Paper II

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Low back pain interventions at the workplace: a systematic literature review

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Objective	To assess the effect of controlled workplace interventions on low back pain (LBP) through a review of controlled studies. The rising costs of employees with LBP have resulted in an abundance of offers to society and organizations of interventions to prevent and/or treat the problem. Little is known of the effect of the different interventions.
Methods	A systematic literature search based on the inclusion criteria: controlled trial, work setting and assessment of at least one of the four main outcome measures: sick leave; costs; new episodes of LBP; and pain. Effect of the interventions was reported for the four main outcome measures.
Results	Thirty-one publications from 28 interventions were found to comply with the inclusion criteria. Exercise interventions to prevent LBP among employees and interventions to treat employees with LBP have documented an effect on sick leave, costs and new episodes of LBP. Multidisciplinary interventions have documented an effect on the level of pain.
Conclusions	The results show that there is good reason to be careful when considering interventions aiming to prevent LBP among employees. Of all the workplace interventions only exercise and the comprehensive multidisciplinary and treatment interventions have a documented effect on LBP. There is a need for studies employing good methodology.
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Introduction

Low back pain (LBP) causes a lot of misery, is painful for the individual suffering from it, and is costly to employers and society [1]. Various interventions have been tried both to prevent [2] and to treat [3] LBP. Several specific reviews about LBP interventions in the workplace have been published, e.g. ergonomic interventions [4], physical activity [5,6], back belts [6,7] and education [6,8], in addition to occupational health guidelines for the management of LBP at work [9,10]. The aim of this review is to summarize the evidence from a broad spectrum of workplace interventions trying to prevent and/or treat LBP.

LBP is one of the most common subjective health complaints in Western populations [11]. In Britain, the 1 year prevalence was 49% [12] and in the Nordic countries the 1 month prevalence of LBP was 35% [11]. It is also one of the most common causes of sick leave and disability pension in Norway and the Western world [13]. In Norway, 15% of the total amount of sick leave in 1999 was due to LBP [14]. Consequently, the cost for society and the workplace is large and seems to be steadily increasing [1]. Sick leave and costs were chosen as outcome measures due to their importance to organizations and society [13]. Since the number of new episodes of LBP and level of pain are important to the individual, these were chosen as additional outcome measures.

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Because most of the adult population is employed, worksite interventions enable contact with large parts of this population [15]. In addition, musculoskeletal problems are often believed to be work related [16]. Interventions carried out at the workplace will keep employees on sick leave in contact with work and colleagues, which is something believed to make return to work easier [17,18]. However, employees on sick leave with LBP may not benefit from an intervention carried out at the workplace unless they are specifically invited to participate.The prognosis of acute LBP is very good if left to its natural course [19]. After 6 weeks, 90% of cases have recovered and are back at work [13,20,21]. The prognosis deteriorates with the length of the sick leave. Half of the patients treated by primary health care in Norway will not return to work if they have been on sick leave for >8 weeks [22–24].

In recent years, there has been much focus on the importance of psychosocial factors at work for LBP [25]. However, psychosocial factors seem to be most important as LBP progresses to disability, whereas physical factors play a more prominent role in the early stages [26]. In a recent study of occupational factors related to LBP heavy physical workload, low influence over working conditions and poor social relations at work were among the variables most commonly associated with LBP [27]. These findings imply that psychosocial factors are important, but traditional ergonomic factors are not to be forgotten in the process of acknowledging the newer information.

The aim of this review was to assess if controlled workplace interventions have a positive effect on LBP, and which interventions are most effective.

Method

Inclusion criteria

Controlled workplace interventions with employees as participants, aiming to prevent or treat LBP were included. One of the following outcome measures had to be used: lost work days or sick leave due to LBP, cost or cost-effectiveness, new episodes of LBP, or level of pain.

Studies published in English from 1980 through June 2002 were included. The search was ended in November 2002.

