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Systematic review of active workplace interventions to reduce sickness absence

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Background	The workplace is used as a setting for interventions to prevent and reduce sickness absence, regardless of the specific medical conditions and diagnoses.
Aims	To give an overview of the general effectiveness of active workplace interventions aimed at preventing and reducing sickness absence.
Methods	We systematically searched PubMed, Embase, Psych-info, and ISI web of knowledge on 27 December 2011. Inclusion criteria were (i) participants over 18 years old with an active role in the intervention, (ii) intervention done partly or fully at the workplace or at the initiative of the workplace and (iii) sickness absence reported. Two reviewers independently screened articles, extracted data and assessed risk of bias. A narrative synthesis was used.
Results	We identified 2036 articles of which, 93 were assessed in full text. Seventeen articles were included (2 with low and 15 with medium risk of bias), with a total of 24 comparisons. Five interventions from four articles significantly reduced sickness absence. We found moderate evidence that graded activity reduced sickness absence and limited evidence that the Sheerbrooke model (a comprehensive multidisciplinary intervention) and cognitive behavioural therapy (CBT) reduced sickness absence. There was moderate evidence that workplace education and physical exercise did not reduce sickness absence. For other interventions, the evidence was insufficient to draw conclusions.
Conclusions	The review found limited evidence that active workplace interventions were not generally effective in reducing sickness absence, but there was moderate evidence of effect for graded activity and limited evidence for the effectiveness of the Sheerbrooke model and CBT.
Key words	Cognitive workplace interventions; composite interventions; systematic review; workplace exercise; workplace physical activity.

Introduction

The cost of sickness absence and disability benefits represents a major challenge for many workplaces and for society as a whole. Work is beneficial for both physical and mental health and is important for identity and social status [1]. Sickness absence is a risk factor for permanently leaving the workforce[2], and receiving a disability pension is a risk factor for early mortality [3]. There may be much to gain from interventions aimed at preventing long-term sickness absence.

A large number of systematic reviews summarize the effectiveness of different workplace interventions [4,5], but this literature is mostly subdivided into diagnostic categories with health as the primary outcome. Musculoskeletal and mental-health problems are the most common main diagnoses associated with sickness absence [6]. However, patients with long-term sickness absence are characterized by comorbid or multimorbid conditions and multiple body distress symptoms [7–9]; e.g. between 30–100% of low back pain (LBP) patients have comorbid psychiatric symptoms [10]. The 'main diagnosis' represents only part of the total picture. A systematic review across various diagnostic groups is therefore a useful addition to the existing literature.

In this review, the term 'active treatments' refers to interventions requiring that the subject is active and where

the goal is behavioural change. This definition excludes interventions such as surgery, massage, use of medication etc. Active interventions like cognitive behavioural therapy (CBT) [11] and instructions to stay active in the treatment of musculoskeletal pain have to a large degree replaced passive treatments as the preferred approach [12]. While passive treatments aim to change the physical condition of the treatment recipient, active interventions target behavioural change or negative cognitions.

The aim of this study was to review randomized controlled trials (RCTs) of active interventions implemented in the workplace or through the initiative of the employer, both to prevent and reduce sickness absence for employees over 18 years of age.

Methods

PubMed, Embase, Psych-Info, ISI Web of Science and the Cochrane Central Register Databases were searched by two of the authors (M.O and L.H.M) in March 2010. The search string had two parts, one for identifying RCTs and the other for identifying sickness absence. A combination of keywords, subject headings and free text terms were used in all searches, and each search was adapted to the database used (see Appendix 1, available as Supplementary data at *Occupational Medicine* Online, for search strategy). A research librarian assisted with the search. A supplemental search was performed on 27 December 2011 to include all articles published to this date. We searched the reference lists of two Cochrane reviews with similar inclusion criteria and outcome measures [4,13] for additional articles. Finally, www.clinicaltrials.gov was searched in March 2011 to identify ongoing trials.

Articles reporting RCTs of active interventions published in English in peer-reviewed journals were included. A scoping search indicated that English articles were sufficient to cover the relevant literature. The trial participants were employees above 18 years of age. At least some part of the intervention had to have taken place at the workplace or at the initiative of the employer. Furthermore, the intervention had to be aimed at one or several specific workplaces. Interventions recruiting participants from clinical settings or economic claim databases were excluded unless recruitment was done at a predefined set of workplaces.

