Review Article

# Preventive Strategies for Low Back Pain: A Systematic Review & Meta-analysis

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## Abstract

**Background:** Exercising and education strategies appear to be effective at reducing pain and enhancing life in adults with persistent low back pain, in particular in fitness care populations. **Aim:** This work aims to determine the effect of preventive strategies e.g. exercises and education on low back pain patients. **Materials and Methods:** A systematic search was performed over different medical databases to identify Internal medicine studies, which studied the outcome of the intervention group versus the Control group of low back pain patients. Using the meta-analysis process, either with fixed or random-effects models, we conducted a meta-analysis on the incidence of low back pain as a primary outcome, and on the number of patients on sick leave as a secondary outcome. **Results:** Six studies were identified involving 8632 patients, 2980 patients in the intervention group, and 5652 patients in the Control group. The meta-analysis process revealed a highly significant decrease in the incidence of low back pain, in the Intervention group compared to the Control group (p=0.007). The meta-analysis process also revealed a highly significant decrease in the incidence of sick leave, in the Intervention group compared to the Control group (p<0.01). **Conclusion:** To conclude, the addition of a short education program on active management to usual care in primary care leads to small but consistent improvements in disability, pain, and quality of life. The addition of a short physiotherapy program composed of education on postural hygiene and exercise intended to be continued at home, increases those improvements, although the magnitude of that increase is clinically irrelevant.

**Keywords:** Low Back Pain (LBP); Prevention

## Introduction

Low back pain (LBP) is associated with disability and paintings absence and accounts for excessive in your price range charges in western societies. The control of LBP accommodates a variety of different intervention strategies consisting of surgical treatment, drug therapy, and non-scientific interventions. Over the past years, a massive wide variety of randomized controlled trials (RCTs) have been posted and those have been summarized in systematic critiques. Most of these systematic evaluations cognizance at the effectiveness of interventions and describe the effects on the special types of LBP. [1]

Control of LBP has been the target of greater clinical studies and better use of essential appraisal strategies to assess and practice research findings. A huge quantity of systematic reviews is available within and outside the framework of the Cochrane back assessment organization that has evaluated the therapeutic interventions for LBP. This huge body of evidence has substantially improved our understanding of what does and does not paintings for LBP. The evidence from trials and critiques has formed the basis for clinical practice suggestions on the management of LBP that have been evolved in various nations around the world. [2]

A central element inside the modern debate about great exercise control of low backache is the efficacy of targeted versus established (non-targeted) management strategy. Many primary care clinicians (chiropractors, widespread practitioners, physiotherapists, and osteopaths) face up to the notion that non-targeted treatment is suitable. In clinics, they observe variably affected patients' presentations and the belief that targeting management strategy to people with unique styles of signs and symptoms (treatment effect modifiers) offers higher patient satisfaction. Treatment selections are influenced using this belief but there is little settlement approximately what signs and signs are critical management strategy impact modifiers and some argue that non-centered management strategy can be equally powerful. [3]

Exercising and education management strategies appear to



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be effective at reducing pain and enhancing life in adults with persistent low back pain, in particular in fitness care populations. In sub-acute low returned ache populations, a few proofs indicate that graded-hobby software improves absenteeism consequences, even though the proof for different varieties of exercise is unclear. In acute low returned ache populations, workout management strategy is as effective as both, no management strategy or other conservative remedies. [4]

This work aims to determine the effects of preventive strategies e.g. exercise and education on low back pain patients.

## Literature Review

Our review came following the (PRISMA) statement guidelines. [5]

### Study eligibility

The included studies should be in English, a journal published article, and a human study describing patients suffering from low back pain.

The excluded studies were non-English, or animal studies or describing other treatment strategies for low back pain (e.g. medications), or describing low back pain of specific cause (e.g. sciatica).

### Study identification

Basic searching was done over the PubMed, Cochrane library, and Google scholar using the following keywords: Low Back Pain, Prevention.

### Data extraction and synthesis

RCTs, clinical trials, and comparative studies, which studied the outcome of the intervention group versus the Control group of low back pain patients, will be reviewed.

Outcome measures included incidence of low back pain (as a primary outcome), and incidence of sick leave (as a secondary outcome)

### Study selection

We found 251 records, 190 excluded based on title and abstract review; 61 articles are searched for eligibility by full-text review; 19 articles cannot be accessed; 20 studies were reviews and case reports; 11 were not describing functional outcome; the desired procedure not used in 5 studies leaving 5 studies that met all inclusion criteria.