Search strategy

One author searched the databases Medline Advanced, PsycINFO, the ISI base and the Cochrane Controlled Trials Register, and reference lists of relevant publications. The sensitive search strategy used in the Cochrane back reviews [28] was used for searching Medline and PsycINFO. The search strategy used for the other databases was as close to the sensitive strategy as possible.

Methodological quality assessment

Two of the authors assessed the methodological quality of the studies independently, and later used a consensus method to reach agreement on scoring the articles, with consultation of the third author if disagreement persisted.

Using the guidelines of van Tulder *et al.* [8], the methodological quality of the studies was assessed, and the studies were graded as high, medium or low methodological quality. Blinding of providers and participants was not used as a criterion because of the nature of these interventions. Internal validity was assessed using four criteria: concealment of allocation, withdrawal/drop-out rate, blinded outcome assessment and intention-to-treat analysis [28] (see Table 3). The criteria were rated 'positive', 'unclear', 'negative' or 'not relevant'. Overall assessment of internal validity was based on a summary of these four criteria. Low risk for bias meant that all criteria were positive, medium risk for bias meant that one or more of the criteria were unclear, and high risk for bias meant that one or more of the criteria were negative.

Evidence assessment

Many studies presented the data in a way not suitable for statistical pooling, and the studies were also heterogeneous regarding study populations, interventions and outcomes. Consequently, we decided not to perform a quantitative meta-analysis, but to summarize the results qualitatively. A qualitative assessment—evidence score—based on design, quality and outcome of the studies was used [29]. The evidence score consisted of four levels:

- Strong evidence: evidence from multiple methodologically strong studies.
- Moderate evidence: evidence from one methodologically strong and at least one weak study.
- Limited evidence: evidence from one methodologically strong or multiple weak studies.
- No evidence: evidence from one methodologically weak study or contradictory outcomes.

Description of the studies

The search in Medline retrieved 60 studies, the search in PsychLIT/PsycINFO added two studies and the search in the Cochrane Controlled Trials Register added 13 studies. Twenty-eight interventions were included in the review, three of them having two publications each, to give a total of 31 publications. Twenty-four studies were preventive interventions, covering 25 publications in total, and four studies were treatment interventions, with six publications in total. The excluded studies either did

not have a control group, were not workplace interventions or did not use any of the outcome measures.

The 24 preventive interventions were split into five subcategories:

- educational (10 interventions, 11 publications)
- exercise (six interventions)
- back belts (five interventions)
- multidisciplinary (two interventions)
- pamphlet (one intervention)

Back schools dominated the preventive interventions in the education subcategory. Back schools were introduced in Sweden in 1970, and the programme involved instructions in proper lifting techniques and body mechanics [30]. Since then, several back schools have been developed, differing in approach, content, length and delivery [30].

Exercise interventions involved specific exercises for strengthening back muscles or for flexibility, or exercises to increase strength and fitness generally. They varied from high to low intensity, were mandatory or voluntary, were performed within or out of working hours, and were of varying duration. Back belts interventions varied in duration and number of subjects, control interventions varied from none to exercise and education. Multidisciplinary interventions were comprehensive, based on the notion that LBP is multicausal [31]. Interventions aiming to treat employees with LBP were comprehensive, usually combining medical, psychosocial and ergonomic interventions for employees on sick leave with LBP.

Results

For a summary of the results, see Table 1.

Educational interventions

A total of 10 educational interventions were reported in 11 publications, thus being the largest group of interventions [32–42] (see Tables 2 and 3).

Sick leave

The effect of educational interventions on sick leave due to LBP was reported in six studies [32–34,37,39,40]. Two studies [32,40] reported a positive effect on sick leave in the intervention group, but there was no significant difference between the intervention and control groups. One study [32] had a risk of selection bias and other methodological weaknesses. The other study [40] was one of the methodologically strongest studies in this group. The rest of the studies did not report significant effects on sick leave. There is no evidence of effect on sick leave from educational interventions.