Quantified sickness absence and/or return to work (RTW) were the only outcome measures. Qualitative reports and estimates of future sickness absence were not included; neither were non-quantified reports, e.g. 'yes or no' to sickness absence. Unadjusted values for the sickness absence outcome had to be reported separately for intervention and control groups. Finally, studies with a high overall risk of bias were excluded.

Two pairs of reviewers (M.O and L.H.M; T.H.T and S.M) independently screened the titles and abstracts of the identified articles. Articles considered eligible for full text screening were retrieved. Four articles could not be retrieved even after emailing the corresponding authors [14–17] and were not included in the review. The retrieved articles were screened in full text, and disagreements were resolved by discussion among all the reviewers.

Data from each of the included articles were independently extracted by two reviewers, using a digital data extraction form in EPPI reviewer software [18]. Disagreements were resolved by discussion until consensus was reached. Data were extracted about the participants, the intervention(s), the workplace, health complaints, and whether there was a significant effect on sickness absence or not.

The Cochrane collaborations tool for risk of bias [19] was used to assess risk of bias. Assessments were based on the published information only. We included two additional items: (i) financial interests of authors that might be related to the study results and (ii) selection bias caused by systematic differences between participants in a study and those who refused participation. Samples where less than two-thirds of the invited populations agreed to participate were considered biased.

Active interventions require collaboration from the participants implying that they know which intervention they get. It is also impossible to blind the treatment providers. As all studies included in this review had a high risk of bias on blinding, we disregarded these criteria, except for outcome assessment. For this criterion, we considered register data as blinded and self-report data as un-blinded.

The studies were classified as high, low or medium overall risk of bias. The criteria were

- Low: Studies with low risk of bias in randomization and allocation, no high risks of bias, and not more than two unknown risks of bias.
- High (excluded): Two or more high risks of bias, or a total of five high or unknown risks of bias.
- The remaining articles were classified as medium risk of bias.

A narrative data analysis considering study size, effect size and risk of bias was done. The interventions were classified into four broad categories: cognitive, educational, composite, and physical activity. The comparisons between interventions and control were the unit of analysis. Thus, if a study tested three different interventions against a control group, it would be counted as three comparisons.

The Cochrane Collaboration Back Review Group's 2003 criteria for deciding quality of evidence [20] was used to determine the overall quality of evidence for each intervention type in the synthesis. Strong quality evidence required consistent findings among multiple high quality RCTs, moderate required consistent findings

from multiple low quality RCTs and/or one high quality RCT, and limited evidence required consistent findings, with evidence from at least one low quality RCT [20].

In addition to the main synthesis, we checked for systematic differences in sickness absence and risk of bias between high- and low-quality studies and between studies with register and self-report data.

The protocol of the review was not published and trial registration was not done, as no suitable register was found during the start of the review. The protocol can be obtained by contacting the authors. No ethical approval was required as the study was a systematic review based on published data.

Results

Ninety-three articles were retrieved in full text, and 17 of them fulfilled the inclusion criteria (see Figure 1). Eight of the included articles targeted musculoskeletal, three mental, and six multiple health complaints or general health. Seventy-six articles were excluded, mainly because they did not fulfil the workplace, sickness absence reporting, or active intervention criteria (see Appendix 1, available as Supplementary data at *Occupational Medicine* Online). Thirteen articles were excluded because of a high overall risk of bias (see Appendix 2, available as Supplementary data at *Occupational Medicine* Online).

Two of the 17 studies had a low risk of bias; the rest had a medium risk of bias (see Figure 2). Fourteen studies used register data, and four of these reported a significant sickness absence reduction. Three studies used self-report data, none with significant results. The studies with no effect had a mean number of participants of 691, while the studies with effect had a mean number of participants of 120. Median values were 312 and 119, respectively. The control interventions were no treatment,

