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## Review Article

## Mindfulness-based Practices in Workers to Address Mental Health Conditions: A Systematic Review

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## ABSTRACT

The effectiveness of mindfulness techniques in addressing mental health conditions in workers is uncertain. However, it could represent a therapeutic tool for workers presenting with such conditions. Our objective was to assess the effects of mindfulness-based practices for workers diagnosed with mental health conditions. We conducted a systematic review of randomized controlled trials. Participants included were workers with a mental health condition. Interventions included any mindfulness technique, compared to any nonmindfulness interventions. Outcomes were scores on validated psychiatric rating scales. A total of 4,407 records were screened; 202 were included for full-text analysis; 2 studies were included. The first study (Finnes et al., 2017) used Acceptance and Commitment Therapy (ACT) associated or not with Workplace Dialogue Intervention (WDI), compared to treatment as usual. At 9 months follow-up, for the ACT group, depression scores improved marginally (standardized mean difference [SMD]: -0.06,  $p = 0.021$ ), but anxiety scores were worse (SMD: 0.15,  $p = 0.036$ ). Changes in mental health outcomes were not statistically significant for the ACT + WDI group. In the second study (Grensman et al., 2018), no statistically significant change in mental health scales has been observed after completion of mindfulness-based cognitive therapy compared to cognitive behavioral therapy. Substantial heterogeneity precluded meta-analysis. This systematic review did not find evidence that mindfulness-based practices provide a durable and substantial improvement of mental health outcomes in workers diagnosed with mental health conditions.

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## 1. Introduction

The 2019 Global Burden of Diseases, Injuries, and Risk Factors Study found mental conditions to be the second highest cause of years lived with disabilities [1]. Not only are mental health issues associated with unemployment but also with lower wages, an impacted career trajectory, productivity loss, and higher sickness absence rates [2,3]. For instance, around 500,000 individuals in Canada are absent from work per week due to a mental condition, associated to a cost of 51 million Canadian dollars a year and a total

of 30% of disability claims and 70% of disability costs [4]. Some of these mental health conditions are compensable as occupational diseases in different jurisdictions (such as France, Mexico, Chile, Denmark, or Canada), if a diagnosis is provided by a physician or a psychologist consistent with International Classification of Diseases, 10th revision (ICD-10) or Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5-TR) criteria [5].

Mindfulness programs have been used to treat various mental health disorders. These programs have been utilized in various populations, including workers such as healthcare workers and

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teachers [6,7]. Mindfulness has been defined by Kabat-Zinn as the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment [8]. Mindfulness-based interventions are used to reach this state of awareness.

Over the years, a considerable number of mindfulness interventions have been developed. Mindfulness-based stress reduction (MBSR) was the first mindfulness-based program, proposed by Kabat-Zinn in the 1970s. Mindfulness-based cognitive therapy (MBCT), initially developed to reduce relapse in individuals with major depressive disorders [9], was evaluated by the American Psychological Association (APA) Society of Clinical Psychology as having “*strong strength of research support*” [10]. In a systematic review, Galante et al. listed more than 50 different mindfulness-based programs [11] (Appendix 1). Goldberg et al. have introduced the concept of *mindfulness-based interventions*, rather than *programs* [12]. They defined these as interventions that have mindfulness meditation as a core component with home meditation practice. However, they excluded from this classification several therapies emphasizing the attitudinal stance of mindfulness, such as Acceptance and Commitment Therapy (ACT) and dialectical behavior therapy (DBT) [13]. Shapiro et al. considered both ACT and DBT as *mindfulness-informed interventions*; in such programs, mindfulness practices are part of a broader program that also include a range of non-meditation-based techniques, and they also do not require formal mindfulness meditation practice *per se* [14]. The efficacy of such *mindfulness-informed interventions* (not considered as *mindfulness-based programs* or *interventions*) has been assessed in working populations: ACT has been assessed to improve the productivity and to reduce the absenteeism of healthcare providers in psychiatric wards [15] and to reduce the stress and symptoms of burnout of social workers [16]; DBT has been assessed to address the emotional dysregulation of battlefield US soldiers [17].

Given the variety of concepts (*mindfulness-based interventions*, *mindfulness-based programs*, and *mindfulness-informed interventions*), we needed to clarify the relation between these concepts (Fig. 1). In our research, we will use and define the broader

concept of *mindfulness-based practice* as any intervention using any mindfulness technique, either as alone or as a part of an intervention. *Mindfulness-based practices* are one type of positive psychology interventions, defined as any intentional activity or method (training, coaching, etc.) based on the cultivation of valued experiences, the building of positive individual traits or the building of civic virtue, and positive institutions [18].

