B, McIntosh B. Tai chi for older nurses: a workplace wellness pilot study. *Appl Nurs Res.* 2012;25(1):54–59. https://doi.org/10.1016/j.apnr.2010.01.002

134. Pan C, Wang H, Chen M, et al. Mindfulness-based intervention for nurses in AIDS care in China: a pilot study. *Neuropsychiatr Dis Treat.* 2019;15:3131–3141. https://doi.org/10.2147/NDT.S223036

135. Reilly PM, Buchanan TM, Vafides C, Breakey S, Dykes P. Auricular acupuncture to relieve health care workers' stress and anxiety: impact on caring. *Dimens Crit Care Nurs.* 2014;33(3):151–159. https://doi.org/10.1097/DCC.0000000000000039

136. Repar PA, Reid S. Creatively caring: effects of arts-based encounters on hospice caregivers in South Africa. *J Pain Symptom Manage.* 2014;47(5):946–954. https://doi.org/10.1016/j.jpainsymman.2013.10.023

137. Rich A, Aly A, Cecchinato ME, et al. Evaluation of a novel intervention to reduce burnout in doctors-in-training using self-care and digital wellbeing strategies: a mixed-methods pilot. *BMC Med Educ.* 2020;20(1):294. https://doi.org/10.1186/s12909-020-02160-y

138. Rinaldi A, Tecchio R, Perugino S, De Luca A. The educational intervention "focusing" as a strategy to stress reduction among health care workers: a pilot study in an Italian teaching hospital. *Ann Ig.* 2019;31(3):236–243. https://doi.org/10.7416/ai.2019.2286

139. Rippstein-Leuenberger K, Mauthner O, Bryan Sexton J, Schwendimann R. A qualitative analysis of the Three Good Things intervention in healthcare workers. *BMJ Open*. 2017;7(5):e015826. https://doi.org/10.1136/bmjopen-2017-015826

140. Rodriguez-Vega B, Palao A, Munoz-Sanjose A, et al. Implementation of a mindfulness-based crisis intervention for frontline healthcare workers during the COVID-19 outbreak in a public general hospital in Madrid, Spain. *Front Psychiatry.* 2020;11:562578. https://doi.org/10.3389/fpsyt.2020.562578

141. Rosen B, Preisman M, Read H, et al. Resilience coaching for healthcare workers: experiences of receiving collegial support during the COVID-19 pandemic. *Gen Hosp Psychiatry.* 2022;75:83–87. https://doi.org/10.1016/j.genhosppsych.2022.02.003

142. Schneider A, Wehler M, Weigl M. Effects of work conditions on provider mental well-being and quality of care: a mixed-methods intervention study in the emergency department. *BMC Emerg Med*. 2019;19(1):1. https://doi.org/10.1186/s12873-018-0218-x

143. Schorch K, Stamm R, Priddy D, Taylor C. A wellness program to decrease pediatric postanesthesia care unit staff compassion fatigue. *J Pediatr Health Care.* 2021;35(5):526–541. https://doi.org/10.1016/j.pedhc.2021.04.003

144. Selamu M, Hanlon C, Medhin G, Thornicroft G, Fekadu A. Burnout among primary healthcare workers during implementation of integrated mental healthcare in rural Ethiopia: a cohort study. *Hum Resour Health.* 2019;17(1):58. https://doi.org/10.1186/s12960-019-0383-3

145. Shapiro SL, Astin JA, Bishop SR, Cordova M. Mindfulness-based stress reduction for health care professionals: results from a randomized trial. *Int J Stress Manag.* 2005;12(2):164–176. https://doi.org/10.1037/1072-5245.12.2.164

146. Sockalingam S, Clarkin C, Serhal E, Pereira C, Crawford A. Responding to health care professionals' mental health needs during COVID-19 through the rapid implementation of Project ECHO. *J Contin Educ Health Prof.* 2020;40(3):211–214. https://doi.org/10.1097/CEH.0000000000000311

147. Sorensen G, Nagler EM, Hashimoto D, et al. Implementing an integrated health protection/health promotion intervention in the hospital setting: lessons learned from the Be Well, Work Well Study. *J Occup Environ Med.* 2016;58(2):185–194. https://doi.org/10.1097/JOM.0000000000000592

148. Tarquinio C, Brennstuhl MJ, Rydberg JA, et al. EMDR in telemental health counseling for healthcare workers caring for COVID-19 patients: a pilot study. *Issues Ment Health Nurs.* 2021;42(1):3–14. https://doi.org/10.1080/01612840.2020.1818014

149. Tonarelli A, Cosentino C, Tomasoni C, et al. Expressive writing. A tool to help health workers of palliative care. *Acta Biomed.* 2018;89(6-S):35–42. https://doi.org/10.23750/abm.v89i6-S.7452

150. Vajpeyee M, Tiwari S, Jain K, et al. Yoga and music intervention to reduce depression, anxiety, and stress during COVID-19 outbreak on healthcare workers. *Int J Soc Psychiatry*. 2022;68(4):798–807. https://doi.org/10.1177/00207640211006742

151. Waterman S, Hunter ECM, Cole CL, et al. Training peers to treat Ebola centre workers with anxiety and depression in Sierra Leone. *Int J Soc Psychiatry*. 2018;64(2):156–165. https://doi.org/10.1177/0020764017752021

152. White CH, Meier N, Swint C. The implementation of a stress management program for health care workers through a rural occupational health clinic. *Workplace Health Saf.* 2021;69(4):161–167. https://doi.org/10.1177/2165079920982406

153. Zingela Z, van Wyk S, Bronkhorst A, Groves C. Developing a healthcare worker psychological

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preparedness support programme for the COVID-19 outbreak. *S Afr J Psychiatr.* 2022;28:1665. https://doi.org/10.4102/sajpsychiatry.v28i0.1665

154. Hurrell JJ Jr, Murphy LR. Occupational stress intervention. *Am J Ind Med.* 1996;29(4):338–341. https://doi.org/10.1002/(SICI)1097-0274(199604)29:4<338::AID-AJIM11>3.0.CO;2-2

155. Becker LA. Effect size calculators. University of Colorado, Colorado Springs. June 9, 2022. Available at: https://lbecker.uccs.edu. Accessed June 9, 2022.

156. Cohen J. *Statistical Power Analysis for the Behavioral Sciences.* 2nd ed. New York, NY: Routledge; 1988. https://doi.org/10.4324/9780203771587

157. Ellis PD. *The Essential Guide to Effect Sizes: Statistical Power, Meta-Analysis, and the Interpretation of Research Results.* Cambridge, England: Cambridge University Press; 2010. https://doi.org/10.1017/CBO9780511761676

158. Feingold A. Effect sizes for growth-modeling analysis for controlled clinical trials in the same metric as for classical analysis. *Psychol Methods.* 2009;14(1):43–53. https://doi.org/10.1037/a0014699