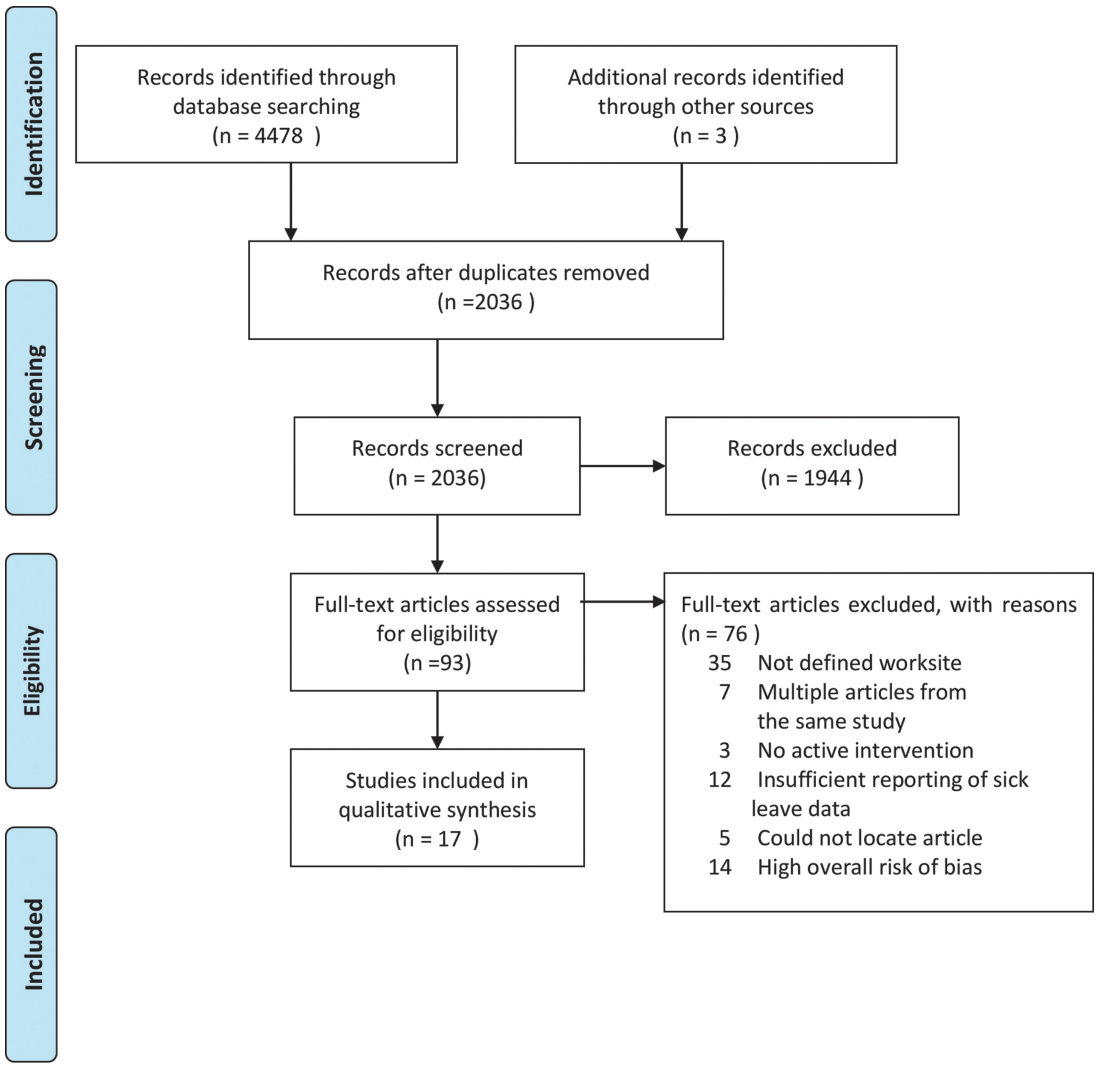

Figure 1. Flow diagram of article selection.