Costs

In four studies [32,33,39,40], the economic savings to the organizations from educational interventions were assessed. Three studies reported a positive effect; only Daltroy *et al.* [33] did not find any significant effect on costs. Two studies reported significant effects with important impact for the organizations [32,40]. The study by Brown *et al.* [32] showed a positive effect from pre- to post-intervention in the intervention group, but the difference between the intervention and control groups was not significant. Selection bias may be a problem in the studies by Brown *et al.* [32] and Tuchin and Pollard [39]. In the latter, the effect was seen between non-randomized groups. The studies by Daltroy *et al.* [33] and Versloot *et al.* [40] were the methodologically strongest. The study by Versloot *et al.* [40] was the only educational study that demonstrated an effect between the groups. There is no evidence of any effect of educational interventions on costs.

Episodes of LBP

The effect of educational interventions on new episodes of LBP was assessed in six studies [32–34,36,41,42]. A positive effect was reported in two of the studies [32,34], the one by Brown *et al.* [32] having quite a large impact, but with the reservation for selection bias. In the study by

Table 1. Summaries of outcomes

	Sick leave	Costs	Episodes of LBP	Pain	Other outcomes
Education	no evidence of effect	no evidence of effect	limited evidence of no effect	no evidence of effect	yes
Exercise	limited evidence of effect	limited evidence of effect	limited evidence of effect	no evidence of effect	yes
Back belts	no evidence of effect	no evidence of effect	limited evidence of no effect	no evidence of effect	yes
Multidisciplinary interventions	limited evidence of no effect	no evidence of effect	no evidence of effect	limited evidence of effect	yes
Pamphlet	no evidence of effect	–	–	–	yes
Treatment	moderate evidence of effect	no evidence of effect	limited evidence of effect	no evidence of effect	yes

Table 2. Presentation of the studies and their methodological score

Reference	*n*	Setting	Intervention	Methodological score	Outcome
			Educational interventions		
[32]	140	municipality	back school with education and exercise for employees with a history of on-the-job back injury, 2 h/day for 6 weeks for all the participants in the back school; the control group had no intervention	medium	cost-effectiveness related to lost time cost and medical cost
[33]	4000	postal service	two 90 min sessions of body mechanics, lifting techniques, exercises and pain management	medium	incidence of LBP, days lost and costs (days lost, medical and replacements); reports from 5.5 years
[34]	272	hospital	theoretical instruction on how to handle patients and other loads lasting 6 days; 2 days of supervision at work 3 and 6 months later; non-intervention control	medium	episodes of LBP, injury rate, number of days on sick leave, prevalence musculoskeletal complaints
[35]	55	medical centres	2 h education session of lifting techniques and body mechanics; non-intervention control group	medium/low	amount of pain and fatigue
[36]	52	nursing school	added education in ergonomic knowledge and behavioural training, 2 h per week for 2 years; the control group had the ordinary curriculum	medium	amount of LBP and ergonomic knowledge measured after 1 year at work
[37]	188	Finnish cooperative	six 1 h education and exercise sessions during 3 weeks, two 1 h review sessions 6 months later; the control group got a written copy of the education material	medium	sick leave, pain, disability, spinal mobility and muscle strength
[38]	74	municipality	back school with education and exercise for employees with a history of on-the-job back injury, 2 h/day for 6 weeks for all; intervention group had 15 min/week of individual counselling in addition; same intervention as Brown *et al.* (1992)	medium	back strength and flexibility, pain and psychological well being
[39]	121	mailing company	2 h spinal care lecture; control 1 instructed to do daily exercises, control 2 non-intervention	medium	cost-effectiveness related to days lost
[40]	500	bus company	back school with motivation, stress, coping, relaxation training and body mechanics; one 3 h session and two 1.5 h sessions; control most probably non-intervention	medium	sick leave, cost-effectiveness related to sick leave
[41]	200	nursing school	40 h of practical and theoretical training in patient-handling skills during nursing school; students from the previous 2 years were controls	medium	patient-handling skills (observation) and back injuries during the first year as a qualified nurse
[42]	not given; ~250?	geriatric hospitals	back programme including 30 min individual coaching session at the unit and 1 h with body mechanics and lift/transfer techniques; control group promised the programme later	medium/low	back accident rate
			Exercise		
[43]	142	hospital	comparison of a callisthenics programme twice a week for 3 months with five sessions (totalling 7.5 h) of back school with an emphasize on exercise; the control group was promised the most effective programme	medium	number of painful months, strength and flexibility
[44]	60	geriatric hospital	20 min workout once or twice per week for 13 months; designed to improve back muscle strength, endurance and coordination; non-intervention control	medium	back muscle strength, endurance, co-ordination, lost workdays, days with complaints
[45]	469	municipal fire fighters	mandatory flexibility exercises 30 min per day on every shift for 6 months; non-intervention control	medium	flexibility, costs related to medical care and lost time
[46]	282	home care personnel	physical exercise, self-administered with individual design of programme and five follow-ups on diary, and stress management, 90 min weekly for 7 weeks; no intervention in control group	medium	neck, shoulder, and back pain, physical exertion, psychosocial factors

