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THE EFFICACY OF BACK SCHOOLS: A REVIEW OF RANDOMIZED CLINICAL TRIALS

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Abstract—The purpose of this study was to assess the efficacy of back school programmes for low-back pain. Data sources comprised computer-aided search of published randomized clinical trials and assessment of the methods of the studies. 21 papers reporting on 16 randomized clinical trials evaluating a back school programme were selected for the study.

Data extraction included a score for quality of the methods, based on four categories: study population, interventions, effect measurement and data presentation and analysis; and the conclusion of the author(s) with regard to the efficacy of the back school programme. Only two studies scored more than 50 points (maximum = 100 points) indicating the overall poor quality of the methods. Seven studies indicated that the back school programme was more effective than the reference treatment and seven reported it to be no better or worse than the reference treatment. In two studies the authors refrained from drawing a conclusion. The studies reporting positive results showed higher methods scores (4/7 positive vs 0/7 negative scored ≥ 45 points). Reported benefits of back schools were usually of short duration only. There are major flaws in the design of most studies. The best studies indicated that back schools may be effective in occupational settings in acute, recurrent or chronic conditions. The most promising type of interventions were (modifications of) the "Swedish back school" and were quite intensive (a 3 to 5-week stay in a specialized centre). Future research efforts should focus on the identification of patients who would benefit most from back schools. In addition, more attention should be paid to the cost-effectiveness of back schools.

Backache Low-back pain Back schools Randomized clinical trials Review
Meta-analysis

INTRODUCTION

Recent studies continue to show the major contribution of low-back pain to the burden of illness in western societies [1-3]. To reduce the impact of low-back pain in society, and to lessen the suffering of patients, many therapeutic interventions are available to date [4]. The efficacy of

most of these interventions for (subgroups of) patients with low-back pain are still under debate [5, 6]. During recent decades an enormous amount of research has been directed towards evaluating the various treatment options. These cover a wide range of conservative care (drug therapy, physical therapy, [bed]rest etc.), surgical interventions, and complementary medicine [4, 5]. In earlier review articles we assessed the available evidence on physiotherapy exercises, spinal manipulation and traction in low-back pain [7-9]. In this article we focus on the efficacy

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of back schools. The original "Swedish back school" was introduced by Zachrisson-Forsell in the seventies [10]. It consisted of 4 lessons lasting about 45 minutes. During the lessons, among other topics, information is given on the anatomy and function of the back, the mechanical strain in different positions is discussed and the psoas position (semi-Fowler position) is taught. Patients also receive instructions on isometric abdominal muscle exercises and are encouraged to increase their activity level during leisure time [10, 11]. The content of back schools nowadays appears to vary widely [12]. In this review we included back school programmes if they consisted of an education and skills programme and included an exercise regimen. In addition, all lessons were given to small groups of patients and supervised by a physiotherapist or other (para)medical specialist. Back schools have gained great popularity in recent years. Although no exact figures are available, the estimated number of back schools is approximately 300 in Sweden (in 1984), about 1000 (pain clinics) in the U.S.A. (in 1986), over 40 in the U.K. (in 1987) and at least 70 in The Netherlands (in 1992) [12]. In order to assess whether their widespread use is supported by evidence from sound randomized clinical trials, we performed a systematic review of the literature. Strong emphasis is laid on the methodological quality of the published trials.

METHODS

Selection of studies

A MEDLINE literature search was carried out for the period 1966–1992 (keywords [MesH]: backache, low-back pain, lumbago, randomized controlled trials). In addition, the references given in relevant publications were further examined. Abstracts and unpublished studies were excluded. Studies had to meet the following criteria: (1) the (experimental) treatment regimen included a back school type of intervention (additional interventions were allowed), (2) the study subjects suffered from low-back pain and (3) the design was a randomized clinical trial.

Assessment of validity

All trials were scored according to the criteria listed in Table 1. The criteria are based on generally accepted principles of intervention research. Similar criteria have previously been

used in reviews concerning other therapeutic interventions in low-back pain [7–9]. To each criterium a weight is attached, and the maximum score is set at 100 points for each study. The methodological quality of the studies was assessed by two reviewers (BK, MvT) independently. In a subsequent meeting they tried to reach consensus on each criterion they disagreed about. Where disagreement persisted, a third reviewer (DvdW) made the final decision. The assessments resulted in a hierarchical list in which higher scores indicate the studies with a better methodological quality. The outcome of the studies will be discussed in relation to their methodological scores.

