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# THE SWEDISH BACK SCHOOL IN CHRONIC LOW BACK PAIN

*Part I. Benefits*

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**ABSTRACT. The aim of this 12-month follow-up study was to evaluate the effect of the Swedish-type back school in chronic low back pain. 188 subjects completed the study (95 in the treatment group and 93 in the control group). The following were assessed: 1) subjective scores of pain and disability; 2) clinical measurement and evaluation including spinal mobility and strength measurement; 3) number and length of sick-leaves. At 12 months, subjective scores of pain and disability, and mobility of the lumbosacral section of the spine showed differences in the favour of the treatment group. There was no difference, however, in the number or the length of sick-leaves after the back school. It was concluded that patients with chronic or recurrent low back pain may get relief of subjective symptoms of low back pain from the back school. In addition to chronicity, there may be other factors affecting the outcome of treatment.**

*Key words:* low back pain, back school, rehabilitation.

The treatment of chronic low back pain (LBP) patients, both those who suffer from recurring episodes and those who show gradual deterioration, is controversial and often ineffective. The rationale of using the Swedish type of back school in the treatment of LBP seems acceptable. It is based upon the fact that most patients' back pain is exacerbated by increased mechanical strain (25). Epidemiology provides support for this view (1). In practice this means that patients are taught how to avoid pain-provoking situations, encouraged to perform physical exercise and instructed to cope with the disorder during acute phases of the condition.

Although these objectives appear reasonable, it remains to be shown which type of the low back pain patients draw most benefit from this kind of health education. Bergquist-Ullman & Larsson (2) showed that the regimen might be appropriate in acute condition of LBP. However, Lindequist et al. (14) were unable to confirm this result. Lankhorst et al. (13) performed a controlled study on the effect of back school in chronic LBP patients who had not responded favourably to conventional physiotherapy. The back school treatment group did not differ from the control group at the end of the follow-up. In all these studies the intervention used was the Swedish type of back school. There are also other variants of the back school, such as the Canadian back school (8) and the Californian back school (17).

In the present study, the benefits of the Swedish type of back school (25) were evaluated among chronic low back pain patients. The Swedish variant of the back school was chosen, because it is widely used in Scandinavia and also in Finland.

## PATIENTS AND METHODS

*Patients.* The number of subjects included in the study was initially 204, selected by means of questionnaires two months before the back school among the employees of a major Finnish cooperative. All the subjects were female. The information obtained by questionnaires was supplemented by a physical examination. The patients who entered into the study fulfilled the following criteria: 1) idiopathic low back pain (LBP) of at least 12 months' duration; and 2) low back pain symptoms present on at least one day each week during the month preceding the initial examination and/or limitations of daily activities, caused by these symptoms. Patients with rheumatoid arthritis or other systemic connective tissue disease as well as patients with a history of back surgery were excluded.

*Allocation of patients to treatment and control group.* The subjects were randomly (pairwise matching for age, severity of low back pain syndrome, quality of work) assigned either to a treatment group or a control group. In the course of the study 16 patients were lost, so the final size of the sample was 188 patients (treatment group $n=95$, control group $n=93$), of whom 93 in the treatment group and 92 in the control group completed the clinical measurements and evaluations.

*Treatments.* Patients in the experimental group attended a 60-min education and exercise session six times in the course of three weeks. A review class of $2\times60$ min took place six months after the back school proper. This group therapy programme was organised and conducted by a physiotherapist. An average number of patients was 11 in each group. The inclusion of a review class was the most significant difference in this modification of the back school compared with the original Swedish one. During the review class essential facts about the back school programme were

Table I. *Basic data on the subjects at the initial examination*

T = treatment group, C = control group

| | T $n$=95 | C $n$=93 |
|---|---|---|
| Age (years) | 46.1±9.5[a] | 45.4±9.2 |
| Duration of back pain symptoms (years) | 11.6±9.4 | 9.9±8.2 |
| Proportion of patients using analgesics for back pain (%) | 41.8 | 41.9 |
| Back pain index | 17.5±5.6 | 18.1±5.2 |
| Physical condition subjectively worse than average (%) | 14.8 | 12.9 |
| Height (cm) | 161.6±5.7 | 161.7±6.0 |
| Weight (kg) | 67.7±10.6 | 68.2±13.7 |

[a] Standard deviation.

repeated. The compliance and the problems involved were also inquired, although in no systematic manner. The patients in the control group were given the instruction material of the back school in written form (a 15-page hand-out on basic anatomy and physiology of the spine, principles of ergonomics for low back pain patients, instructions on how to exercise the body muscles and how to cope with the acute phase of low back pain). No actual treatment was administered to the control group. These patients were, nevertheless, free to use the health care services they were accustomed to.

*Measurements.* To evaluate the effectiveness of the treatment, the number and duration of sick leaves were recorded for two years before and after the intervention. Degree of experienced pain and disability was quantified by a set of measurements: 1) visual analogue scale measuring a sum index of four evaluations (back pain at the moment, in the morning, after the working day and in the evening); 2) low back pain index, measured on a verbal scale, to evaluate the severity of low back pain, also used in earlier studies at the Rehabilitation Foundation (10, 18); 3) the Oswestry Low Back Pain Disability Questionnaire (6). In addition, the use of analgesic drugs and use of other medical services were inquired by means of questionnaires. The questionnaires were presented at the initial examination just before the intervention and at follow-up examinations at 6 and 12 months after the initial examination. The 6 months questionnaires were mailed and the reply was expected before the review class in the treatment group. The reply rate was 85% in the treatment group and 84% in the control group for 6 months follow-up examination.

