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Evidence-based interventions to prevent sick leave: a scoping review of reviews

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Abstract

Background Despite the large body of research on interventions aimed at preventing sick leave, the evidence is scattered and a comprehensive overview is lacking. Therefore, this scoping review of reviews aims to provide an overview of evidence-based interventions to prevent sick leave.

Methods Embase and PsycInfo were systematically searched for reviews published between January 2000–January 2024. A review was included when at least one of the included original intervention studies fulfilled three criteria: (1) target group was active workers not on sick leave, (2) sick leave was studied as outcome, and (3) the intervention was evaluated using a controlled design. Results were descriptively summarized and grouped based on the cause of sick leave and type of intervention they focused on. Furthermore, the effectiveness in preventing sick leave was reported.

Results Twenty-eight reviews were included. Eight reviews focused on preventing sick leave due to physical health problems, ten on mental health problems, and ten on all-cause sick leave. Overall, the reviews identified a lack of effective interventions to prevent sick leave. However, multi-component interventions consisting of both individual and environmental components aimed at workers' lifestyle and aimed at mental health were promising to prevent sick leave in the general working population (e.g. workplace mental health promotion intervention). Furthermore, certain specific interventions targeting workers at risk were effective. Examples are cognitive behavioral therapy programs for workers with anxiety and depression, and consultation with occupational medical staff for workers at high risk for sick leave. Lastly, exercise programs were most effective in preventing sick leave due to physical health problems (e.g. exercise for low back pain prevention).

Conclusions This scoping review identified reviews on sick leave prevention across a broad scope of health problems, types of interventions, and target groups. Although a few effective interventions for preventing sick leave were identified, the included reviews indicate a limited availability of effective interventions. Therefore, more randomized controlled trials with long-term follow-up that include sick leave as outcome are needed. To develop more effective interventions, further research is needed on better integrating the workplace environment, and on understanding barriers and facilitators to successful implementation.

Keywords Absenteeism, Intervention, Prevention, Review, Sickness absence, Sick leave, Work participation

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Introduction

Sick leave, defined as time away from work because of illness [1], can have a significant impact on workers, employers, and society as a whole. In the last decades, the number of people who were absent from work due to illness or disability has risen substantially, with a 44% increase between 2006 and 2020 in Europe, though the occurrence of sick leave differs considerably across countries [2]. Both physical health problems, such as respiratory infections and musculoskeletal disorders [3, 4], and mental health problems [5] are responsible for high sick leave rates.

Work contributes to meaning in life, provides financial security, and fulfills an important social role by shaping one's social identity [6]. Therefore, being unable to work due to health problems significantly impacts workers themselves in the first place. Furthermore, sick leave profoundly impacts employers, organizations, and society, among others from a financial point of view. The average cost of sickness and healthcare benefits in Europe has been estimated at €2484 per inhabitant in 2019 [7]. The COVID-19 pandemic has shown the significant consequences of widespread sick leave for society as a whole, resulting in work processes coming to a halt due to a shortage of labor [8].

Due to the substantial impact of sick leave, it is not surprising that numerous interventions have been developed to prevent sick leave in active workers. Subsequently, a large number of reviews have summarized the evidence of these interventions. However, these reviews are diverse in their focus, among others regarding the type of intervention, cause of sick leave, and/or population they focus on. In some reviews, the *type of intervention* is of primary interest. These include, for example, educational interventions [9], lifestyle interventions [10, 11], and mental health promotion interventions [12]. Some reviews include single-component interventions that involve one specific strategy/approach e.g [13]., while others include multi-component interventions that incorporate a combination of strategies/approaches e.g [14]. Furthermore, the level of the interventions varies by targeting either the individual workers [15], the organizational environment [16, 17], or both [12]. Other reviews focus on a specific *cause of sick leave* due to a particular health problem, such as back pain [18, 19], influenza [13], anxiety disorders [20], or depression [21]. In addition, some reviews focus on primary prevention by targeting the general working population, while other reviews focus on secondary prevention by specifically targeting workers with health problems [21]. In addition, some reviews target a specific working population, such as office workers [18], construction workers [22], shift workers [16], pregnant women [23], or nurses [24].

Thus, while there is a large variety of scientific knowledge on interventions aimed at preventing sick leave, the evidence is scattered and a comprehensive overview is lacking. To support the implementation of tailored interventions that are effective in preventing sick leave, a clear overview is needed on what knowledge exists, on what causes of sick leave, about what types of interventions, and for which target groups. Furthermore, such an overview is important for the identification of knowledge gaps in the current literature. Therefore, the aim of this scoping review of reviews is to provide an overview of evidence-based interventions to prevent sick leave.

Methods

Study design

The protocol for this scoping review of reviews was based on the methodological guidelines provided by the Joanna Briggs Institute for scoping reviews [25].