In addition to our weighting system presented in Table 1 we performed a sensitivity analysis by applying different weighting systems in order to evaluate the robustness of the quality assessment. For this purpose, we performed one analysis in which we assume equal weights for all criteria listed in Table 1 (option B) and another analysis in which the criteria which are considered to be most important for the internal validity of the trials (i.e. criteria B, C, E, I, J, K, M, O) are given twice as much weight than the others (option C).

Table 1. Criteria list for the methodological assessment of randomized clinical trials of back schools for low-back pain (for details, see Appendix)

Criteria	Weight
<i>Study population</i>	
A Homogeneity	2
B Comparability of relevant baseline characteristics	5
C Randomization procedure adequate	4
D Drop-outs described for each study group separately	3
E <20% loss to follow-up	2
<10% loss to follow-up	2
F <50 subjects in the smallest group	8
>100 subjects in the smallest group	9
<i>Interventions</i>	
G Interventions standardized and described	10
H Control group adequate	5
I Co-interventions avoided	5
J Compliance measured and satisfactory in all study groups	5
<i>Effect</i>	
K Patients blinded	5
L Outcome measures relevant	10
M Blinded outcome assessments	10
N Follow-up period adequate	5
<i>Data presentation and analysis</i>	
O Intention-to-treat analysis	5
P Frequencies of most important outcomes presented for each treatment group	5

Outcome of the studies

A study is considered to be positive if the authors concluded (in their abstract or conclusions) that the back school programme was more effective than the reference treatment. In a negative study the authors reported no differences between the study treatments, or even better results in favour of the reference treatment.

RESULTS

Twenty one publications met our selection criteria [13–33]. However, respectively four [13–16], two [17, 18] and two other [32, 33] papers reported on the same trial. Thus, a total number of 16 trials were included in this review. Of these, 11 (69%) were published within the last 5 years (1987–1992). For the assessment of the methods of the trials we combined the information from all papers reporting on the same trial. Tables 2 and 3 present the 16 trials in hierarchical order, according to their methodological quality. Initially, there was disagreement between the two independent reviewers over the criteria in 74 (15%) of the 480 items scored, but this was solved in a subsequent consensus meeting. Disagreement mainly occurred because of reading and interpretation errors. The third reviewer was called in only once to make a final decision.

Table 2 shows the wide range in methodological scores (range 16–70). Only two studies [13–18] scored more than 50 points (maximum score = 100), indicating the overall poor methodology of the trials. Only five trials [13–21] scored more than 40 points. The most prevalent methodological shortcomings appeared to be (C) an insufficient description of the randomization procedure, (D) no description of the number of or reason for drop-outs in each study group, (F) the small size of the study population, (I) no measures taken to avoid co-interventions in the study design, (J) no satisfactory compliance of interventions or no measurement of compliance at all, (K) no attempts to blind patients with respect to interventions and (M) failure to include a blinded assessor for at least some of the effects.

Table 4 presents the 16 studies in a hierarchical order according to their methodological quality when using different weighting systems than presented in Table 1. It appears that if all criteria are given equal weight (option B), the

hierarchical order does not change very much compared to the hierarchy presented in Table 2. The four best studies remain the same, while the same holds for the two worst studies (Table 4). In between, the sequence show some slight variations. In the situation that the criteria which are most important for the internal validity of the studies are allocated twice the weight than others (option C), the hierarchical order shows some more variation. However, also with this scoring algorithm the two best and the two worst studies remain the same.

In about half of the trials ($n = 7$) the authors reported better results from a back school programme in comparison to usual care, placebo short-waves, a waiting-list control group etc. In seven other trials the authors reported no differences or even worse outcomes of a back school programme compared to the reference treatment (e.g. usual care, McKenzie treatment, detuned short-waves). In two trials [28, 32, 33] the authors refrained from drawing a conclusion. Both had relatively low methods scores of 28 and 16, respectively.