### Statistical methodology

The pooling of data, odds ratios (ORs), with 95% confidence intervals (CI) were done, using MedCalc ver. 18.11.3 (MedCalc, Belgium). According to heterogeneity across trials using the $I_2$-statistics; a fixed-effects model or random-effects model were used in the meta-analysis process.

## Results

The included studies published between 2008 and 2020. Regarding the type of intervention, 5 studies (out of 6 studies) used to exercise and education, while 1 study used shoe insoles [Table 1]. [6-11]

Regarding patients' characteristics, the total number of patients in all the included studies was 8632 patients, with 2980 patients in Intervention group, and 5652 patients in Control group, and their average number of sessions of (3), and their average duration of the intervention of (8.3) months, the mean age of all patients was (34.4 years) [Table 1].

A meta-analysis study was done on 6 studies that described and compared the 2 different groups of patients; with an overall number of patients (N=8632) [Table 2].

Each outcome was measured by:

**Table 1: Patients and study characteristics.**

| N | Author | Number of patients: Total | Intervention group | Control group | Type of intervention | Average age (years) | Number of sessions | Duration of Intervention (months) |
|---|---|---|---|---|---|---|---|---|
| 1 | Warming et al. [6] | 68 | 35 | 33 | Education & Exercise | 34.8 | 2 | 2 |
| 2 | George et al. [7] | 4307 | 1995 | 2312 | Shoe insoles | 22 | 5 | 12 |
| 3 | Mattila et al. [8] | 220 | 73 | 147 | Exercise | 19 | 1 | 6 |
| 4 | Moore et al. [9] | 30 | 13 | 17 | Exercise | 49 | 1 | 12 |
| 5 | Sihawong et al. [10] | 530 | 261 | 269 | Exercise | 37.1 | 2 | 12 |
| 6 | Sennehed et al. [11] | 3477 | 603 | 2874 | Exercise | 44.7 | 6 | 6 |

#Studies arranged via publication year.

**Table 2: Summary of outcome measures in all studies.**

| N | Author | Primary outcome: Incidence of low back pain: Intervention group | Control group | Secondary outcome: Incidence of sick leave: Intervention group | Control group |
|---|---|---|---|---|---|
| 1 | Warming et al. [6] | 14 | 22 | 2 | 5 |
| 2 | George et al. [7] | 300 | 406 | --- | --- |
| 3 | Mattila et al. [8] | 24 | 42 | --- | --- |
| 4 | Moore et al. [9] | 0 | 10 | --- | --- |
| 5 | Sihawong et al. [10] | 23 | 53 | --- | --- |
| 6 | Sennehed et al. [11] | 200 | 1393 | 171 | 1326 |

- Odds Ratio (OR)
- Incidence of low back pain (1ry outcome)
- Incidence of sick leave (2ry outcome)

Concerning the primary outcome measure, we found 6 studies reported the incidence of low back pain with a total number of patients (N=8632). $I_2$ (inconsistency) was 81.7% with highly significant Q test for heterogeneity (p<0.01), so random-effects model was carried out; with overall OR=0.59 (95% CI 0.405 to 0.868).

Using the random-effects model, the meta-analysis process revealed a highly significant decrease in the incidence of low back pain, in the Intervention group compared to the Control group (p=0.007) [Figure 1].

Concerning the secondary outcome measure, we found 2 studies reported the incidence of sick leave with a total number of patients (N=1629). $I_2$ (inconsistency) was 0% with non-significant Q test for heterogeneity (p >0.05), so fixed-effects model was carried out; with overall OR=0.46 (95% CI 0.380 to 0.557).

Using the fixed-effects model, the meta-analysis process revealed a highly significant decrease in the incidence of sick leave, in the Intervention group compared to the Control group (p<0.01) [Figure 2].

## Discussion

This work aims to provide cumulative data about the effect of preventive strategies e.g. exercise and education on low back pain patients.

The included studies published between 2008 and 2020.