The mechanisms explaining the efficacy of mindfulness-based practices on mental health outcomes are still unclear [9]. Several hypotheses have been raised. Mindfulness may help a better identification of one's emotions and may help in regulation of difficult emotions. Some studies have shown brain and neural changes in functional imaging in individuals completing MBSR for instance [19]. A systematic review has shown an impact of mindfulness medication on markers of inflammation. Immune system dynamics are suspected to be involved in certain mental health conditions such as post-traumatic stress disorders and depression [20].

Such interventions can be used to address mental health conditions of workers. There are already systematic reviews published on the effectiveness of mindfulness in a working population [21–23]. However, the available literature might be confusing and may have some conceptual and methodological issues. These issues may be on how the condition is formally diagnosed or not (whether the intervention is used to treat a condition diagnosed with an ICD or a DSM framework, or to treat “stress”). Protocols may be inappropriate, with studies with no control groups, and failure to report attrition rates [24]. The intervention is not always clearly defined. Outcomes may also be assessed in a variety of ways. Some existing systematic reviews mix mental health outcomes and job performance outcomes [25]. Some existing papers use debatable methods to assess the effectiveness of positive psychology practices, such as rating happiness or optimism with a single 5-point Likert scale item [26].

Our objective is to conduct a systematic review to assess the effects of mindfulness-based practices for mental health in workers diagnosed with mental health conditions. This review aims to inform clinical management of workers diagnosed with such conditions.

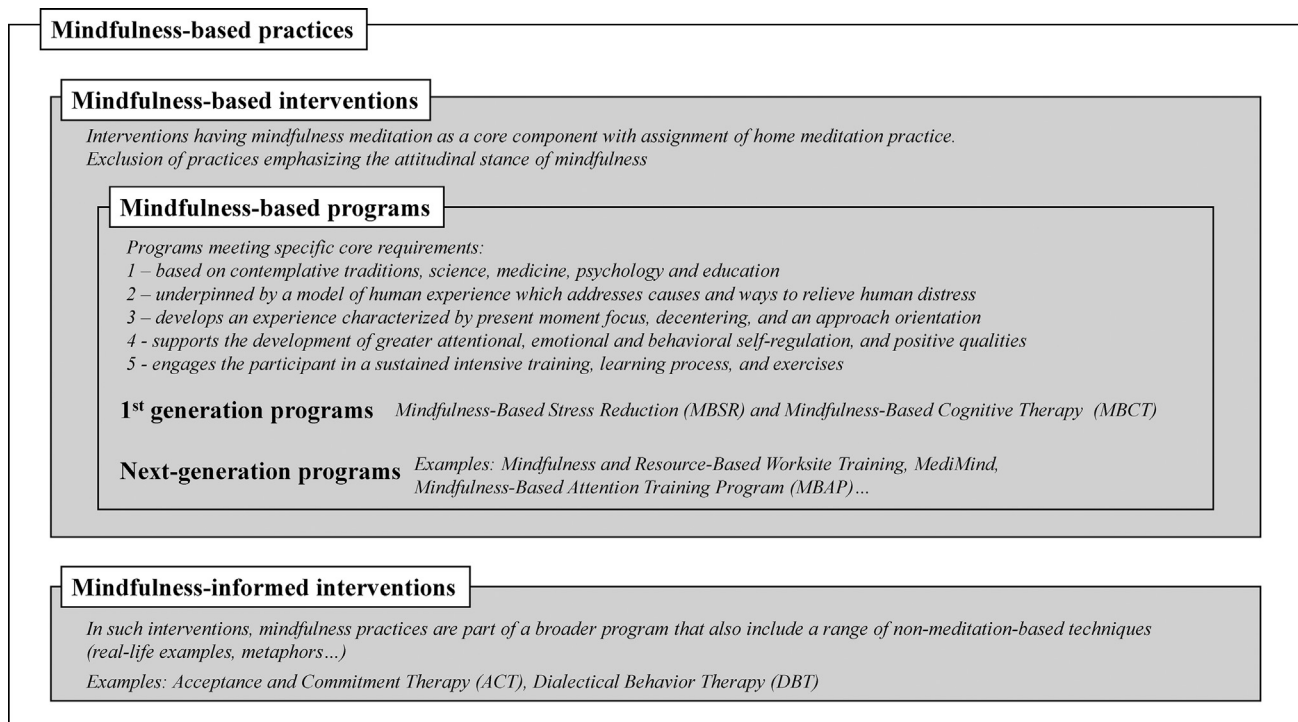


Fig. 1. Definitions and classification of mindfulness-based practices.