Table 2. Continued

Reference	*n*	Setting	Intervention	Methodological score	Outcome
[47]	111	industry	weekly exercise programme one hour per week for 1.5 years during work hours; committed to exercise on their own at least once a week; non-intervention control	medium	days with sick leave, LBP
[48]	65	hospital	comparison of two exercise programmes, endurance and strength, 1 h twice a week for 15 weeks; waiting list control group.	medium/low	pain and aerobic capacity
			Back belts		
[49]	60	nursing and environmental services	intervention group was to wear belts at work for the 3 months study period; controls did not wear belts	medium	back injuries and pain
[50]	642	airport baggage handlers	group 1: used belts at work for the 8 months study period; group 2: 1 h supervised back injury prevention training; group 3: both; group 4: control	medium	lumbar injury, lost workdays and cost related to workers' compensations
[51]	60	hospital	both intervention and control groups attended 8 h back school and were instructed in a 5 min exercise programme expected to be done every day; the intervention group wore belts for 3 months	low	job attitude and frequency of LBP
[52]	301	cargo department of airline	group 1: lumbar supports at work and three educational sessions totalling 5 h; group 2: lumbar supports only; group 3: education only; group 4: control (non-intervention)	medium/high	back pain incidence, sick leave
[53]	90	warehouse	group 1: 1 h training session with body mechanics and pain prevention and wore corsets at work for 6 months; group 2: training only; group 3: control	high	sick leave, knowledge, strength, and number of back injuries
			Multidisciplinary interventions		
[18]	66	hospital	8 h per day for 5 weeks of physical therapy, exercise, ergonomics, behaviour therapy and prevention of pain and reinjury; waiting-list control group with priority	high	pain, anxiety, depression, usual subjective health complaints and pain-related sick leave
[55]	205 (intervention group)	county	back injury prevention programme including education, training, physical fitness activities and ergonomics lasting 1 year; non-intervention control	medium	cost related to medical claims and sick leave, adjusted for the costs of the programme; prevalence of back pain
			Pamphlet		
[56]	571	light industry	pamphlet encouraging active coping, activity and early return to work after LBP distributed in intervention company; control company had neutral pamphlet; attitude and knowledge measured	medium	knowledge and attitude, sick leave
			Interventions to treat employees with LBP		
[57]	128	hospital	back injured nurses offered rehabilitation programme immediately, and occupational therapy assessment/treatment if absent more than 4 days; control wards had no intervention; intervention period: 2 years	medium/low	function, pain
[58]	338	mine	comprehensive medical and psychosocial evaluation, counselling and eventual referral to general care, medical speciality, physical therapy or psychologist; control group had no special intervention	medium	lost time, cost-effectiveness and costs in relation to lost time and medical costs
[59,60]	104	workplaces in the Sherbrooke area	group 1: occupational intervention, starting after 6 weeks of sick leave; group 2: clinical intervention starting after 8 weeks of sick leave; group 3: both; group 4: control	high	return to work