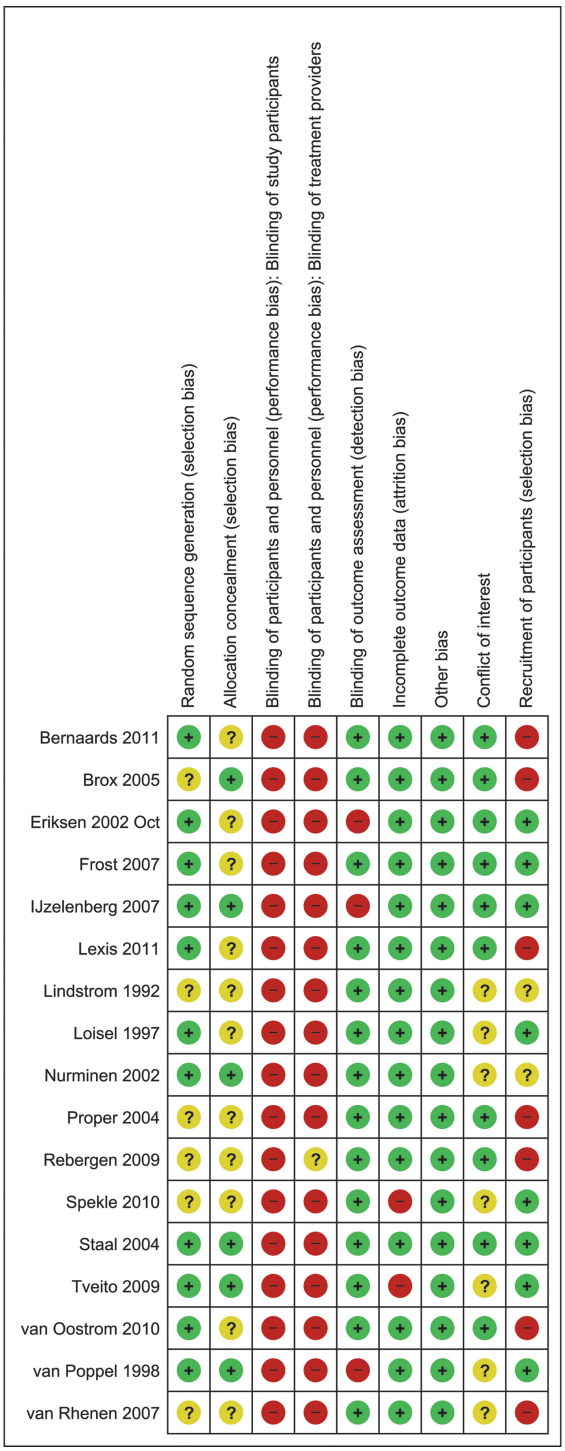

Figure 2. Risk of bias in included studies.

treatment as usual or some minimal intervention such as a booklet. The studies are described in Table 1.

Four of 24 interventions reported a statistically significant reduction of sickness absence [21–24]. One study showed a small subgroup effect, but in accordance with the authors' own conclusion, it was classified as not effective [25].

Six studies examined cognitive interventions [21,26–30]. Four focused on mental disorders [21,28–30] and two were general prevention [26,27]. A combination of CBT and problem solving therapy (PST) reduced sickness absence with 46% in employees with depression (n = 139) [21]. Other cognitive interventions [26–30] had no effect on sickness absence.

We concluded that there is limited evidence of effect of CBT combined with PST on sickness absence and no evidence of effect of other cognitive interventions on sickness absence.

There were five educational interventions reported in four articles, all focusing on musculoskeletal complaints [31–34]. None of these showed a significant reduction of sickness absence. There were no effects of information on back pain and handling of workloads [31], education about prevention of upper extremity pain [32], group meetings to increase physical activity and awareness of ergonomic work style [33] or education of baggage handlers in lifting techniques with or without a lumbar support [34].

We concluded that there is moderate evidence that workplace education aiming to prevent musculoskeletal disorders is not effective in reducing sickness absence.

Three articles reported results from five composite interventions [23,25,31], all targeting musculoskeletal complaints. The Sheerbrooke model, a comprehensive intervention including both workplace adjustment and a clinical component, showed a significant effect on sickness absence [23]. There were no effects of screening workplaces for hazards (focusing on lifting) and distributing a brochure about low back pain [31] and ergonomic adjustment, education and fast access to health care in a comprehensive intervention [25]. An effect on sickness absence from upper extremity complaints was explained by attrition bias [25].

We concluded that there is limited evidence for the effect of the Sheerbrooke model on sickness absence and no evidence of effect on sickness absence of other composite interventions.

There were eight interventions from seven articles on physical activity [22,24,26,29,35–37]. Two of these reported significant reductions of sickness absence. Graded activity and back schools had a significant effect on sickness absence and RTW in a population of auto workers with LBP [22], and the intervention and results were later replicated [24]. Workplace physical exercise was examined in five studies, none of which showed effect [26,29,35–37].

We concluded that there is moderate evidence that graded activity reduces sickness absence and moderate evidence that workplace exercise programs do not reduce sickness absence.

We searched clinicaltrials.gov for ongoing studies. We found 10 studies [38–47] that would probably have been included if they had been published. These were trials on physical exercise [38,45], obesity prevention [39,40,42] and education [41,43,46,47].