## 2. Methods

The protocol for this systematic review was registered on the international prospective register of systematic reviews (PROSPERO, number CRD42021229803).

Eligible for inclusion were randomized controlled trials (RCTs). Studies were included irrespective of their publication status and language of publication. Research team members are proficient in English (all), French (QDM, TJ), and German (SS). Support from other colleagues was obtained to read any other language. Eligible participants were workers described as employed, either part-time or full-time, diagnosed with a mental illness according to any version of either the ICD [27] or the DSM [28] codes. There was no age or geographic restriction. Students (including medical residents) and participants with no information on their employment status were not included. Eligible interventions were any *mindfulness-based practices*, defined as any intervention using any mindfulness technique either exclusively or as a part of an intervention. There were no restrictions in terms of duration of the intervention (brief and regular interventions were considered). Eligible comparators were any nonmindfulness practices. The primary outcome was the score on any mental health scale, either self-report or completed by a clinician (e.g., a standardized clinical interview). Information on time points of participant assessments was collected. Data on gender, country, and occupational groups were collected when available.

The following databases were searched: Ovid MEDLINE, Ovid Embase, CINAHL, Cochrane Library (via Wiley), Scopus, APA PsycInfo, and [ClinicalTrials.gov](https://www.clinicaltrials.gov). The sources of interest were: peer-reviewed journal articles, conference abstracts, and trial registrations. The search strategies are provided in [Appendix 2](#). There was no date or language restriction for our search. The search strategy was run on May 1, 2021. Supplementary to the database searches, we conducted citation tracking and screened the reference lists of the included papers and related systematic reviews for relevant literature and also examined collaborator-nominated papers for inclusion in our review.

All search results were uploaded into Covidence, a web-based screening software for systematic reviews. After duplicates were removed, two research team members independently screened the results by title and abstract and excluded studies that were obviously not relevant. Disagreements were resolved by a third team member. Studies selected for further review were screened as full texts and evaluated according to the eligibility criteria mentioned earlier. For studies that were eliminated as ineligible, the reasons for their exclusion were recorded. Disagreements were again resolved by a third team member.

Data extraction was then carried out by two research team members independently on the eligible full-text papers. Discrepancies in the extraction were resolved by a third team member. Reports of the same studies were linked together by using the following information: publication information, authors' names, sponsor for the study and sponsor identifiers, location and setting, number of participants and baseline data, date and duration of the study, and specific details of the intervention and comparator group.

When needed, study authors were contacted to try to obtain missing information using the information for the corresponding author given in the publication. Missing data were not replaced when unavailable, and analyses were planned on the basis of available data. The risk of bias was assessed using the Revised Cochrane risk-of-bias tool for randomized trials (RoB 2) [29].

Data were interpreted in the context of the statistical heterogeneity observed. A meta-analysis was carried out if the heterogeneity was not considerable. The Grading of Recommendation, Assessment, Development and Evaluation (GRADE) framework was

used to assess the certainty of evidence of outcomes, including risk of bias, consistency of effect, imprecision, indirectness, and publication bias.

## 3. Results

Of the 4431 papers screened for eligibility (4407 through database searching and 24 added via other methods; PRISMA diagrams are presented in [Figs. 2 and 3](#)), two studies have been included in our systematic review. The characteristics of these two studies are presented in [Appendix 3](#). The three main reasons for rejection were that the control group was only a waitlist ( $n = 58$ ), the study was not a RCT ( $n = 58$ ), and there was no evidence of a mental health diagnosis ( $n = 55$ ).

The first study, from Finnes et al. [30], was conducted with 352 workers diagnosed with selected mental health conditions, meeting ICD-10 criteria. They assessed the effectiveness of ACT combined or not with a Workplace Dialogue Intervention (WDI), compared to WDI or to Treatment As Usual. Mental health outcomes were assessed using Hospital Anxiety and Depression Scale (HADS) for the follow-up period (9 months after the intervention); there was no significant difference in overall linear change between groups for depression or anxiety scores. The within-group effect size (Cohen's  $d$ ) was more important preintervention to postintervention: 0.93 for depression and 0.77 for anxiety in the ACT group and 0.86 for depression and 0.53 in the ACT + WDI group. However, this effect dropped at the 9-months follow-up to 0.05 for depression and -0.11 for anxiety in the ACT group and to 0.27 for depression and 0.16 for anxiety in the combined ACT + WDI group.