Eligibility criteria

Reviews that studied the effect of preventive interventions on sick leave (either as primary or secondary outcome) were included. In this context, preventive interventions mean that they could focus on reducing the duration of future sick leave or preventing sick leave in active workers who were not on sick leave. Hence, return-to-work interventions were not considered. A review was included when at least one original intervention study in the review fulfilled three main eligibility criteria: (1) the target group of the intervention is active workers, (2) sick leave is a studied outcome of the intervention (either primary or secondary), and (3) the intervention is evaluated using a controlled design, where the intervention group is compared to a control group. Randomization of workers into the intervention and control groups is not a mandatory criterion. As the intervention needed to have a preventive character, we excluded reviews that only included interventions for workers who were already on sick leave and for example focused on returning to work. English peer-reviewed journal reviews that were published in the period of January 2000–January 2024 were included. Systematic as well as non-systematic reviews were included.

Information sources and search

With the assistance of an experienced librarian, the bibliographic databases Embase and PsycInfo were searched. The 'PCC' (population, concept, and context) framework was used to construct the search strategy [26]. The population specified in the search strategy was all types of workers. The concept in the search strategy was a focus on controlled intervention studies that consider sick leave as an outcome, and were included in a review published in the biomedical, medical, health sciences, or psychology research literature. The context in this scoping review was all relevant settings for workers, including, but not limited to, the workplace. The search strategy was first drafted by the librarian and further specified through team discussion. The final search strategies in Embase and PsycInfo can be found in

Supplementary Table S1 and S2. The final search results were exported into EndNote, and the librarian removed duplicates.

Selection of reviews

The selection of the scientific articles was performed by first screening the titles and abstracts by two researchers independently. Disagreements were discussed with a third researcher. Review articles were included if the abstract indicated that the review focused on (randomized) controlled intervention studies targeting workers. A prerequisite in this was that the abstract suggested that sick leave was an outcome. Hereafter, a full-text screening of the review articles that were selected based on their abstracts was conducted. The results of the full-text screening were discussed within the research team. A review was excluded at this stage if it did not discuss or interpret the effects of an intervention on sick leave or solely focused on return to work. The selection of scientific articles was supplemented with snowballing through the reference lists of the selected reviews in order to identify additional relevant reviews.

Data extraction process

Data from all included scientific reviews were extracted by three researchers using an extraction form on study characteristics (i.e. author, title, year of publication, aim of the review, study population, how many controlled intervention studies that consider sick leave were included), intervention characteristics (i.e. type of intervention, treatment of control group), and key findings as to the effectiveness on sick leave. Any uncertainties related to data extraction were discussed within the research team. The aim was to give an overview to what extent interventions were effective to prevent sick leave. To do so, we based our synthesis on the results and conclusions reported by the authors of the reviews. In addition, we reported the method used to synthesize the results and assess the risk of bias of the review under study.

Synthesis of results

We conducted a descriptive synthesis of results. First, the reviews were grouped based on the cause of sick leave they focused on: sick leave due to physical health problems, sick leave due to mental health problems, or all-cause sick leave (i.e. targeting general health or both physical and mental health problems). Second, within these three groups, reviews were categorized based on type of intervention, i.e. whether they included solely single-component interventions that involve one specific strategy/approach or also multi-component interventions that incorporate a combination of strategies/approaches. Next, it was determined and described whether the interventions included in the review were aimed at the individual worker, at the environment (e.g. organization, employer or supervisors), or both. Furthermore, the target group of the interventions was considered by describing whether the included interventions were aimed at the general working population or at workers with specific health problems or at high risk for sick leave. Lastly, based on the conclusions reported by the authors of the review, an overall conclusion of whether the included interventions were effective in preventing sick leave (yes; partly; no) was made.

Results

Results of the search

We identified 76 reviews from Embase (64) and PsycInfo (12) after removing duplicates and original studies. The titles and abstracts of these reviews were screened for potential inclusion. Hereafter, we obtained full-texts of 33 reviews. From this selection, one review was excluded because the publication was withdrawn and eight reviews were excluded because they did not meet our inclusion criteria for the following reasons: seven reviews did not discuss the effects of an intervention on sick leave and in one review the target population was workers on sick leave. In addition, snowballing through the selected reviews' reference lists resulted in the inclusion of four more articles. This resulted in a total of 28 reviews being included in this study. Figure 1 shows a flow diagram of the selection process.

Description of included reviews

Of the 28 included reviews, eight reviews were on interventions that focused on preventing sick leave due to physical health problems (Table 1), ten reviews on preventing sick leave due to mental health problems (Table 2), and ten reviews on preventing all-cause sick leave (Table 3). Supplementary Table S3 presents the number of included studies, the number of included controlled studies, and the number of included controlled studies with sick leave as an outcome in each review. In total, the included reviews covered 164 unique (randomized) controlled trials with sick leave as an outcome. These studies were conducted in the USA ($n = 41$), the Netherlands ($n = 27$), the UK ($n = 20$), Sweden ($n = 13$), Canada ($n = 10$), Australia ($n = 9$), Germany ($n = 9$), Denmark ($n = 8$), Finland ($n = 8$), Norway ($n = 8$), Japan ($n = 2$), Brazil ($n = 1$), France ($n = 1$), Greece ($n = 1$), Malaysia ($n = 1$), Poland ($n = 1$), South Africa ($n = 1$), Switzerland ($n = 1$), Turkey ($n = 1$), and 8 different European countries ($n = 1$). The countries of origin of the included studies per included review are listed in Table S4. Per cause of sick leave, the reviews included respectively 46, 48, and 81 (randomized) controlled trials with sick leave as an outcome, with a total of 14,154, 16,018, and 370,017