The two best studies from Table 2, with methodological scores above 50 points, reported a favourable outcome of a back school programme in patients with chronic low-back pain. Of the three studies with methods scores between 40 and 50 points, two reported positive results in patients with acute and/or recurrent low-back pain. One study reported negative results in patients with pain with a duration between 2 weeks and 6 months. Of the 11 studies with methods scores below 40 points, three reported positive results in patients with acute, recurrent and chronic low-back pain. Six studies reported negative results, mainly in patients with chronic pain, but also in patients with acute conditions.

Interestingly, the four best studies (≥ 45 points) all reported positive outcomes of the back school programme. The best study of all, by Harkapaa *et al.*, showed that a modified Swedish back school, including exercises during a 3-week rehabilitation period in a centre or a 2-month period in an outpatient setting, was better than no systematic treatment in patients with chronic and recurrent low-back pain. However, no clear differences existed between the three groups after a 2.5-year follow-up period. The patients in this trial were selected in an occupational setting (Finnish State Railways) and had been involved in physically strenuous

Table 2. Randomized trials on the efficacy of back schools in order of methods score

Author	Scores for methods criteria*																Total score	Indication†	Conclusion‡
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P			
Harkapaa, Mellin [13-16]	1	3	—	—	4	17	10	5	—	5	—	10	—	5	5	5	70	Chronic and recurrent low-back pain	Positive
Hurri [17, 18]	2	3	—	—	4	8	10	5	—	—	—	8	—	5	5	5	55	Chronic low-back pain	Positive
Bergquist, Larsson [19]	2	3	2	—	2	8	10	5	—	—	—	4	—	5	—	5	46	Acute low-back pain	Positive
Linton <i>et al.</i> [20]	1	1	—	3	4	—	10	5	—	—	—	6	—	5	5	5	45	“Non-chronic” (recurrent) low-back pain	Positive
Berwick <i>et al.</i> [21]	2	3	—	—	2	8	—	5	5	—	—	6	—	5	—	5	41	Low-back pain (duration > 2 wk, < 6 mth)	Negative
Stankovic, Johnell [22]	2	3	4	—	4	—	10	—	—	—	—	6	—	5	5	—	39	Acute low-back pain	Negative
Lankhorst <i>et al.</i> [23]	2	3	2	—	2	—	5	5	—	—	3	6	—	5	—	5	38	Chronic low-back pain	Negative
Lindequist <i>et al.</i> [24]	1	2	—	—	4	—	5	5	—	—	—	4	—	5	5	5	36	Acute low-back pain	Negative
Moffet <i>et al.</i> [25]	1	3	—	—	2	—	5	5	—	—	—	4	10	—	—	—	30	Chronic low-back pain	Positive
Keijsers <i>et al.</i> [26]	1	—	—	3	2	—	—	5	—	—	—	8	—	5	—	5	29	Chronic low-back pain	Negative
Herzog <i>et al.</i> [28]	1	1	—	—	—	—	—	5	—	—	—	6	10	—	—	5	28	Chronic sacroiliac joint pain	No conclusion
Donchin <i>et al.</i> [29]	—	3	—	—	—	—	5	5	—	—	—	4	—	5	5	—	27	Chronic low-back pain	Negative
Postacchini <i>et al.</i> [30]	1	3	—	—	2	—	5	5	—	—	—	6	—	5	—	—	27	Chronic low-back pain and acute in chronic history	Positive
Morrison <i>et al.</i> [31]	—	—	—	—	—	8	—	—	—	—	—	4	—	5	—	5	22	Acute low-back pain	Positive
Oudheusden <i>et al.</i>	1	1	—	—	—	—	5	5	—	—	—	4	—	—	—	—	16	Chronic low-back pain	No conclusion
Keijsers <i>et al.</i> [32, 33]																			

*See Appendix for details of criteria.
†The labels acute and chronic are according to the authors of the study. Classification might therefore vary between the studies.
‡Conclusion of the author(s) of the study. Positive conclusion = back school better than the reference treatment; negative conclusion = back school worse than or equally effective as reference treatment.

or moderately strenuous work for at least 10 years [13–16]. The second best study, by Hurri, was also conducted in an occupational setting (“a major Finnish cooperative”) and only women were included. In this study the Swedish back school appeared to be more effective (less pain) than usual care in chronic low-back pain after a 6-month follow-up period. After 12 months the differences in effect had disappeared [17, 18].