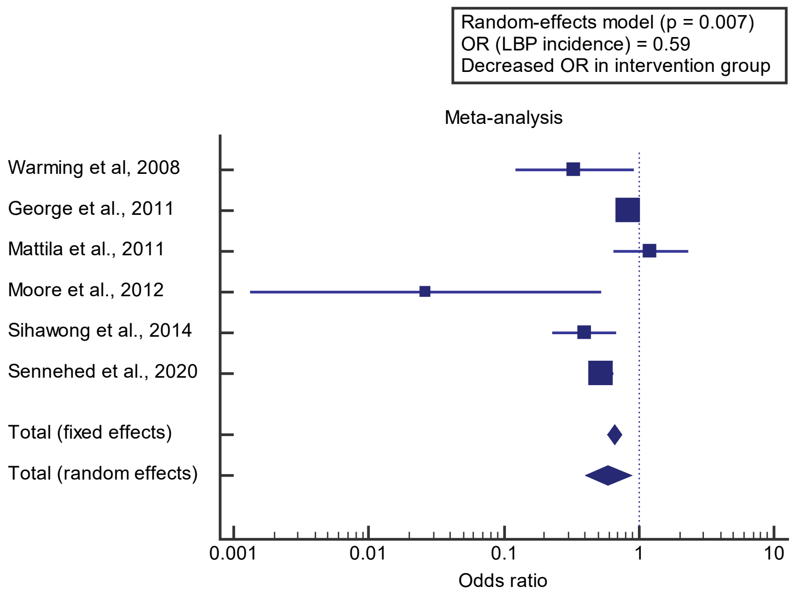


**Figure 1:** Forest plot demonstrating (incidence of low back pain).

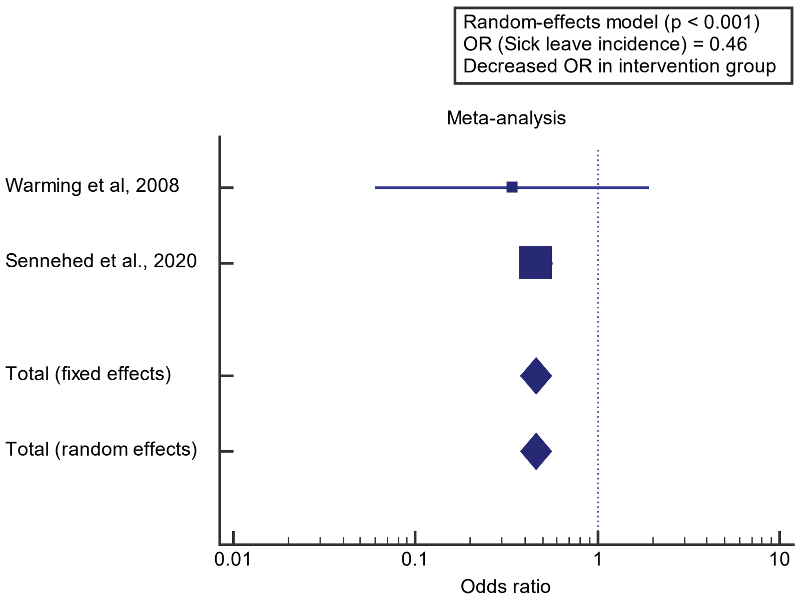


**Figure 2:** Forest plot demonstrating (incidence of sick leave).

Regarding the type of intervention, 5 studies (out of 6 studies) used to exercise and education, while 1 study used shoe insoles.

Regarding patients' characteristics, the total number of patients in all the included studies was 8632 patients, with 2980 patients in Intervention group, and 5652 patients in Control group, and their average number of sessions of (3), and their average duration of the intervention of (8.3) months. The average age of all patients was (34.4 years).

A meta-analysis study was done on 6 studies that described and compared the 2 different groups of patients; with an overall number of patients (N=8632).

We found 6 studies reported the incidence of low back pain with a total number of patients (N=8632).

Using random-effects model, the meta-analysis process revealed a highly significant decrease in the incidence of low back pain, in Intervention group compared to Control group (p=0.007), which came in agreement with Oesch et al. [12] Steffens et al. [13] Foster et al. [14] Tekur et al. [15] Haladay et al. [16] and Albaladejo et al. [17]

Oesch et al. reported that a total of 23 trials met the inclusion criteria, 20 of which have been appropriate for inclusion in meta-analysis permitting 17 comparisons of exercising interventions with usual care and 11 comparisons of 2 different exercise interventions. A statistically significant impact in favor of exercise on work disability was found in the long term (OR)=0.66, however not within the short (OR=0.80) and intermediate period (OR=zero.78). Meta-regression indicated no significant effect of specific exercise characteristics. [12]