Table 2. Continued

Reference	*n*	Setting	Intervention	Methodological score	Outcome
[61]	not given	mine	new mine with treatment plan for acute back pain including staff education, early treatment and emphasis on early return to work; control mine in adjacent town	medium	costs related to claims and number of claims due to back pain; days lost; reports from 6 years
[62]	1645 (intervention wards: 250)	hospital	same intervention as [57]	medium	sick leave, incidence of LBP and cost related to lost time and medical expenses

Table 3. Internal validity scores

Reference	Treatment allocation	Withdrawal/ drop-out rate	Blinding of assessor	Intention-to-treat analysis	Risk of bias
		Educational interventions			
[32]	N	U	P	P	high
[33]	U	N	U	P	high
[34]	N	P	NR	N	high
[35]	N	N	P	N	high
[36]	N	U	P	N	high
[37]	N	P	N	N	high
[38]	U	U	U	N	high
[39]	N	P	U	P	high
[40]	N	P	NR	P	high
[41]	N	N	N	N	high
[42]	N	N	P	P	high
		Exercise			
[43]	U	P	N	P	high
[44]	U	P	N	N	high
[45]	N	P	U	P	high
[46]	U	N	P	N	high
[47]	U	N	N	N	high
[48]	N	N	U	N	high
		Back belts			
[49]	U	P	NR	P	medium
[50]	U	P	NR	U	medium
[51]	N	U	NR	N	high
[52]	P	P	NR	N	high
[53]	P/U	P	P	N	high
		Multidisciplinary interventions			
[18]	U	U	U	P	medium
[55]	N	P	NR	N	high
		Pamphlet			
[56]	N	NR	NR	P	high
		Interventions to treat employees with LBP			
[57]	N	U	U	N	high
[58]	P	P	NR	N	high
[59,60]	P	P	NR	N	high
[61]	N	P	N	P	high
[62]	N	P	NR	P	high

P, positive score; U, unclear score/not reported; N, negative score; NR, not relevant for the study.

Fanello *et al.* [34], there was no significant difference between the groups. The other studies did not demonstrate any significant effects. Based on this, there is limited evidence for no effect of educational interventions on new episodes of LBP.

Pain

Three studies assessed effect from educational interventions on level of pain [35,37,38], and a possibility of selection bias was present in both the study by Feldstein *et al.* [35] and that by Sirles *et al.* [38]. One study demonstrated a significant reduction of pain in the intervention group compared to the control group [37]. Feldstein *et al.* [35] and Sirles *et al.* [38] did not find any significant effect on pain between the groups. All the studies were methodologically weak, so there is no evidence for an effect of educational interventions on level of pain.

Exercise

Six studies assessed the effect of exercise interventions on LBP [43–48] (see Tables 2 and 3).

Sick leave

Two studies assessed the effect of exercise on sick leave [44,47] and both showed important significant effects. However, there was risk of selection bias and low scores on internal validity. There is limited evidence for a positive effect from exercise on sick leave.

Costs

Two studies assessed the effect of exercise interventions on costs [44,45]. Both showed substantial economic savings, but had methodological weaknesses. There is limited evidence that exercise has a positive effect on costs.

Episodes of LBP

Three of the studies reported an effect of exercise on new episodes of LBP [43,44,47]. All studies demonstrated important significant effects between the groups, but had risk of bias. There is limited evidence that exercise has a positive effect on new episodes of LBP.

Pain

Three studies assessed effect on level of pain [44,46,48]. In one of the studies, there was no data backup for the statement that the intervention had a significant effect on pain [44]. In the other two studies, there were no significant differences between the groups on pain [46,48]. There is no evidence of effect of exercise on level of pain.

Back belts

Five studies assessed the effect of back belts on LBP [49–53] (see Tables 2 and 3). Compliance is a problem in studies of back belts as the belts may feel uncomfortable and hamper movements, and this may lead to many dropouts from the intervention group [54].