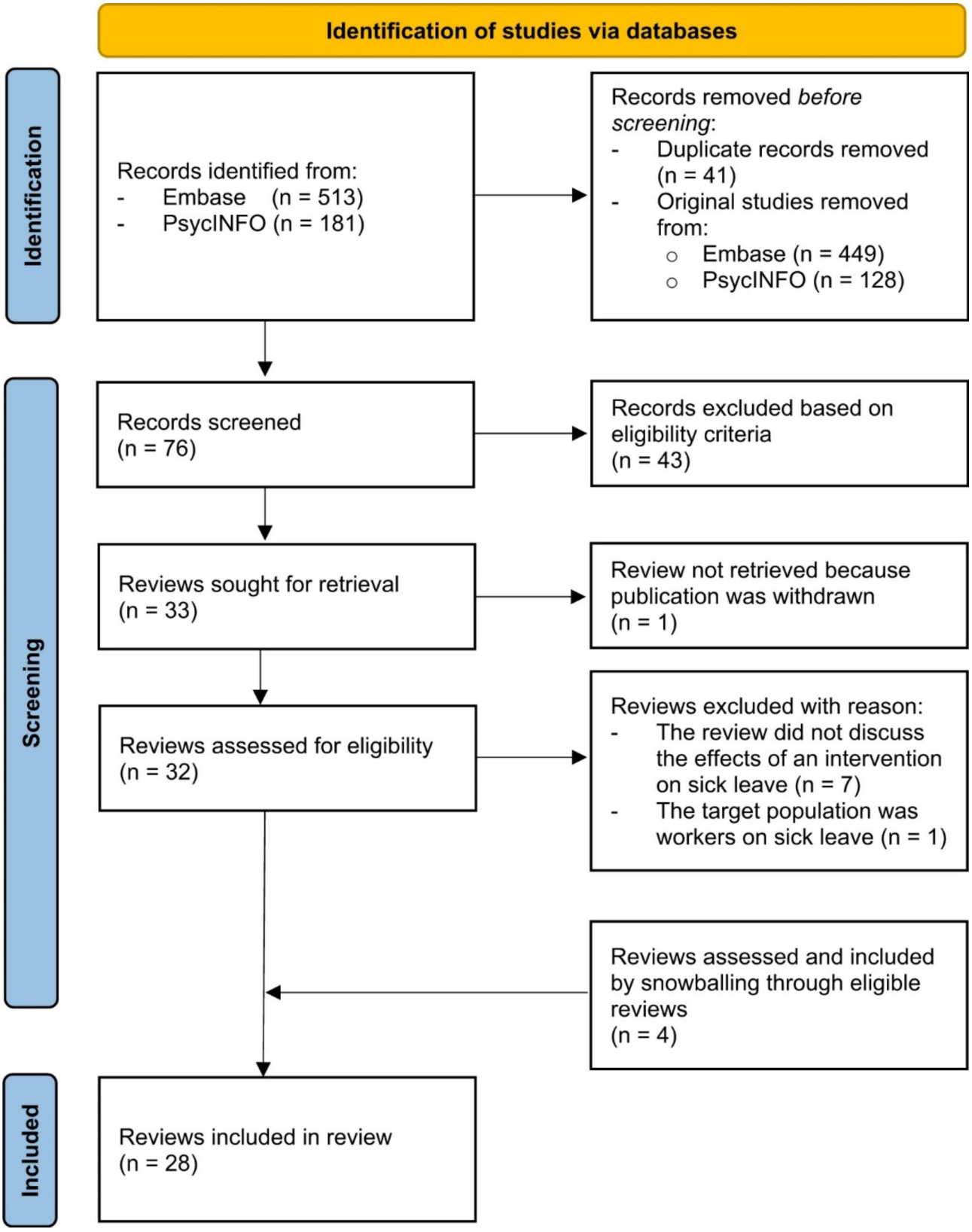

Fig. 1 Selection process of selected reviews visualized in PRISMA 2020 flow diagram

Table 1 Characteristics of the included reviews on preventing sick leave due to physical health problems

			Population characteristics		Intervention characteristics			
Author and year	**Studies[1] (total # of studies)**	**Total N**	**Description of population**	**General vs. with health problems**	**Description of types of intervention**	**Single vs. multi-component**	**Individual vs. environmental**	**Effective in preventing sick leave?**
O'Reilly et al. 2002 [13]	11 (11)	Not reported	General working population among which healthcare workers	General	Influenza immunization (vaccine)	Single	Individual	Partly
Pedersen et al. 2018 [23]	5 (5)	1652	Employed pregnant women	General	Physical training, complementary and alternative medicine	Single	Individual	Partly
Dick et al. 2011 [27]	1 (28)	268	Workers with upper limb disorders	With health problems	Software program that prompted computer users to take regular breaks	Single	Individual	No
Tveito et al. 2004 [19]	15 (28)	7267	Employed adults with and without low back pain	Both	Preventive educational, exercise, treatment, back belts, multidisciplinary or pamphlet interventions to prevent or treat LBP	Multi	Individual	Partly
Eisele-Metzger et al. 2023 [18]	7 (24)	2929	Office workers without and with back pain	Both	Work-related physical activity and multi-component interventions aimed at preventing back pain	Multi	Individual	Partly
Bos et al. 2006 [24]	3 (13)	675	Nursing home nurses and nursing home coordinators	General	Training, education and ergonomic interventions	Multi	Both	No
Demoulin et al. 2012 [9]	2 (9)	487	Workers without back pain, with back pain or with previous back pain	Both	Educational intervention on lifting techniques, back belt intervention and combination. Education train the trainers and education and physical training	Multi	Both	No
Steffens et al. 2016 [28]	4 (23)	1363	Workers without LBP or with mild LBP	Both	Preventive strategies for nonspecific LBP (education, training, ergonomic adjustments, exercise, back belts)	Multi	Both	Partly