The second study, from Grensman et al. [31], was conducted with 84 primary healthcare patients on sick leave because of burnout and diagnosed with an exhaustion syndrome using a country-specific ICD-10 code (F43.8A). Participants were randomized to either a traditional yoga (TY), a cognitive behavioral therapy (CBT), or a MBCT group. Mental health outcomes were assessed using subscales of the Swedish Health-Related Quality of Life survey (SWED-QUAL) questionnaire, including the subscales "positive affect", "negative affect", and "role limitation due to emotional health". The within-group effect size for the MBCT group was 0.99 for the role limitation due to emotional health, 0.90 for "positive affect", and 1.07 for "negative affect". Similar effects were observed in comparison groups ( $d$  was 0.93 in the TY group and 0.82 for the CBT group for "role limitation due to emotional health"; 1.05 in the TY group and 1.12 in the CBT group for "positive affect"; and 1.0 in the TY group and 0.81 in the CBT group for "negative affect"). When comparing the effects of TY and MCBT, and CBT and MBCT, there were no statistically significant differences between groups on the three mental health subscales.

[Fig. 4](#) summarizes the risk of bias in included studies. Overall, the risk of bias was judged to be low in both studies.

Our systematic review has allowed us to find 3 different eligible interventions addressing the mental health of workers diagnosed with a mental health condition. The summary of findings is presented in [Tables 1–3](#).

- **ACT (alone) compared to Treatment As Usual (TAU)** (Finnes et al.) significantly improved the SMD for the HADS depression subscale by -0.46 ( $p = 0.002$ ), preintervention to postintervention and significantly improved it by -0.06 ( $p = 0.021$ ) postintervention to 9-month follow-up. It also significantly improved the SMD for the HADS anxiety subscale by -0.23 ( $p = 0.019$ ) preintervention to postintervention, but it increased significantly by 0.15 ( $p = 0.036$ ) at 9-month follow-up.

- **ACT combined with WDI compared to TAU** (Finnes et al.) significantly improved the SMD for the HADS depression subscale