Sick leave

Three studies assessed the effect of use of back belts on sick leave [50,52,53]. One study demonstrated a significant effect between the groups [53]. Two studies did not find any significant differences between intervention and control groups [50,52]. There is no evidence of effect of back belts on sick leave.

Costs

One study assessed the effect of back belts on costs [49] and there was no significant effect. There is no evidence of effect of back belts on costs.

Episodes of LBP

Three studies tested effect of back belts on new episodes of LBP [49,51,52]. Two studies did not find significant effects [49,52], one study reported an effect, but had a low methodological score [51]. There is limited evidence that back belts have no effect on new episodes of LBP.

Pain

One study assessed effect on level of pain and found no significant difference between the groups [49]. There is no evidence of effect of back belts on level of pain.

Multidisciplinary interventions

Two studies were multidisciplinary interventions [18,55] (see Tables 2 and 3). In a methodologically strong study, Linton *et al.* [18] found no significant difference between the groups on sick leave, but demonstrated a clinically important positive effect on level of pain. Shi [55] reported positive effects on costs and new episodes of LBP. There is limited evidence that multidisciplinary interventions have no effect on sick leave, no evidence for effect on costs or new episodes of LBP, and limited evidence of effect on level of pain.

Pamphlet

There was only one study in this subcategory [56] (see Tables 2 and 3). No between-group effects were shown and the study is methodologically weak. There is no evidence of effect of an information pamphlet on sick leave due to LBP.

Interventions to treat employees with LBP

Four interventions aiming to treat employees with LBP were reported in six different publications [57–62] (see Tables 2 and 3). The two publications by Loisel *et al.* [59,60] were reports from the same intervention, as were the publications by Cooper *et al.* [57] and Yassi *et al.* [62].

Sick leave

Four studies reported effects on sick leave from interventions to treat LBP [58,59,61,62]. One intervention did not report significant effects [58]. The study by Loisel *et al.* [59] had a high methodological score. There is moderate evidence that interventions to treat employees with LBP have a positive effect on sick leave.

Costs

Three studies assessed the effect on costs [58,61,62]. One intervention did not demonstrate effect [58]. Yassi *et al.* [62] showed a decrease in compensation expenditure in the intervention group and an increase in the control group. Ryan *et al.* [61] reported an important difference in number of claims and costs per claim between intervention and control group; however, the study was not randomized and had other important methodological weaknesses. There is no evidence that interventions aiming to treat employees with LBP have an effect on costs.

Episodes of LBP

Two studies assessed effect on new episodes of LBP [61,62]. Both studies showed a significant effect. There is limited evidence that interventions to treat employees with LBP have an effect on new episodes of LBP.

Pain

One study reported a positive effect on pain [57]. Because of the methodological weaknesses in this study, there is no evidence for effect on level of pain of interventions aiming to treat employees with LBP.

Discussion

Only exercise interventions, multidisciplinary interventions and interventions aiming to treat employees with LBP showed evidence of effect on LBP (see Table 1). Exercise interventions showed limited evidence of effect on sick leave, costs and new episodes of LBP, and no evidence of effect on level of pain. Multidisciplinary interventions showed limited evidence of effect on level of pain, limited evidence of no effect on sick leave and no evidence of effect on costs and new episodes of LBP. Interventions to treat employees with LBP showed moderate evidence of effect on sick leave, limited evidence of effect on new episodes of LBP, and no evidence of effect on costs and level of pain.

Educational interventions showed limited evidence of no effect on new episodes of LBP and no evidence of effect on sick leave, costs and level of pain. Back belts showed limited evidence of no effect on new episodes of LBP and no evidence of effect on sick leave, costs and level of pain. There was no evidence of effect of a pamphlet on sick leave.

Some of the evidence scores were based on evidence from only one or two studies. However, many studies assessing the outcome of LBP interventions by sick leave, costs, new episodes, and level of LBP, were not included in this review because of the inclusion criterion that the study should take place in a workplace setting.