LBP, low back pain. 1. Number of controlled studies with sick leave as outcome included in the review, between brackets is the total number of studies included in the review. For this cause of sick leave, there are 48 studies in total, but 46 without duplicates across reviews

participants. In total, 19 out of the 28 reviews targeted the general working population, while nine reviews (also) targeted workers with health problems. Regarding the type of interventions described in the reviews, twelve reviews only described single-component interventions, of which six targeted the individual level and six the environmental level. Sixteen reviews also described multi-component interventions, of which fourteen targeted both the individual and environmental level, and two only targeted the individual level. The main results of the included reviews are shown in Table S5 for sick leave due to physical health problems, in Table S6 for sick leave due to mental health problems, and in Table S7 for all-cause sick leave.

Prevention of sick leave due to physical health problems

Single-component interventions

Three of the eight reviews examining the prevention of sick leave due to physical health problems describe single-component interventions and target the individual level [13, 23, 27]. First, the results on sick leave of a review on the effectiveness of influenza immunization (through vaccination) in the general working population were mixed, with the included studies showing either no significant differences in sick leave or a statistically significant reduction in sick leave [13]. Second, a review on the effectiveness of interventions targeting sick leave among pregnant women included three studies on physical training interventions and two on alternative medicine interventions [23]. The authors of the review concluded that these interventions did not significantly reduce sick leave, except for one intervention. That intervention consisted of aerobic training with a physical therapist and home exercises and reduced women's sick leave due to low back pain which resulted in a 22% (89/397) sick leave prevalence in the intervention group versus 30% (111/365) in the control group (odds ratio (OR) = 0.7, 95% confidence interval (CI) = 0.5;1.0, $p = 0.04$) [23]. Third, a review on interventions targeting workers who already had upper limb problems identified one study on a software program that prompted computer workers to take breaks [27]. Sick leave was not affected by this intervention and the review concluded that a remarkably small number of publications evaluated the impact of occupational management of upper limb disorders on sick leave.

Multi-component interventions

Five reviews about the prevention of sick leave due to physical health problems incorporated multi-component interventions [9, 18, 19, 24, 28]. Two of these included intervention studies that focused solely on the individual level [18, 19]. These interventions consisted of, among others, education, exercise, medical treatments, back belts, flyers encouraging activity and early return to work after low back pain, or multi-component programs aimed at preventing back pain. The reviews concluded that there is limited evidence for a positive effect of exercise as single-component intervention on sick leave, but that the evidence of multi-component interventions including exercise is uncertain.

Three reviews on back pain and musculoskeletal symptoms included at least one multi-component intervention that targets the organizational level in addition to the individual level, by means of organizational implemented guidelines and appointed trainers [24], train the trainers [9], or ergonomic adjustments to the workplace [28]. Insufficient evidence was found for an effect of education and training (among others on lifting techniques or back belts) to prevent sick leave due to musculoskeletal problems among general workers and healthcare workers. Insufficient evidence was also found for this education in combination with the organizational guidelines and appointed trainers, with train the trainers, or with advice on ergonomic adjustments to the workplace [9, 24, 28]. Demoulin et al. (2012) therefore concluded that the benefits of preventive educational interventions on sick leave can be questioned [9]. Similar as Tveito et al. (2004), Steffens et al. (2016) concluded that there is no evidence for an effect of back belts on sick leave prevention [19, 28]. Eisele-Metzger et al. (2023) (mean difference=-1.10 days, 95% CI=-2.07;-0.13), Steffens et al. (2016) (relative risk = 0.22, 95% CI = 0.06;0.76), and Tveito et al. (2004) all found support for an effect of exercise on preventing sick leave [18, 19, 28].

Prevention of sick leave due to mental health problems

Single-component interventions

Of the ten reviews on interventions that focused on preventing sick leave due to mental health problems, five reviews included studies examining single-component interventions [15, 17, 20, 29, 30].

The reviews of Dannheim et al. (2021) and Kuehnl et al. (2019) both aimed to summarize the evidence on improving health and wellbeing of employees by targeting the workplace environment through leadership interventions [17, 29]. These were training programs for supervisors aimed at reducing work-related stress [17] and at improving supervisor-employee interaction and supervisors' capability of designing the working environment [29]. While the latter review did not find support for a beneficial impact on sick leave, the first one did find significant effects of supervisor training on sick leave. However, both reviews concluded that the quality of the available evidence was low and that more well-designed studies are needed to assess the effects of leadership interventions on stress, wellbeing, and sick leave.