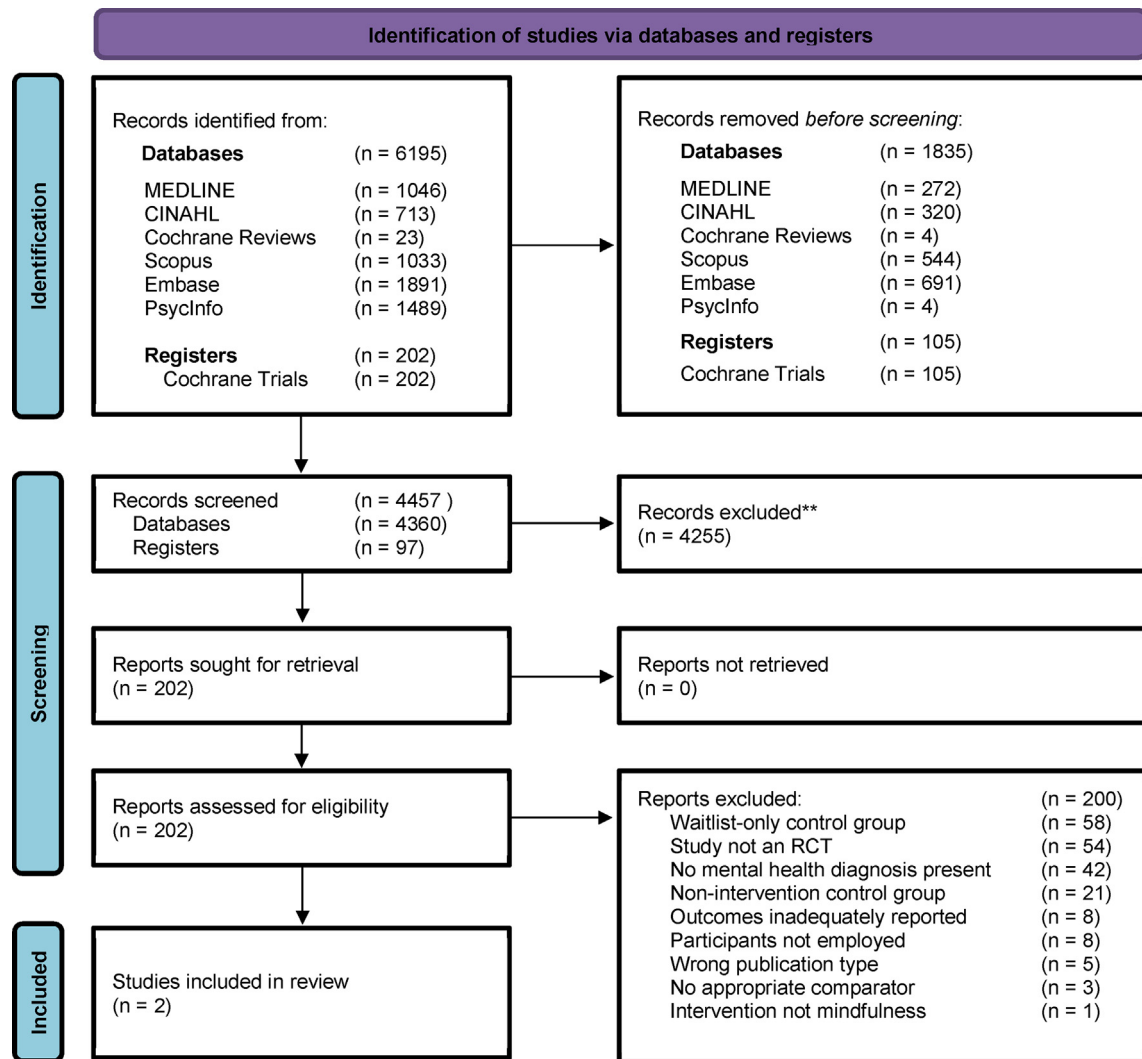


Fig. 2. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram of studies identified via databases and registers.

by  $-0.37$  ( $p = 0.045$ ), preintervention to postintervention and improved it nonsignificantly by  $-0.11$  ( $p = 0.172$ ) postintervention to 9-month follow-up. It also improved the SMD for the HADS anxiety subscale by  $-0.23$  ( $p = 0.019$ ) preintervention to postintervention but increased it significantly by  $0.15$  ( $p = 0.036$ ) at 9-month follow-up.

- **MCBT compared to CBT** (Grensman et al.) nonsignificantly changed the SMD, preintervention to postintervention for the SWED-QUAL subscales of "role limitation due to emotional health" by  $0.32$  ( $p = 0.36$ ), "positive affect" by  $-0.17$  ( $p = 0.52$ ), and "negative affect" by  $0.37$  ( $p = 0.19$ ).

The heterogeneity of the included studies was considered too high to conduct a meaningful meta-analysis. We only included 2 studies with different comparators and different measured mental health outcomes.

## 4. Discussion

### 4.1. Summary of main results

Our systematic search resulted in identifying 2 studies assessing the effectiveness of 3 mindfulness-based practices compared to non-mindfulness-based practices in a population of workers

diagnosed with mental health conditions. Despite the large variety of interventions (as illustrated in [Appendix 1](#)), included studies reported on some of the most described mindfulness-based practices (ACT and MBCT).

ACT used alone, compared to treatment as usual, moderately improved the HADS depression score immediately after intervention (SMD:  $-0.46$ ,  $p = 0.002$ ) and very marginally improved the HADS depression score at 9-month follow-up (SMD:  $-0.06$ ,  $p = 0.021$ ). This intervention somewhat decreased the HADS anxiety score (SMD:  $-0.23$ ,  $p = 0.019$ ) immediately after the intervention, but anxiety levels were slightly higher (worse) at 9-month follow-up (SMD:  $0.15$ ,  $p = 0.036$ ). The quality of evidence ranged from low to moderate.

ACT used in combination with WDI, compared to treatment as usual, moderately improved the HADS depression score immediately after the intervention (SMD:  $-0.37$ ,  $p = 0.045$ ). There was no statistically significant measurable effect at 9 months of follow up. There was no statistically significant measurable effect of this combined intervention on anxiety levels, either immediately after the intervention, or at 9-month follow-up. The quality of evidence ranged from low to moderate.

MBCT compared to CBT did not provide any statistically significant measurable effect immediately after the intervention in any of