Table 1. Characteristics of included studies, subdivided by intervention types

Author, year, country, reference	Study sample (*N*)	Intervention(s)	Comparator	Significant sickness absence reduction	Diagnostic group	Risk of bias
Cognitive interventions						
Eriksen *et al*. 2002, Norway [26]	Blue collar postal workers (860)	Stress management training	No intervention	No	General sickness absence prevention	Medium
Lexis *et al*. 2011, Netherlands [21]	Bank employees (139)	CBT with problem solving therapy	No intervention	Yes	Depression	Medium
Proper *et al*. 2004, Netherlands [27]	White collar workers (299)	Counselling on physical activity and life style	Booklet	No	General sickness absence prevention	Medium
Rebergen *et al*. 2009 Netherlands [30]	Police officers (240)	Guideline based cognitive treatment	No intervention	No	Mental health	Medium
van Oostrom *et al*. 2010, Netherlands [28]	Mixed group workers (145)	Participatory problem solving training	No intervention	No	Mental health (distress)	Medium
van Rehnen *et al*. 2007, Netherlands [29]	Telecom workers (792)[a]	Brief cognitive intervention	No intervention	No	Mental health (stress)	Medium
Educational interventions						
Bernaards *et al*. 2011, Netherlands [33]	Computer workers (446)	Education about physical activity and work style	No intervention	No	Musculoskeletal	Medium
Frost *et al*. 2007, Denmark [31]	Industrial and health care workers (3808)	Information booklet	Information given to the organization	No	Musculoskeletal	Medium
Speklé *et al*. 2010, Netherlands [32]	Computer workers (1183)	Education and ergonomic advice	Limited general advice, referral if required (usual care)	No	Musculoskeletal	Medium
van Poppel *et al*. 1998, Netherlands [34]	Manual labourers at airport (312)	Education in lifting techniques	No intervention	No	Musculoskeletal	Medium
van Poppel *et al*. 1998, Netherlands [34]	Manual labourers at airport (312)	Education in lifting techniques and lumbar support belt	No intervention	No	Musculoskeletal	Medium
Composite interventions						
Frost *et al*. 2007, Denmark [31]	Industrial and health care workers (3808)	Information booklet and ergonomic screening	Information given to the organization	No	Musculoskeletal	Medium
IJzelenberg *et al*. 2007, Netherlands [25]	Workers in physically demanding jobs (489)	Education, exercise, and ergonomic advice	No intervention	No	Musculoskeletal	Medium
Loisel *et al*. 1997, Canada [23]	Manufacturing, health care, and services (104)	Back school and multidisciplinary treatment if necessary	Video on back pain, no further intervention	No	Musculoskeletal	Medium
Loisel *et al*. 1997, Canada [23]	Manufacturing, health care, and services (104)	Back school, ergonomic screening, 'therapeutic RTW'	Video on back pain, no further intervention	Yes	Musculoskeletal	Medium
Loisel *et al*. 1997, Canada [23]	Manufacturing, health care, and services (104)	Back school, multidisciplinary, ergonomic screening, 'therapeutic RTW' (Sheerbrooke model)	Video on back pain, no further intervention	Yes	Musculoskeletal	Medium

(*Continued*)

Author, year, country, reference	Study sample (*N*)	Intervention(s)	Comparator	Significant sickness absence reduction	Diagnostic group	Risk of bias
Physical activity interventions						
Brox *et al.* 2005, Norway [35]	Nursing home (129)	Stress management, nutrition, and exercise	No intervention	No	General sickness absence prevention	Medium
Eriksen *et al.* 2002, Norway [26]	Postal workers (blue collar) (860)	Exercise, education, and workplace adjustment	No intervention	No	General sickness absence prevention	Medium
Eriksen *et al.* 2002, Norway [26]	Postal workers (blue collar) (860)	Exercise with stress management	No intervention	No	General sickness absence prevention	Medium
Lindström *et al.* 1992, Sweden [22]	Auto workers (103)	Graded activity and back school	No intervention	Yes	Musculoskeletal	Medium
Nurminen *et al.* 2002, Finland [36]	Laundry workers (260)	Exercise	No intervention	No	Combination/ other	Low
Staal *et al.* 2004, Netherlands [24]	Airline employees (blue collar) (134)	Graded activity and exercise	No intervention	Yes	Musculoskeletal	Low
Tveito and Eriksen 2009, Norway [37]	Nurses and nursing aids (40)	Exercise, stress management training, and ergonomic examination of workplace	No intervention	No	Combination/ other	Medium
van Rehnen *et al.* 2007, Netherlands [29]	Telecom workers (792)[a]	Brief physical intervention	No intervention	No	Mental health (stress)	Medium

[a]Of the 792 invited participants, 242 participated in the intervention, but all invited participants were analysed (intention to treat).