The other three reviews about single-component interventions were aimed at the individual level [15, 20, 30].

Table 2 Characteristics of the included reviews on preventing sick leave due to mental health problems

			Population characteristics		Intervention characteristics			
Author and year	**Studies[1] (total # of studies)**	**Total N**	**Description of population**	**General vs. with health problems**	**Description of types of intervention**	**Single vs. multi-component**	**Individual vs. environmental**	**Effective in preventing sick leave?**
Stratton et al. 2021 [15]	12 (28)	4727	Workers in paid employment	General	Mental health digital mHealth intervention, CBT, problem solving training, stress management	Single	Individual	Partly
Noordik et al. 2010 [20]	7 (7)	691	Workers with anxiety disorders (OCD, PTSD, severe phobias)	With health problems	Exposure-in-vivo containing interventions (component of CBT to learn to gradually deal with anxiety-provoking situations)	Single	Individual	Yes
Lee et al. 2014 [30]	2 (5)	1723	Workers in paid employment	With health problems	Targeted occupational health intervention program, which included consultation and personalized feedback from occupational medical staff	Single	Individual	Yes
Dannheim et al. 2021 [17]	2 (10)	2390	Employees	General	Health-oriented training programs targeted at supervisors (to raise awareness for the importance of health issues, teach mindfulness practices for conscious awareness, reduce stress and promote resources at the level of individual behavior)	Single	Environmental	Yes
Kuehnl et al. 2019 [29]	3 (21)	769	Employees and supervisors	General	Supervisor employee interaction, e.g. personal coaching concerning active listening while working; Design of working environment e.g. 360°-feedback session for assessing and improving the leader's participative leadership behavior	Single	Environmental	No
Czabała et al. 2011 [12]	5 (79)	Not reported	Workers in paid employment	General	Workplace mental health promotion interventions: stress management training, working conditions and lifestyle changes, employee fitness program, biofeedback and muscle relaxation	Multi	Both	Yes
Gillen et al. 2017 [32]	2 (5)	1948	Employees in paid work within private, public, or voluntary organizations	General	Educational intervention program, expressive writing intervention, CBT, Civility, Respect, and Engagement in the Workforce (CREW)	Multi	Both	Partly
Greiner et al. 2022 [22]	1 (4)	293	Construction workers	General	Training sessions by a physical therapist, rest-break tool, empowerment training	Multi	Both	No
Nieuwenhuijsen et al. 2008 [21]	11 (11)	2556	Depressed workers	With health problems	Anti-depressant medication, psychodynamic therapy, enhanced primary care, psychological treatment, and occupational therapy	Multi	Both	No
Estevez Cores et al. 2021 [31]	4 (49)	1184	Healthy workforce participants	Both	Stress management, exercise, stress management, work examination, mindfulness, yoga	Multi	Both	No

CBT, cognitive behavioral therapy. 1. Number of controlled studies with sick leave as outcome included in the review, between brackets is the total number of studies included in the review. For this cause of sick leave, there are 49 studies in total, but 48 without duplicates across reviews

The first one concluded that exposure-in-vivo interventions, which is a common part of cognitive behavioral therapy (CBT) in which participants learn to deal with anxiety-provoking situations, can improve work functioning (including sick leave) in workers with anxiety disorders [20]. The second one reported small and non-significant effects of CBT, problem solving training, or stress management delivered through digital mHealth interventions on reducing sick leave in the general working population (Hedges effect size (g) = 0.28, 95% CI=-0.02;0.57) [15]. The third review found that an occupational health intervention where employees at high risk for sick leave received consultation and personalized feedback from occupational medical staff was effective in reducing sick leave days after 1 year (mean difference=-11 days, 95% CI = 1;20) [30].

Multi-component interventions

All five reviews considering multi-component interventions included interventions that targeted both the individual and environmental level [12, 21, 22, 31, 32].

In three reviews, these interventions consisted of a combination of stress management training, exercise, and/or relaxation at the individual level, and examination of working conditions or training of the employer/organization at the environmental level [12, 31, 32]. Two out of three reviews found support for an effect of these interventions on preventing sick leave in some studies, but they did not conduct a formal meta-analysis and concluded that further research is necessary to come up with conclusive evidence [12, 32]. In their meta-analysis, Estevez-Cores et al. (2021) found significant effects of occupational health interventions on stress-related outcomes, but not on sick leave rates (g=-0.10, 95% CI=-0.21;0.00) [31].

Two reviews were aimed at a specific group of workers [21, 22]. The review of Greiner et al. (2022) focused on mental health promotion interventions for construction workers, but only identified one controlled study that evaluated the effect on sick leave [33]. The study evaluating this intervention, which consisted of training sessions by a physical therapist, a rest-break tool, and empowerment training sessions, showed a substantial but non-significant decline in sick leave days (OR = 0.44, 95% CI = 0.13;1.26). In their review on interventions to improve occupational health in depressed workers, Nieuwenhuijsen et al. (2008) found no evidence for an effect of interventions consisting of medication, enhanced primary care, and/or psychological interventions on sick leave [21].