The “classical” study of Bergquist and Larsson also evaluated the Swedish back school in an occupational setting. Patients with back pain for less than 3 months (acute and subacute) were selected from a major automobile industry. The mean number of days until recovery was less in the back school group, although the differences compared with combined physiotherapy were small. Both were clearly more effective than placebo short-wave therapy [19]. There were no clear differences with respect to the number and duration of recurrences during a 1-year follow-up period.

The fourth study in the hierarchical order, by Linton *et al.*, was also conducted in an occupational setting. It evaluated a programme aimed at secondary prevention for nurses with non-chronic low-back pain. The programme appeared to be intensive and consisted of a 5-week programme in a back clinic for 8 hours a day. At least 4 hours a day were spent on various exercise activities. Patients also received ergonomic education in the form of a low-back school, individual physiotherapy when needed, and behavioural therapy consisting of pain control, lifestyle management, risk analysis and application training. The programme showed better results compared to a waiting-list control group, even after a 6-month follow-up period [20].

In general, there appeared to be a clear relationship between the methodological quality of the studies and their outcome. Figure 1 shows the seven studies reporting positive outcomes and the other seven studies reporting negative outcomes of back schools in relation to their methodological scores. It shows that studies reporting positive results tended to have higher methodological scores. This is clearly illustrated by the finding that 57% of the positive studies have a methodological score of 45 points or higher, whereas not a single study (0%) of the negative trials scored more than 45 points.

DISCUSSION

Methodological quality

This review demonstrates the large variation in methodological quality of randomized trials of back schools. Most studies lack a clear description of an adequate randomization procedure. It is usually stated that the subjects were divided “at random” over the intervention groups. However, such a statement is no guarantee that all patients who had met the entry criteria and were willing to participate actually did have the same chance to be assigned to either study group. In our opinion, readers should be given detailed information about how the randomization procedure was carried out and by whom, in order to assess whether bias was, indeed, excluded.

Another problem appeared to be the lack of a description of the number of and reason for drop-outs in each study group. Although this information is essential in order to evaluate the value of the outcome of the study, the authors usually fail to supply these findings.

The small size of the study populations is a frequent problem in low-back pain research. For this reason, many studies lack the statistical power to detect potentially important differences in effects between the interventions under study. Another problem with smaller sample sizes is that important (un)known prognostic variables might not be in balance between the study groups after randomization.

The measurement of compliance is given little or no attention in most trials. However, in order to be able to make a valid interpretation of the outcome of a study, this information may be very important. Interpretation of the results of a back school which is found not to be effective when it was implemented with full compliance of the participants, will differ from the interpretation of the results of a back school which was implemented with only partial (or no) compliance of the participants.

Hardly any attempts were made to blind patients with respect to the interventions under study. Although we admit that blinding would be difficult to achieve, we believe that attempts should be made to control for expectation bias of patients included in a trial. Only Lankhorst *et al.* made such an attempt. They included a placebo short-wave intervention and told all patients (using a standard formula) that they were to receive a relatively new type of therapy of which the efficacy had not yet been fully

Table 3. Details of trials studying the efficacy of back schools for low-back pain