Steffens et al. reported that the literature search recognized 6133 probably eligible studies; of those, 23 published reviews (on 21 different randomized medical trials which include 30850 specific participants) met the inclusion criteria. With outcomes presented as RRs, there was moderate-quality proof that exercise combined with education reduces the hazard of an episode of LBP (0.55) and low-quality proof of no impact on sick leave (0.74). [13]

Foster et al. reported that many clinical exercise recommendations suggest similar methods for the evaluation and management of low back pain. Recommendations include the use of a biopsychosocial framework to guide control with initially no pharmacological management, which includes education that helps self-management and restoration of normal daily life practices and exercise, and psychological interventions for resistant symptoms. Guidelines recommend prudent use of medication, imaging, and surgical procedure. [14]

Tekur et al. reported that, group and time interactions (p<0.05) and between group's differences (p<0.05) were significant in all variables. The numerical rating scale for pain in both groups reduced significantly 49% in Yoga, while 17.5% in controls (p<0.01) respectively. State anxiety reduced by 20.4% and trait anxiety by 16%, in the yoga patients with (p<0.01) respectively. Depression scale decreased in both groups by 47% in yoga patients and 19.9% in controls (p<0.01) respectively. Spinal mobility improved in both groups, 50%, in yoga and 34.6% in controls (p<0.01) respectively. [15]

Haladay et al. reported that certain exercises are commonly advised for rehabilitation of chronic LBP sufferers. Systematic Reviews (SRs) revealed that stabilization exercises proved to be more effective than no management at all; however, still there is low evidence advocating stabilization exercises over other interventions. Our findings should be interpreted with caution. All SRs indicated that specific stabilization exercises are effective for persons with chronic LBP; however, half indicated that they are no more effective than alternative treatments, including manual therapy and other forms of exercise, such as general flexibility and strengthening. [16]

Albaladejo et al. reported that, during the 6-month follow-up period, improvement in the "control" group was negligible. extra improvement in the "education" and "schooling _ physiotherapy" groups was found for disability (2.0 and 2.2 Roland Morris Questionnaire factors, respectively), LBP (1.8 and 2.10 visual Analogue Scale points), referred pain (1.3 and 1.6 visual Analogue Scale points), catastrophizing (1.6 and 1.8 Coping strategies Questionnaire points), physical quality of lifestyles (2.9 and 2.9 SF-12 points), and mental quality of lifestyles (3.7 and 5.1 SF-12 points). [17]

Using fixed-effects model, the meta-analysis process revealed a highly significant decrease in the incidence of sick leave, in Intervention group compared to Control group (p<0.01), which came in agreement with Oesch et al. [12] Steffens et al. [13] and Foster et al. [14]

Oesch et al. reported that data on work disability varied among the distinctive studies and included self-assessed work capability, days of sick leave, days at work, physician's judgment of work capability, and days of sickness compensation or numbers of employees returning to full-responsibility work. Those were obtained from insurance databases whereby national legal requirements may also have influenced the recordings. The data used for pooling had been the number of people who returned and did no longer back to work at the time of the follow-up, or the whole number of sick days within the follow-up duration. [12]

Steffens et al. reported that low- to very low–high-quality proof suggested that exercising alone may reduce the hazard of both an LBP episode (RR=0.65) and the use of sick leave (0.22). For education alone, there has been slight to very low–quality proof of no impact on LBP (1.03) or sick leave (0.87). there has been low- to very low–quality proof that lower back belts do no longer reduce the hazard of LBP episodes (1.01) or sick leave (0.87). There has been low-quality proof of no protecting effect of shoe insoles on LBP (1.01). [13]

Foster et al. reported that a further promising direction will be to target both the health-care system and, more broadly, public health via included health-care and occupational interventions. If backache symptoms are decreased, then return to work is expected to follow. The association between pain, function, and return to work is, however, weak with opinions suggesting that the association modifications with low back pain duration (positive association in the acute phase, no association inside the subacute phase, and negative association within the chronic phase). Humans can improve in function and go back to work even if the pain stays, and proof indicates that return to work happens before symptom recovery. [14]

## Conclusion

To conclude, the addition of a short education program on active management to usual care in primary care leads to small but consistent improvements in disability, pain, and quality of life. The addition of a short physiotherapy program composed of education on postural hygiene and exercise intended to be continued at home, increases those improvements, although the magnitude of that increase is clinically irrelevant.

## Competing Interests

The authors declare that they have no competing interests. All the listed authors contributed significantly to the conception and design of study, acquisition, analysis, and interpretation of data and drafting of the manuscript, to justify authorship.

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