Prevention of all-cause sick leave

Single-component interventions

Of the ten reviews on the prevention of all-cause sick leave, four included studies that examined single-component interventions [16, 34, 35, 36]. These intervention studies all targeted a specific component in the environment (i.e. self-certification, pre-employment examinations, health circles, and adjusted work schedules). Kausto et al. (2019) found mixed results of changing the length of time a worker is allowed to take time off work because of illness without a physician's certificate (i.e. self-certification) on sick leave [35]. Schaafsma et al. (2016) concluded that pre-employment examinations of job applicants may not reduce the risk of sick leave for light duty work, but may be effective for army recruits [36]. Aust et al. (2004) did not find a reduction in sick leave as a result of discussion groups at the workplace aimed at improving working conditions [34]. Bambra et al. (2008) summarized the effect of increasing the hours worked per day while decreasing the number of days worked in shift workers and found support for this so-called "Compressed Working Week" in one intervention study, but not in two others [16].

Multi-component interventions

All six reviews examining multi-component interventions encompassed intervention studies that targeted both the individual and environmental level [10, 11, 14, 37, 38, 39]. Four reviews concerned workplace lifestyle interventions [10, 11, 37, 39]. Jensen et al. (2011) and Grimini et al. (2019) investigated the effect of workplace nutrition and physical activity interventions consisting of, among others, education, health risk assessments, assessing workplace facilities, and physical exercise sessions [10, 37]. Both reviews concluded that these health promotion efforts can be effective in preventing sick leave, particularly when they include components aimed at the physical work environment. However, Pereira et al. (2015) concluded that onsite workplace health-enhancing physical activity programs, consisting of different exercises, had no benefit on sick leave in the general working population [11]. Shrestha et al. (2016) specifically evaluated the effect of workplace interventions to reduce sitting at work [39]. They concluded that sit-stand desks (with or without information and counselling about sitting less) did not have a considerable effect on sick leave.

The aim of the reviews of Tarro et al. (2020) and Odeen et al. (2013) was to assess the effects of workplace interventions in general on preventing sick leave [14, 38]. They included educational interventions, cognitive/counselling interventions, physical activity interventions, organizational interventions, and multi-component interventions. Tarro et al. (2020) conducted a meta-analysis across all these types of interventions and concluded

Table 3 Characteristics of the included reviews on preventing all-cause sick leave

			Population characteristics		Intervention characteristics			
Author and year	**Studies[1] (total # of studies)**	**Total N**	**Description of population**	**General vs. with health problems**	**Description of types of intervention**	**Single vs. multi-component**	**Individual vs. environmental**	**Effective in preventing sick leave?**
Kausto et al. 2019 [35]	5 (5)	254,505	Employees or insured workers	General	Introducing self-certification of sickness absence, or changing the length of the self-certification period	Single	Environmental	No
Bambra et al. 2008 [19]	3 (45)	217	Shift workers	General	Compressed working week intervention in which the hours worked per day are increased, whilst the days worked are decreased in order to work the standard number of weekly hours in less than five days	Single	Environmental	Partly
Schaafsma et al. 2016 [36]	3 (11)	6717	Job applicants or new army recruits	General	Pre-employment examination	Single	Environmental	Partly
Aust et al. 2004 [34]	2 (11_	200	Employees	General	Health circles (discussion groups, formed at the workplace, to develop change options for the improvement of potentially harmful working conditions)	Single	Environmental	No
Pereira et al. 2015 [11]	6 (8)	1277	General working population	General	Health enhancing physical activity interventions	Multi	Both	No
Jensen 2011 [10]	9 (30)	72,531	Employees	General	Nutrition-related worksite interventions (e.g. education, health risk assessment, worksite environment, fitness, rewards)	Multi	Both	Yes
Grimani et al. 2019 [37]	24 (39)	89,030	Healthy working population	General	Workplace nutrition and physical activity intervention (e.g. education, health screening, incentives, exercise, workplace facilities)	Multi	Both	Yes
Shrestha et al. 2016 [39]	3 (20)	106	Workers who spend the majority of their working time sitting at a desk	General	Interventions to reduce sitting at work (e.g. sit-stand workstation, coaching, management consultation)	Multi	Both	No
Tarro et al. 2020 [14]	29 (47)	Not reported	Employees	General	Workplace interventions to improve work-related outcomes. Multicomponent, counseling, education, organizational, and physical activity interventions	Multi	Both	Yes
Odeen et al. 2013 [38]	12 (17)	8757	Employees	General	Workplace interventions aimed at preventing sick leave. Cognitive, educational, composite, and physical activity interventions	Multi	Both	Partly

1. Number of controlled studies with sick leave as outcome included in the review, between brackets is the total number of studies included in the review. For this cause of sick leave, there are 96 studies in total, but 81 without duplicates across reviews

that workplace interventions were in general effective in reducing sick leave (mean difference=-1.56 days, 95% CI=-2.67;-0.44), with individualized and counseling interventions with < 10 sessions/total being the most effective workplace intervention methodological design for reducing the absenteeism of employees [14]. Odeen et al. (2013) concluded that a cognitive intervention consisting of CBT and problem solving therapy was effective in reducing sick leave among employees with depression, but that other workplace education interventions, composite interventions, and workplace exercise interventions were not effective in reducing sick leave [38].