Discussion

Overall, there is moderate evidence that graded activity reduces sickness absence and limited evidence that the Sheerbrooke model and CBT reduce sickness absence. In addition, the studies included in this review indicate that there is also moderate evidence that workplace physical exercise programmes do not reduce sickness absence. In general, however, there is at best limited evidence that the workplace interventions considered are effective in reducing sickness absence.

The major strengths of the review were the broad inclusion criteria for diagnoses and interventions. Since many reviews focus on narrow groups of diagnosis and interventions, this review provides a supplementary overarching perspective. This is important due to the high frequency of comorbid complaints, both in the general population and in clinical populations [7,9].

There were also some limitations in the review. Blinding of participants and treatment providers is not possible in these interventions, thus motivation and preferences of the participants may influence the results. Some studies have reduced this problem by using register data. Data from sickness absence registers contain errors and limitations, but they are unlikely to be caused by systematic biases between intervention groups [48,49]. While the articles screened for inclusion in full text comprised studies from many countries, only one of the included studies was not Dutch or Nordic [23]. In the Netherlands and the Nordic countries, the employers and the state carry the major part of the sickness absence costs, and this may affect research funding. The Netherlands and Nordic countries are also the largest contributors to research on the related field of RTW, together with the USA [50]. Five of 12 studies excluded for insufficient sickness absence reporting were from the USA [51–55], so a lack of sickness absence data, or differences in the reporting of these data, may be one of many potential reasons why there were no US studies included.

In this review, the interventions were categorized into groups based on our combined understanding of the interventions and their content. This understanding is certainly open for discussion. As interventions grow more comprehensive and multidisciplinary, it becomes increasingly difficult to compare studies.

An evidence hierarchy [20] was used in order to make this review transparent and fair. The evidence hierarchy rules were used together with our understanding of the results. No intervention type was rated as 'high-quality' evidence because none of the intervention types showed significant sickness absence reduction in two studies with a low risk of bias. We did not use the latest version of the hierarchy [56] because it was less suited to the narrative approach we used.

The most frequent diagnoses linked to sickness absence are musculoskeletal and mental complaints [6]. The studies included in this review reflected this; musculoskeletal complaints and particularly LBP were the most frequent diagnostic groups.

Problems with recruitment of participants were commonly reported in our sample, thus many of the studies reported results from non-representative samples of employees. This reflects a more general problem with workplace interventions: those at high risk for sickness absence may be less likely to participate in the intervention, or may simply not be present at the workplace due to sickness absence [57].

Our results differ somewhat from other reviews of workplace interventions. A recent Cochrane review found moderate evidence for the effectiveness of changes in the work organization or work environment interventions on sickness absence [4]. Our wider definition may be one of the reasons why the results were different. In another review of workplace interventions for LBP, physical exercise and comprehensive multidisciplinary interventions were effective in reducing sickness absence [58]. Studies published after this review was completed and differences in inclusion criteria may explain the discrepancy.

Graded activity interventions led to a significant reduction in sickness absence in two studies [22,24]. However, another study that did not fulfil our workplace inclusion criterion has shown that graded activity had a negative effect on RTW for employees who were still on sickness absence after 8 weeks of participating in the Sheerbrooke model intervention [59]. Employees who do not respond to the Sheerbrooke model may need more treatment than graded activity provides. The primary purpose of graded activity programmes is to demonstrate by starting carefully and then gradually increasing the activity, that activity may be painful, but it is safe. According to Staal *et al.*: 'The primary goal of the physical exercises was not to improve aerobic endurance, muscle strength, or any other aspect of physical fitness but to make the disabled worker aware that it was safe to move and to be physically active despite his or her pain' [24]. This approach is consistent with the theory [60] behind the brief intervention that has been effective in multiple RCTs [61–64].

The Sheerbrooke model [23] is a comprehensive programme with cascading stages and components, including a workplace assessment. The programme focuses on involving all stakeholders around the injured worker. This approach has been identified as effective in previous reviews [5] and may be one of the reasons why the Sheerbrooke model reduced sick leave in this review, but it is not possible to confirm this from the available data. An adapted version of the Sheerbrooke model in the Netherlands also reduced sickness absence significantly [59] but recruited participants from occupational physicians and thus was not included in this review.