Authors	Back school programme (No. of patients)	Reference treatment(s) (No. of patients)	Methods score	Results*
Harkappa, Mellin <i>et al.</i> [13-16]	i. Inpatient group: 3-week rehabilitation period in groups of 6-8 patients: modified Swedish back school (4 sessions), 15 sessions back exercises, 9 sessions relaxation exercises, supervised by physiotherapist; heat or electrotherapy and massage and session with physiologist and physician. Refresher course 2 weeks after 1.5 yr (156). ii. Outpatient group: 15 sessions during a 2-month period, twice a week in groups of 6-8 patients: modified Swedish back school (4 sessions), 15 sessions back exercises, 9 sessions relaxation exercises, supervised by physiotherapist and session with physiologist and physician. Refresher course 8 sessions after 1.5 yr (150).	iii. No systematic treatment; written and oral instructions on back exercises and ergonomics (153).	70	Changes in pain index and disability index after 3 months follow-up: significantly greater reduction in group (i) and (ii) than in (iii) (data in graphs and by anova). At 2.5 yr follow-up no clear differences.
Hurri [17, 18]	i. Modified Swedish back school: 60 min education and exercise session, 6 times in 3 weeks. Refresher course 2 x 60 min after 6 months. Supervised by physiotherapist; 11 patients per group (95). i. Swedish back school: 4 x 45 min in 2 weeks (lessons include information on anatomy, causes of low-back pain, semi-Fowler position, ergonomics, exercises and advice on physical activity (70). i. 5 week-period in a back clinic; 8 hr/day mostly in groups of 6 patients; exercise activities (walking, swimming, jogging, cycling) 4 h/day; ergonomic education, individual physical therapy programmes, behaviour therapy techniques (36).	ii. Instruction material of the back school in written form. No actual treatment, but free to use health care services (93). ii. Combined physical therapy: manual therapy according to Cyriax, Kaltenborn, Lewitt, and Janda (72). iii. "Placebo": short-waves at lowest intensity; a maximum of 10 treatments (75). ii. Waiting-list control: no additional active treatment (30).	55 46	Visual analogue Scale, Pain index, and Oswestry's Index: after 6 months follow-up group (i) significantly better than group (ii). After 12 months no differences (data in graphs). Mean number of days until recovery: (i) 14.8 (ii) 15.8 (iii) 28.7.
Bergquist, Larsson [19]				Visual Analogue Scale for pain intensity: significantly better in group (i) compared to group (ii) after a 6-week interval and a 6-month follow-up (data in graphs and by anova for repeated measures). Other outcome measures (fatigue, anxiety, sleep quality etc.) similar results.
Linton <i>et al.</i> [20]			45	

Berwick <i>et al.</i> [21]	i. A single 4-hr instruction session on low-back pain (psycho-education) (72). ii. A single 4-hr instruction session on low-back pain (psycho-educational) plus a compliance package (ongoing instruction and reinforcement by telephone and mail) (76). iii. Usual care: subjects were sent a single short pamphlet on low-back pain (74).	41	Percentage of patients with any pain after 3, 6, 12, 18 months: (i) 47, 36, 59, 48 (ii) 41, 35, 54, 60 (iii) 43, 47, 39, 43. No differences between study groups.
Stankovic, Johnell [22]	i. Mini back school: one lesson of 45 min on back care and education (50).	39	Less pain in group (ii) compared to (i) after 3 and 52 weeks (no data).
Lankhorst <i>et al.</i> [23]	i. Swedish back school: 4 sessions of 45 min in the course of 2 weeks (anatomy and causes of LBP, function muscles and posture, ergonomics, advice on physical activity) (21). ii. Postural education "back school type" and training programme supervised by physiotherapist (24). i. Swedish back school: 3 sessions containing education on anatomy and body mechanics, semi-Fowler position, ergonomic counseling, and exercises aiming at strengthening the abdominal muscles (40). i. Maastricht back school: education and skills programme in group setting (10-12 patients per group): 7 lessons of 2.5 hr and refresher lesson after 6 months. Including postural education, exercises, information on psychological factors (-). i. 6-week rehabilitation programme at a back pain centre: educational course and physiotherapy (164). i. Back school programme (including instruction on how to move and stretching postural exercises) supervised by physiotherapist: 10 sessions in a 4-week period (13).	38	Mean pain on 10-point scale after the intervention and after 3, 6 and 12 months: (i) 6.0, 5.9, 6.2, 5.6 (ii) 6.8, 6.5, 5.8, 6.5. No significant differences (including functional capacity).
Lindequist <i>et al.</i> [24]	ii. Advice not to strain the back and to use analgesics when needed. No physiotherapy (32). ii. Exercises only (same as in group (i)) (38).	36	Percentage of patients pain-free after 1, 3 and 6 weeks: (i) 21, 75, 83 (ii) 16, 66, 81. No significant differences. Change in mean pain and functional disability scores after 8 and 16 weeks significantly larger in group (i) compared to (ii) (data in graphs).
Moffet <i>et al.</i> [25]	ii. Waiting-list control group (-).	30	Mean pain Visual Analogue Scale: after 2 and 6 months: (i) 5.4, 5.4 (ii) 5.2, 4.6. No significant differences, including functional status.
Keijzers <i>et al.</i> [26]	ii. Control group (not further explained) (189). ii. Spinal manipulative treatment by a chiropractor: 10 treatment sessions in a 4-week period (16).	29	No significant differences after 4 and 8 months with regard to subjective feeling of pain (no data). Mean pain score after 4 weeks: significantly lower in group (i) compared to (ii) (data in graphs). Group (ii) significantly better in restoring gait symmetry.
Aberg [27]		28	
Herzog <i>et al.</i> [28]			