Discussion

This scoping review of reviews evaluating evidence-based interventions to prevent sick leave identified 28 reviews across a broad scope of health problems, types of interventions, and target groups. Overall, these reviews indicated that there is currently a limited availability of effective interventions to prevent sick leave, with eleven of the 28 reviews reporting that the included interventions were not effective, ten reporting that they were partly effective, and seven reporting that they were effective. Nevertheless, based on these reviews, three types of effective interventions to prevent sick leave can be identified. First, multi-component interventions consisting of both individual and environmental components aimed at lifestyle and aimed at mental health are promising interventions to prevent sick leave in the general working population. Second, specific interventions targeting workers at risk (i.e. those with specific health problems or at high risk for sick leave) are effective in preventing sick leave, such as specific CBT programs for workers with anxiety and depression, and consultation with occupational medical staff for workers at high risk for sick leave. Third, exercise programs seem to have the most favorable effect in preventing sick leave due to physical health problems in workers with and without health problems.

Multi-component interventions in the general working population

Multi-component interventions consisting of a combination of individual level components such as stress management training, exercise, and/or relaxation, and environmental level components such as examination of working conditions or training of the employer seem promising to prevent sick leave due to mental health problems [12, 32]. For all-cause sick leave, multi-component workplace nutrition and physical activity interventions including environmental components have the potential to prevent sick leave [10, 37]. This finding may be explained by that an integrated approach targeting both the individual worker and the work environment is more likely to have an impact on lifestyle and health than only targeting one level [40]. Correspondingly, prior work in the field of workplace health promotion indicates that multicomponent interventions are most effective in improving workers' lifestyle and preventing health problems [41, 42, 43]. However, in the current review, not all reviews describing multi-component interventions found positive effects on sick leave [11, 21, 22, 31, 38, 39]. One possible reason for this lack of effectiveness could be insufficient focus on the environmental component in the development and evaluation of multi-component interventions. Yet, this component is important because the organization plays a vital role in the development of work-related stress [12] and in the promotion of healthy lifestyle habits [10, 37]. This focus on the workplace has not only been found to be important in sick leave prevention, but also in return-to-work interventions [44]. Furthermore, commitment of the employer regarding workplace lifestyle interventions is especially important considering that their benefits will generally occur with a substantial time lag [10]. However, compared to individual-focused interventions, targeting the organization itself and workers' working conditions is more difficult to incorporate into interventions and to subsequently evaluate in high-quality designs, and therefore requires further research effort [12, 45]. Another possible reason for a lack of effectiveness in multi-component interventions may be the inadequate implementation of intervention components. Often interventions are not (fully) implemented as intended and participation is low, and in these cases it is premature to conclude that these interventions are ineffective in preventing sick leave [11]. For example, in a review on workplace health-enhancing physical activity programs, it was found that low participation rates were a problem in all included studies that did not find beneficial effects on productivity [11]. This suggests that poor implementation may be key in limited effectiveness of multi-component interventions. To facilitate successful implementation, insight is required in the needs and priorities of the organization and its workers, and intervention components should be adjusted to these specific needs [41, 46]. In intervention research, process evaluations should be conducted alongside effect evaluations to be able to judge how effective those involved were in implementing the intervention program [47].

Exercise programs and specific interventions targeting workers at risk

Of all evaluated interventions, only exercise and physical activity programs seem to have any beneficial effect on preventing sick leave due to physical health problems [18, 19, 23, 28]. However, this effect may be small [18, 19]. Furthermore, the effectiveness of physical activity on preventing sick leave may be greater for treatment effects in those with physical health problems than

for primary prevention [18]. Similarly, the results of the current review show that specific single-component interventions can be effective in preventing sick leave in worker groups at high risk for sick leave [20, 30, 36, 38]. In these interventions, the key to their effectiveness on sick leave seems to be in applying the intervention to a pre-identified high-risk group, instead of to the general working population where sick leave rates are already relatively low compared to high-risk groups. To obtain a better balance between benefits and costs, it may therefore be considered to develop and implement future sick leave prevention initiatives tailored to high-risk groups [48]. From a public health perspective, it is important to include all workers and not only focus on those at high risk. Nevertheless, given the widespread nature of health problems such as musculoskeletal complaints and mental health issues in the working population, a targeted approach to prevent sick leave in such high-risk groups may be warranted [47].

Recommendations for research

To promote higher-quality research on the topic of sick leave prevention, future randomized controlled trials require a follow-up period that is long enough to adequately assess the impact on sick leave. Changes in lifestyle and work habits may take substantial time to be adopted and to have an effect on health, let alone on sick leave. In the current review, some of the included reviews identified positive effects of interventions on health and work outcomes, but failed to show similar positive findings on sick leave outcomes, which may be due to a limited follow-up time [11, 31, 39]. Furthermore, sick leave needs to be incorporated as outcome in trials. The 28 reviews in the current review covered 502 controlled studies, but only around a third of them included sick leave as an outcome (Table S3). This limits the understanding of whether these studies included interventions that could contribute to preventing sick leave. Although sick leave may not be the primary focus in a particular intervention study, researchers should consider including it as a secondary outcome. In addition, when sick leave outcomes are included, they need to be adequately defined and measured. To this end, a core outcome set is a valuable tool to ensure the inclusion of relevant work participation outcomes and to decrease heterogeneity in pooling intervention results [49]. Despite these recommendations, an important aspect for future studies to consider is the balance between a gold-standard study design that allows for an optimal controlled setting and the possibility to execute such studies in a real-world setting. For example, it may not always be feasible to incorporate a longer follow-up period for assessing sick leave. However, the use of data sources that are already in place, such as occupational health records or administrative data, could contribute to this issue.