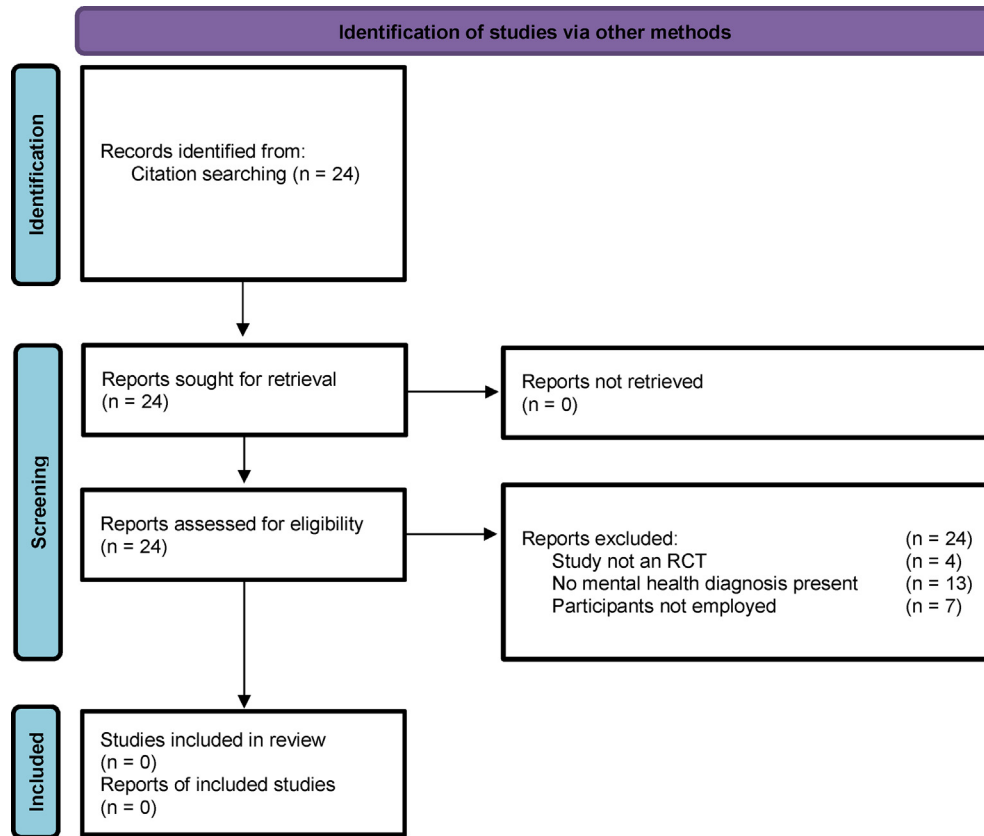


Fig. 3. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram of studies identified via other methods.

Study	Experimental	Comparator	Outcome	Weight	D1	D2	D3	D4	D5	Overall
Finnes et al, 2019	ACT/ACT+WDI	WDI/TAU	HADS scale	1	+	+	!	!	+	+
Grensman et al, 2018	MBCT	Yoga/CBT	SWED-QUAL questionnaire	1	+	+	+	+	+	+

	Low risk
	Some concerns
	High risk

D1	Randomisation process
D2	Deviations from the intended interventions
D3	Missing outcome data
D4	Measurement of the outcome
D5	Selection of the reported result

Fig. 4. Summary of the risk of bias. ACT: Acceptance and Commitment Therapy; CBT: Cognitive Behavioral Therapy; HADS: Hospital Anxiety and Depression Scale; MBCT: Mindfulness-Based Cognitive Therapy; SWED-QUAL: Swedish Quality of Life Survey; TAU: Treatment as Usual; WDI: Workplace Dialogue Intervention.

the SWED-QUAL subscales assessing mental health (role limitation due to emotional health, positive affects, negative affects). The quality of evidence was very low.

#### 4.2. Overall completeness and applicability of evidence

There are many different mindfulness-based practices, and our review includes only 3 different interventions or combinations of interventions. Both included studies were from Sweden, which hinders generalization to other geographical areas. Although all

participants were workers, we were lacking details on the exact occupations for one of the studies. For the second study (Grensman et al.), white-collar workers seem over-represented and blue-collar workers seem under-represented. Interestingly, this has already been pointed out in other publications: mindfulness programs are not used evenly across all occupational groups, and they are more likely to be used in white-collar workers than in blue-collar workers [32].

It is not possible to either recommend or advise against the use of mindfulness-based practices based on our results.



**Table 1**

Summary of findings: Acceptance and commitment therapy (alone) compared to treatment as usual for improving the mental health of workers diagnosed with mental health conditions

Outcomes	Standardized mean difference ( <i>p</i> )	Number of participants in the intervention group (number of studies)	Quality of evidence (GRADE)
<b>Depression subscale of the HADS</b>	<b>-0.46 (<i>p</i> = 0.002)</b>	70 (1 study)	⊕⊕⊙⊙ Low <sup>*,†</sup>
- preintervention to postintervention			
- postintervention to 9-month follow-up	<b>-0.06 (<i>p</i> = 0.021)</b>	82 (1 study)	⊕⊕⊕⊙ Moderate †
<b>Anxiety subscale of the HADS</b>	<b>-0.23 (<i>p</i> = 0.019)</b>	70 (1 study)	⊕⊕⊙⊙ Low <sup>*,†</sup>
- preintervention to postintervention			
- postintervention to 9-month follow-up	<b>0.15 (<i>p</i> = 0.036)</b>	82 (1 study)	⊕⊕⊕⊙ Moderate †

GRADE Working Group grades of evidence.