—continued overleaf

Table 3—continued

Authors	Back school programme (No. of patients)	Reference treatment(s) (No. of patients)	Methods score	Results*
Donchin <i>et al.</i> [29]	i. Four 90 min sessions during a 2-week period plus a fifth session after 2 months. 10–12 patients per group supervised by a physiotherapist (education and exercises for back and abdominal muscles) (46).	ii. Calisthenics in 45 min sessions bi-weekly for 3 months in groups of 10–12 patients (flexion and pelvic tilt exercises in order to strengthen the abdominal muscles, expanding spinal forward flexion) (46). iii. Control group (were promised the most effective programme in the future) (50).	27	Incidence of LBP episodes (mean of painful months during 12 months follow-up): (i) 7.3 (ii) 4.5 (iii) 7.4. Group (ii) significantly better than (i) and (iii).
Postacchini <i>et al.</i> [30]	i. Based on Canadian Back Education Unit: four 1-hr sessions in a one-week period (including muscle exercises) (50).	ii. Spinal manipulation by chiropractor daily for the first week and then twice a week for 6 weeks (52). iii. Drug therapy: non-steroid anti-inflammatory drugs (15–20 days) (47). iv. Physiotherapy: light massage, analgesic currents and diathermy daily for 3 weeks (47). v. Placebo: anti-oedema gel twice a day for 2 weeks (43). ii. Control group (no further information) (—).	27	Mean improvement on combined pain, disability and spinal mobility scores after 3 weeks, 2 and 6 months (in subgroup chronic patients: (i) 0.5, 4.6, 8.9 (ii) 2.2, 2.6, 4.3 (iii) 2.6, 2.2, 4.0 (iv) 3.9, 4.2, 6.0 (v) 0.7, 1.2, 2.0. Back school significantly better in subgroup with chronic pain and in the subgroup acute in a chronic condition. No significant differences in subgroup with low-back and radiating pain. Significantly more improvement with regard to body mechanics, physical strength, mobility, and physical ability in group (i) compared to (ii) after the programme.
Morrison <i>et al.</i> [31]	i. Outpatient back programme including education (body mechanics, causes and remediation, psychological stress) and exercise (increasing physical strength and mobility): six 3-hr sessions over 2, 3 or 6 week period (—). i. Maastricht back school: education and skills programme in group setting (10–12 patients per group): 7 lessons of 2.5 hr and refresher lesson after 8 weeks. Including postural education, exercises, information on psychological factors (20).	ii. Waiting list control group (20).	22	Visual Analogue Scale for pain after the programme: (i) 28.9 (ii) 31.9. No significant differences for most of the outcome measures, including daily activities.
Keijzers, Oudheusden <i>et al.</i> [32, 33]			16	

*Results of the most important outcome measures according to the authors of the study. *p*-Values < 0.05 were taken as statistically significant.