Strengths and limitations

A strength of the current review is its broad scope by including reviews on interventions targeting sick leave due to both mental and physical health problems. Thereby it provides a comprehensive overview on evidence-based interventions to prevent sick leave with its multifaceted nature. The heterogeneity in the populations, interventions, and outcomes across included reviews supports the approach of conducting a scoping review as opposed to a systematic review and meta-analysis. Scoping reviews aim to map the landscape of existing literature rather than to fully explore specific interventions. As a result, they may not always lend themselves to direct application for practice. However, scoping reviews are excellent tools for providing an overview of the current literature, which aligns perfectly with the research aim of the current work, and they thereby contribute to identifying research gaps and setting future research agendas.

One source of heterogeneity in the current scoping review are the different countries of origin in which individual studies were conducted. The findings were primarily based on studies conducted in the USA, Western Europe (mostly the Netherlands and Germany), and Nordic countries. These regions present notable differences, even within Europe [2], in the occurrence of sick leave and in the systems governing sick leave costs. In the USA, employers typically bear initial sick leave costs, but coverage is highly variable. In contrast, there is a more comprehensive and standardized system in the Netherlands, Germany, and the Nordic countries, with the employer and the state being responsible for the majority of sick leave costs. These differences may considerably influence the extent to which interventions are effective and to which results in one country are generalizable to other countries.

The primary outcomes of most of the included reviews were health-related outcomes. As a result, sick leave was often only (a small) part of the included reviews, limiting insight into the specific effects of the interventions on sick leave. Although sick leave is defined as time away from work because of illness, it is important to bear in mind that sick leave is influenced by both personal (e.g. lifestyle) and work-related (e.g. workload and lack of supervisor support) factors other than health [50], which complicates the relationship between ill health and sick leave. Additionally, sick leave could also be applied to treat short-term health problems and thereby prevent long-term sick leave [51], which adds further complexity to the usage of sick leave as an outcome measure. When evaluating interventions, it could therefore be considered

to use sick leave in combination with outcomes directly related to health and wellbeing.

Furthermore, it is important to note that controlled intervention studies on preventing sick leave which have not been included in a review thus far, were consequently also not considered in this review of existing reviews. In addition, reviews on interventions not evaluated in a controlled design such as certain economical or legislative interventions, were also not considered. Our scoping review specifically focused on the biomedical, medical, health sciences, and psychology research literature, and databases from other disciplines such as economics were not covered. Lastly, in this scoping review of reviews, we adopted the conclusions of the authors of the included reviews, and did not re-evaluate the results of the included individual intervention studies, nor conducted a quality appraisal. As not all reviews provided quantitative effect estimates, some of the authors' conclusions rely on qualitative results. Therefore, our conclusions are based on the quality of the included reviews and their reporting. No formal risk of bias assessment of the included reviews was conducted, because the aim of a scoping review is to provide an overview of the existing evidence and the included references are typically not critically appraised [52].

Conclusions

In conclusion, this scoping review among 28 reviews covering 164 (randomized) controlled trials with sick leave as an outcome identified a wide variety of interventions targeting various health problems in different working populations. This diversity is indicative of the multifaceted nature of sick leave and the various initiatives that have been undertaken to address it. This review provides an overview on three types of promising interventions for preventing sick leave. These are (1) multi-component lifestyle interventions and multi-component mental health interventions that integrate both individual and environmental elements, (2) targeted health interventions tailored to high-risk workers, and (3) exercise interventions for sick leave due to physical health problems. However, in general, the included reviews indicate a limited availability of effective interventions to prevent sick leave. On the one hand, this is due to the ineffectiveness of the evaluated interventions. This highlights the need for more well-developed interventions and a deeper understanding of the barriers and facilitators affecting their implementation. On the other hand, the lack of effective interventions stems from insufficient evidence. Therefore, more randomized controlled trials with long-term follow-up that include sick leave as an outcome are needed.

Abbreviations

CBT	Cognitive behavioral therapy
CI	Confidence interval
OR	Odds ratio
PCC	Population, concept, and context

Supplementary Information

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Supplementary Material 1

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Author contributions

KP and BL acquired the funding. EB, KP, and BL designed the protocol and search strategy. EB and DG conducted the screening of reviews. EB, DG, and BL performed the data extraction. EB and BL synthesized the findings and drafted the manuscript. KP and FA substantively revised the manuscript. All authors read and approved the final version of the manuscript.

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Data availability

All data generated during this study are included in this published article and its additional information files. The protocol for this scoping review is available upon request by contacting the corresponding author.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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