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

Abbreviations: HADS, Hospital Anxiety and Depression Scale.

\* Downgraded for imprecision of results, as a statistical power of 0.8 required at least 72 individuals in the intervention group.

† Downgraded for publication bias, as negative results have a lower chance of being published.

**Table 2**

Summary of findings: Acceptance and commitment therapy combined with workplace dialogue intervention compared to treatment as usual for improving the mental health of workers diagnosed with mental health conditions

Outcomes	Standardized mean difference ( <i>p</i> )	Number of participants in the intervention group (number of studies)	Quality of evidence (GRADE)
<b>Depression subscale of the HADS</b>	<b>-0.37 (<i>p</i> = 0.045)</b>	66 (1 study)	⊕⊕⊙⊙ Low <sup>*,†</sup>
- preintervention to postintervention			
- postintervention to 9-month follow-up	-0.11 ( <i>p</i> = 0.172)	80 (1 study)	⊕⊕⊕⊙ Moderate †
<b>Anxiety subscale of the HADS</b>	-0.11 ( <i>p</i> = 0.242)	66 (1 study)	⊕⊕⊙⊙ Low <sup>*,†</sup>
- preintervention to postintervention			
- postintervention to 9-month follow-up	0.05 ( <i>p</i> = 0.309)	80 (1 study)	⊕⊕⊕⊙ Moderate †

GRADE Working Group grades of evidence.

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

Abbreviations: HADS, Hospital Anxiety and Depression Scale.

\* Downgraded for imprecision of results, as a statistical power of 0.8 required at least 72 individuals in the intervention group.

† Downgraded for publication bias, as negative results have a lower chance of being published.

**Table 3**

Summary of findings: Mindfulness-based cognitive therapy compared to cognitive-behavioral therapy for improving the mental health of workers diagnosed with mental health conditions

Outcomes	Standardized mean difference ( <i>p</i> )	Number of participants in the intervention group (number of studies)	Quality of evidence (GRADE)
<b>Role limitation due to emotional health subscale of the SWED-QUAL</b>	0.32 ( <i>p</i> = 0.36)	27 (1 study)	⊕⊙⊙⊙ Very low <sup>*,†</sup>
- preintervention to postintervention			
<b>Positive affect subscale of the SWED-QUAL</b>	-0.17 ( <i>p</i> = 0.52)	27 (1 study)	⊕⊙⊙⊙ Very low <sup>*,†</sup>
- preintervention to postintervention			
<b>Negative affect subscale of the SWED-QUAL</b>	0.37 ( <i>p</i> = 0.19)	27 (1 study)	⊕⊙⊙⊙ Very low <sup>*,†</sup>
- preintervention to postintervention			

GRADE Working Group grades of evidence.

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

Abbreviations: SWED-QUAL, Swedish Health-Related Quality of Life survey.

\* Downgraded twice for imprecision of results, as authors acknowledged they did not take statistical power into account to determine the number of subjects per group.

† Downgraded for publication bias, as negative results have a lower chance of being published.

#### 4.3. Potential biases in the review process and limitations

Our eligibility criteria were quite restrictive, and we only included 2 studies in our systematic review. Our aim was to select only RCTs, with an acceptable comparator. As outlined in Fig. 2, of the 200 records excluded, 58 were excluded because the control group was a waitlist only, and 21 were excluded because there was no intervention in the control group. Such study designs introduce considerable bias as the intervention group is favored, and a study with such designs is more likely to find a measurable effect of the intervention. Since the Hawthorne studies conducted by Mayo, it has been shown that the presence of researchers can influence the outcomes they are measuring, regardless of the nature of the intervention they are conducting [33]. This is the reason we limited comparators to non-mindfulness-based practices.

We also restricted the eligible population to workers diagnosed with a mental health condition according to the ICD or the DSM codes. This also led to the exclusion of a significant number of records from the review (42 out of 200). The rationale for this decision is to provide evidence to inform the care provided to workers diagnosed with a mental condition. However, we have not restricted our review to mental health conditions considered to be work-related as we anticipated that there would be fewer eligible studies with such an inclusion criteria. This is a limitation for the applicability of the results in the context of workers compensation for instance. Not all mental health conditions can be work related; for instance, some conditions occur in patients of nonworking age (e.g., the median age of onset of anorexia nervosa and bulimia nervosa is below 18 [34]), or some conditions (such as certain manic episodes) can be induced by medications. The low number of included studies did not allow us to carry out a subgroup analysis by condition, which would have helped clarify this point.