Table 4. Hierarchical order of trials according to the methodological quality using different weighting systems (sensitivity analysis)

Option B* (equal weights) Author	Outcome	Option C† (emphasis on internal validity)	
		Author	Outcome
Harkapaa, Mellin [13-16]	Positive	Harkapaa, Mellin [13-16]	Positive
Hurri [17, 18]	Positive	Hurri [17, 18]	Positive
Linton <i>et al.</i> [20]	Positive	Stankovics, Johnell [19]	Negative
Bergquist, Larsson [19]	Positive	Linton <i>et al.</i> [20]	Positive
Berwick <i>et al.</i> [21]	Negative	Berwick <i>et al.</i> [21]	Negative
Stankovic, Johnell [22]	Negative	Lankhorst <i>et al.</i> [23]	Negative
Lankhorst <i>et al.</i> [23]	Negative	Lindequist <i>et al.</i> [24]	Negative
Lindequist <i>et al.</i> [24]	Negative	Bergquist, Larsson [19]	Positive
Keijsers <i>et al.</i> [26]	Negative	Moffet <i>et al.</i> [25]	Positive
Postacchini <i>et al.</i> [30]	Positive	Keijsers <i>et al.</i> [26]	Negative
Moffet <i>et al.</i> [25]	Positive	Donchin <i>et al.</i> [29]	Negative
Donchin <i>et al.</i> [29]	Negative	Postacchini <i>et al.</i> [30]	Positive
Herzog <i>et al.</i> [28]	No conclusion	Herzog <i>et al.</i> [28]	No conclusion
Aberg [27]	Negative	Aberg [27]	Negative
Morrison <i>et al.</i> [31]	Positive	Morrison <i>et al.</i> [31]	Positive
Oudheusden <i>et al.</i>	No conclusion	Oudheusden <i>et al.</i>	No conclusion
Keijsers <i>et al.</i> [32, 33]		Keijsers <i>et al.</i> [32, 33]	

*Option B: all methodological criteria (A-P from Table 1) are given equal weights (5 points per criterion).

†Option C: criteria considered to be of major importance to ensure internal validity (B, C, E, I, J, K, M, O from Table 1) are given twice as much weight as the other criteria (10 points vs 5 points, respectively).

established. Finally, in only 2 of the 16 trials had a blinded assessor been involved to assess at least some of the effects. Especially in a situation in which it is difficult to blind the patients with respect to the treatment allocated, it is essential to include a blinded observer.

The reported methodological flaws are not unique for clinical trials evaluating the efficacy of back schools. The quality ratings of the back school trials are more or less similar to the quality rating of trials evaluating the efficacy of spinal manipulation and mobilization (range 26-56) and exercise therapy (range 24-61). In

general, the methodological quality of back pain trials appears to be disappointingly low.

Efficacy

In previous reviews of back schools the authors did not want to draw final conclusions about their efficacy. Linton and Kamwendo (in 1987) concluded that they could not determine the efficacy of low-back pain schools because of insufficient existing data [34]. Keijsers *et al.* (in 1991) reviewed 8 RCTs and concluded that, because of the low methodological quality of the trials, it was not possible to formulate a strong and valid judgement on the efficacy of back schools [35]. Schlapbach (in 1991) reviewed, among other studies, 8 RCTs and concluded that back schools probably have little value in acute low-back pain, but that there are possible beneficial effects in chronic conditions [36].

To date, 16 trials have been performed to evaluate the efficacy of back schools, including a few which showed relatively high methods scores (> 50 points). Despite the shortcomings of most of the trials, the outcomes suggest beneficial results of back schools in at least some of the study populations. Of the 16 trials, seven reported positive results and seven others reported negative results of back schools. However, the positive studies were mostly of better methodological quality.

Fig. 1. Relation between methods score of trials and their outcomes.

It is interesting to see that the four trials with higher methods scores (≥ 45) reporting positive outcomes of back schools, all took place in an occupational setting. Furthermore, three of these involved a (modified) Swedish type of back school. Thus, the (most) promising results seemed to be obtained by an intensive intervention programme in a specialized centre. Of course, a number of questions remain unanswered. The multidisciplinary approach of these programmes make it difficult to identify the (most) effective components of the treatment. Also, the non-specific effects (e.g. extra attention) of such programmes are not controlled for in the studies in this review. Perhaps this would not be possible to realize, because they would require a placebo-intervention programme lasting 3 or more weeks in a specialized centre or pain clinic. A related problem might occur when patients assigned to a control intervention (e.g. waiting-list control group) experience disappointment if they feel that a possible valuable therapy is being withheld. This phenomenon can be regarded as a sort of "negative" placebo effect [37]. In these instances the beneficial effects of back schools might be overestimated.