Four of the studies in the exercise group [43–45,47] showed effects on the main outcome measures. The other two studies did not show effect, but reported only on pain [46,48], and Gundewall *et al.* [44], the only other study reporting pain, also showed no effect on this outcome measure. Interventions varied from voluntary participation in a callisthenics programme [43] to mandatory special exercises for the back and shoulder muscles [45]. The findings are in agreement with the Cochrane review on exercise therapy for LBP [63] and a recent review on ergonomics [4].

Multidisciplinary interventions had a clinically important effect on pain [18]. Considering the multicausal aetiology of LBP [64], one would expect them to have a positive effect by influencing several factors predicting the prognosis of LBP. There was no effect on the other outcome measures, neither sick leave [18] nor costs and new episodes of LBP [55].

Interventions to treat employees with LBP had an effect on sick leave [59,61,62], costs [61,62] and new episodes of LBP [61,62]. Cooper *et al.* [57] found no effect on level of pain. One of the interventions in this group did not show effect on any main outcome [58]. All treatment interventions were comprehensive, focusing on several of the factors known to be associated with LBP.

Educational interventions focusing on the correct way to lift and the use of back belts did not have a positive effect on the four main outcome measures. This is in accordance with the review by Westgaard and Winkel [4], but not in accordance with the Cochrane review on back schools [8], which reported moderate evidence that back schools in occupational settings were more effective than 'placebo' and waiting list controls. Its conclusion was based on the findings of five studies, only one of which was included in the educational intervention group in this review [37]. Of the other four studies from the Cochrane review, two were included in this review but in other categories [18,43], one was not a workplace intervention by our definition [65] and one was published before our earliest inclusion limit [66]. In some studies, the back

Table 4. What is already known on this topic—what this study adds

What is already known on this topic	What this study adds
There is strong evidence that traditional education does not prevent LBP; back schools may be effective in occupational settings	the perspective in this study is interventions carried out in a work place setting
There is contradictory evidence that physical exercise may prevent LBP; exercise may be effective for chronic LBP patients	exercise, multidisciplinary and treatment interventions at the workplace have documented effect on LBP
There is strong evidence that back belts are not effective for LBP	educational interventions, lumbar supports and distribution of a LBP pamphlet at the work place have no documented effect on LBP
Multidisciplinary interventions addressing beliefs and attitudes seem to be effective for LBP	

schools contained other elements in addition to education [8], namely, physical therapy and exercise [18], and some effect may be due to these other elements.

The interventions assessing the effect of back belts on LBP [49–53] did not show evidence of effect on any of the four main outcomes, in accordance with the Cochrane review on lumbar supports [54].

Only controlled studies were included in this review, but even randomized, controlled studies, acknowledged as the golden standard in experimental studies, have their limitations and risks of bias. No matter how well done a study is methodologically, there is an area open to several biases that may seriously distort the conclusions—the interpretation and dissemination of results [67]. This also holds true for reviews [68], including the present one. Systematic reviews are open to biases from interpretation of results [69].

It has been argued that studies with negative findings are often published in the native language of the authors while studies with positive findings are published in English [70]. However, in a recent review [4], a thorough search of studies published in the Scandinavian languages showed that studies meeting reasonable quality criteria were also published in English, and there should be no reason to believe that this finding is special to Scandinavia. But negative results are difficult to publish [71], and the conclusions in this review might in fact be a result of publication bias in the literature.

Conclusion

Exercise and multidisciplinary interventions have an effect on the prevention of LBP, and comprehensive treatment interventions have an effect on sick leave, costs and prevention of new episodes of LBP. There are no documented effects of educational interventions or back belts.

Overall, the methodological quality of the assessed studies was low. There is a need for good quality studies to decide which interventions have effect. Admitting that the workplace is not the ideal setting for controlled interventions, it is still possible to increase the quality of the studies.

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