However, in both included studies, the included conditions can possibly be considered as work-related, and conditions not typically work-related have not been included (such as psychosis, for the publication by Finnes et al.). A caveat is that Grensman et al. have used a modified ICD-10 code (F43.8A), which is a specific code introduced in Sweden for exhaustion syndrome [35]. This code is not used in other countries such as France or Canada, and exhaustion syndrome would be likely coded as burnout (Z73.0) in the ICD-10 code. In France, proposed guidelines have suggested to consider recoding of burnout to other diagnoses (such as depression, F32) if appropriate, for compensation purposes [5], as burnout is not considered as a disease [36]. However, we have decided to keep this study as it met all the other inclusion criteria, and we did not anticipate the possibilities of modified ICD or DSM codes.

#### 4.4. Agreements and disagreements with other studies or reviews

Although there are a lot of existing publications reporting on the effectiveness of mindfulness for mental health, there were a limited number of RCTs reporting on such methods in a working population diagnosed with mental health conditions assessed with reliable psychometrical scales.

There are many recent systematic reviews assessing the effectiveness of mindfulness methods to improve mental health outcomes. For instance, a systematic review and meta-analysis including 7 RCTs with a total of 479 participants has shown that depression scores have been improved following MBCT compared to TAU (SMD: -0.96, 95% confidence interval: -1.54 to -0.38) [37]. The authors of that systematic review considered the effect to be small to moderate on depressive symptoms and suicidal ideation. However, it is unclear from that systematic review whether and for how long this effect remains after the intervention.

Another recent systematic review and metaethnographic study indicated that many studies conducted in MBCT research centers may have conflict of interests [38]. In comparison, none of the authors of the present systematic review deliver mindfulness-based interventions as part of their clinical practice.

Researcher allegiance can also bias published results. Leykin and DeRubeis have defined researcher allegiance as a researcher's belief in the superiority of a treatment and the superior validity of the theory of change that is associated with the treatment [39]. Goldberg and Tucker have published a metareanalysis of trials on mindfulness-based interventions [40]. They concluded that research allegiance appears to be a potential source of bias in mindfulness-based intervention research to consider when interpreting existing studies and planning further studies. This effect may be lower when mindfulness-based interventions are compared to other evidence-based treatments. Researcher allegiance could be a dimension to assess in further systematic reviews investigating the effectiveness of mindfulness-based practices.

Some research has focused on the effect of positive psychology methods to improve the wellbeing of healthcare workers. Covington et al. have conducted a systematic review on mindfulness-based interventions for professionals working in end-of-life care, showing results "overall positive" but reporting on the small participant numbers and lack of comparison groups in a systematic review that ended up including non-RCTs [41]. Krishnan et al. have concluded that mindfulness training can improve the wellbeing of resident physicians [42]. However, there were limited details on the nature of the mindfulness programs, and those authors mentioned that most of the studies had small sample sizes.

Overall, our results are coherent with the existing literature, as most studies have small populations, with limited documentation on the duration of a small to moderate effect over time.

While discussing about the possible use of an intervention to address a work-related condition, it is critical to keep in mind ethical frameworks. Even though there was a significant effect of any mindfulness-based approaches in improving the health of workers, this raises the fundamental problem that it would rather be an adjustment of the worker to their work rather than an adjustment of the work to the worker. However, the International Commission on Occupational Health Code of Ethics [43], as well as the European Union general principles of prevention [44] state that the work should be adjusted to the worker and not the worker to the work. In this context and in any case, even if effective, mindfulness-based approaches would not replace the need for accommodating workers.

## 5. Conclusion

This systematic review did not find evidence that mindfulness-based practices provide a durable and substantial improvement of mental health outcomes in a population of workers diagnosed with mental health conditions.

Further research should include RCTs of appropriate size, an appropriate comparator such as a non-mindfulness-based intervention, a proper assessment of mental health conditions and outcomes, and an assessment conducted over time to assess the sustainability of the effect of the intervention. In any case, the use of mindfulness-based methods would not be recommended for use in workers without consideration of job accommodation and psychosocial factors.

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### Conflicts of interest

The authors report no conflict of interest.

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### Appendix A. Supplementary data

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