CBT is not widely tested in workplace settings. Our review suggests that CBT may reduce sickness absence for high-risk employees [21]. However, more studies are needed before firm conclusions can be drawn.

While the workplace interventions can reach large and diverse groups, those most in need of an intervention may be on sickness absence or feel too sick to participate. Targeting employees already on sickness absence may lead to better results, but preventing further sickness absence after the first long period of sickness absence may be more difficult [22,24,59]. Workplace interventions often do not focus on sickness absence per se, and additionally promoting activity when possible at times when pain and health complaints are present may be a more feasible goal [64].

In view of our findings organizations aiming to reduce sickness absence should not have too high expectations of sickness absence reduction resulting from workplace interventions. New approaches to sickness absence reduction may be necessary. Long-term investment in health and job satisfaction rather than tools for rapid sickness absence reduction may be a more effective approach [57].

Although there are many studies of workplace interventions, there is a need for more high-quality studies. Studies that test single component interventions, or that test individual intervention components separately, are valuable in determining which components (or combination of components) are most effective in reducing sickness absence. Also, a more standardized way of measuring and reporting sickness absence internationally would be helpful for comparing studies and allow meaningful meta-analyses.

In conclusion, the currently available evidence does not support active workplace interventions as being generally effective in reducing sickness absence. However, there is moderate evidence that graded activity reduces sickness absence and limited evidence that the Sheerbrooke model and CBT reduce sickness absence. The studies included in this review provide moderate evidence that physical activity and education do not reduce sickness absence. Reducing sickness absence with active workplace interventions is possible, but the intervention content must be carefully considered.

Key points

- Previous reviews on workplace interventions have studied specific diagnoses or interventions. This systematic review is an overarching review of active workplace interventions for all diagnoses.
- Active workplace interventions do not seem to be generally effective in reducing sickness absence. However, there is moderate evidence that graded activity reduces sickness absence and limited evidence that the Sheerbrooke model and cognitive behavioural therapy reduce sickness absence.
- Active interventions may be ineffective if the goal is short term sickness absence reduction alone. However, these interventions may have other benefits not considered in this review.

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Conflicts of interest

None declared.

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Back to school

My medical school year produced four career occupational physicians of whom two are chief medical officers of multinational blue chip companies and one is a professor. Not bad for a year of 160, but perhaps it represents the fading nadir of a golden age. I am sure this number is not unrelated to the fact that at the time we trained, Malcolm Harrington was the professor of occupational medicine in the recently built Institute of Occupational Medicine, and I remember having a whole day dedicated to occupational health, which included an industrial visit. So in an era of declining undergraduate occupational health teaching it was reassuring to be asked to participate in the current undergraduate teaching at Birmingham University, a neat completion of the cycle for me and another of the quartet after a quarter of a century since our qualification. Another Malcolm (Braithwaite) ran the day with military precision and had recruited a cohort of consultants and specialist registrars to assist. Our mission was to supervise small group teaching sessions based on the case of a welder with back pain. My first surprise was to find that the cavernous pathology museum had disappeared. The rows and rows of specimens in dingy glass cases that I spent hours working among breathing formaldehyde had been replaced with a double-decked layer of smart and functional tutorial rooms. The second surprise was that the first group of 16 students dutifully turned up on time and signed an attendance register. Malcolm's suggested ice breaker was to ask if anyone had experience of working. This was the third surprise. Virtually none of 30 students had ever done any meaningful work apart from the odd waiting on in a restaurant job. Those who had unpaid work experience had taken in it the health service for CV purposes and even these students were in a distinct minority; no porters or cleaners. The nearest to traditional work experience was one student who had worked in a bakery. None of the students had been inside a factory or could identify with anything remotely similar to the photograph of the workshop our fictitious welder worked in. That night on the television there was a feature on the last needle factory in Redditch, where once there were more than a hundred factories producing over 90% of the world's needles. So even in what was once the workshop of the world, it is harder to offer industrial visits, but nevertheless like the teacher who never leaves school, not only do we risk producing a generation of doctors who have not had any occupational health teaching but also we risk a generation of doctors who do not have any meaningful insight into the work of their patients. Even where undergraduate occupational medicine is alive and kicking, the challenge is still greater than we think. Many medical schools don't do any occupational health teaching, and many medical students have no experience of the world of work. As occupational physicians we have a responsibility to rectify both.

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