Another question still unanswered concerns the long-term effects of back schools. The two best studies reported no differences between the study groups after a 1-year and a 2.5-year follow-up, respectively. So far, the reported benefits of back schools were usually of a short duration only [13–18].

Not only the effects, but also the costs of the interventions should be taken into account. Especially when the observed differences are minimal, the relative cost-effectiveness may be important when deciding which intervention, if any, to offer. One may assume that, especially in the case of a stay of some weeks in a specialized centre, the costs of a back school programme can be considerable. On the other hand, the costs of absenteeism from work can also be quite substantial. However, cost-effectiveness analyses, so far, have not been included in randomized trials of back schools.

Limitations

There are certain limitations to the methods used in this review. Publication bias cannot be ruled out, so it might be possible that we missed trials which have not been published, because of their (negative) results. Furthermore, we did not blind the two independent reviewers with respect to the source and outcome of the trials.

However, the methodological criteria which we used were quite strict, and easy to apply, which was also reflected by the 85% concordance after the first assessment round. Readers can also easily check the assessments themselves. The weighting system which we used might have influenced the hierarchical order of the trials included in this review. However, the sensitivity analysis, using two different weighting systems showed more or less the same hierarchical order. Thus, our finding that the positive studies tended to be of higher quality occurred irrespective of the weighting system used. In addition, Shekelle *et al.* used and validated our quality rating system in a recent meta-analysis of spinal manipulation [38]. In this study the results appeared to be similar to the results when using the scoring method of Chalmers *et al.* [39].

To conclude, in recent years a number of randomized clinical trials has evaluated the efficacy of back schools. The critical assessment of the methods used in these trials revealed major flaws in the design of most studies. Future efficacy studies should be carried out taking into account the methodological shortcomings presented in this review. About half of the trials reported positive outcomes and the other half reported negative outcomes of back schools. However, the four best studies all reported positive outcomes of back schools. The results indicated that back schools may be effective for patients in occupational settings (as opposed to patients from the general population) in acute, recurrent and chronic conditions. Most of the successful interventions consisted of a modification of the Swedish back school and were quite intensive (a 3 to 5-week stay in a specialized centre). Future research efforts should focus on determining which patients would benefit most from these intensive back schools in an occupational setting, and should also evaluate their cost-effectiveness.

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APPENDIX

Operationalization of the Criteria from Table 1. Each Criterion must be Applied Independently of the Other Criteria

A	Description of inclusion and exclusion criteria (1 point).
Restriction to a homogeneous study population (1 point).
B	Comparability for: duration of complaints, value of outcome measures, age, recurrence status and radiating complaints (1 point each).
C	Randomization procedure described (2 points).
Randomization procedure which excludes bias (e.g. sealed envelopes) (2 points).
D	Information from which group and with reason for withdrawal. No drop-outs is 3 points.
E	Loss to follow-up: all randomized patients minus the number of patients at main moment of effect measurement for the main outcome measure, divided by all randomized patients, times 100.
F	Smallest group immediately after randomization.

- G Back school intervention explicitly described (5 points).
All reference treatments explicitly described (5 points).
- H Comparison with an existing treatment modality or a "mock" back school.
- I Other medical interventions avoided in the design of the study (except analgesics, advice on posture or use at home of heat, rest, or a routine exercise scheme).
- J Compliance measured in each study group and satisfactory.
- K Attempted blinding of patients with respect to the content of the interventions (use of naive patients) (3 points).
Blinding evaluated and fully successful (2 points).
- L Use (measured and reported) of: pain, global measure of improvement, functional status (activities of daily living), spinal mobility, return to work (or to normal activities) (2 points each).
- M Effect measurement by a blinded assessor (10 points).
- N Including an effect measurement after 6 months or longer (5 points).
- O When loss to follow-up is less than 10%: all randomized patients for most important outcome measures, and on the most important moments of effect measurement minus missing values, irrespective of non-compliance and co-interventions.
When loss to follow-up > 10%: intention-to-treat as well as an alternative analysis which accounts for missing values.
- P For most important outcome measures, and on the most important moments of effect measurement. In the case of (semi)continuous variables: presentation of the mean or median with standard error or percentiles.