Through those 10 items which were included in the questionnaire and mailed 6 months after the initial examination the level of information on back matters was inquired for in both groups.

The methods further included a set of clinical measurements and evaluations. Flexion forward was measured by a slightly modified method of that described by Moll & Wright (23). In this study a distance of 20 cm between the reference points in the lumbar area was used instead of 15 cm described by Moll & Wright (23). Spinal mobility was also measured between the sacrum and the lowest cervical vertebral body. The lateral flexion of the spine was measured with a tape measure described by Mellin (20).

Trunk muscle strength measurements included dynamic strength tests (sit-ups from the supine to test the stomach muscles and trunk raising from a prone position to test back muscles). Trunk extension and flexion strength (static trunk muscle strength) was measured dynamometrically (18). In addition, pain reported during different standard movements (pain in forward and in lateral flexion, pain during the dynamic back muscle and stomach muscle strength test) and palpation pain in standard spots in the lumbar area and in the shoulder-neck area were recorded.

The clinical data, spinal mobility, body strength measurements and pain on palpation and during standard body movements, were compiled by a physiotherapist at the initial and 12-month examination. The physiotherapist performing the tests adhered strictly to standardised questions and instructions of the measurement protocol. The measurements and the back school were conducted by different persons, but no attempt was made to imitate blind assessment.

*Statistical methods.* $t$-Test for paired samples was used for the comparison of means within each group, and $t$-test for independent means was used for the comparison of means between the groups. Proportions were compared by means of the chi-square test.

## RESULTS

Table I shows basic data on the two groups at the initial examination. The two groups were comparable for age, duration of low back pain syndrome and low back pain index. The educational level of the subjects was rather low, in most cases (90%) comprising compulsory education only. Most of the subjects were employed in retail sale (sales personnel was the largest single occupational group).

*Visual analogue scale (VAS).* The mean values on the visual analogue scale recorded for the treatment and control groups did not differ from each other at the initiation of the study. At the 6-month follow-up the mean value of VAS was lower in the treatment group than in the control group ($p<0.05$). At the 12-month follow-up there was no statistically significant difference between the groups.

Intra-group changes only occurred in the treatment group. In this group the mean value of VAS was lower both at the 6-month ($p<0.01$) and the 12-month follow-up ($p<0.05$) than before the back school intervention (Fig. 1).

*Low back pain index.* The groups did not differ from each other in mean value of this index before the back school intervention. At the 6-month follow-up, mean value of the index was lower in the treatment group than in the control group ($p<0.05$); at 12

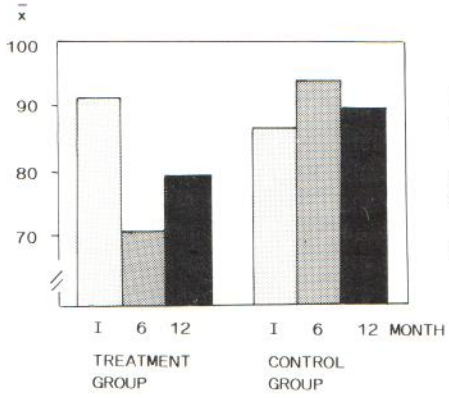


*Fig. 1.* Mean values on the visual analogue scale at the initial examination (I), at the 6-month follow-up and at the 12-month follow-up in the treatment group and the control group. Significance of changes from the initial values indicated on the right.

months the difference was not statistically significant. The most marked intra-group changes occurred in the treatment group; mean value of the index at both the 6-month and the 12-month examinations was lower than at the initial examination ($p<0.01$). In the control group, mean value of this index was lower at the 12-month examination than at the initial examination ($p<0.05$, Fig. 2).

*Oswestry's index.* Mean values of Oswestry's index showed no difference between the groups before the back school intervention. At the 6-month and the 12-month follow-up there was a difference in favour of the treatment group ($p<0.05$). Within the groups, no statistically significant changes occurred during the year following the intervention (Fig. 3).

*Analgesic drugs and other medical treatment.* In the treatment group, the use of analgesic drugs was less frequent at 6 months (41.8% vs. 18.2%, $p<0.01$) and at 12 months (41.8% vs. 33.0%, $p<0.05$) than before the back school. In the control group, no significant changes were observed during the follow-up. With respect to other medical treatment (physiotherapy, massage etc.), no significant changes occurred in either group.

The level of knowledge showed no difference between the treatment and control group 6 months after the initial examination.

*Clinical measurements and evaluations.* At the initial physiotherapist's examination, there were no significant differences in any of the tests between the treatment group and the control group.

*Mobility of the spine.* The mobility of the lumbosacral section of the spine (forward flexion 1) increased statistically significantly in the treatment group during the follow-up year ($p<0.001$), and the mobility was greater on an average in the treatment group than among the controls at the 12-month examination ($p<0.05$). There was no significant change in the control group during the follow-up. Conversely, the ability to flex the whole spine (from C VII to S I, forward flexion 2) decreased in the control group during the follow-up ($p<0.01$), in the treatment group there was no significant change (Table II).

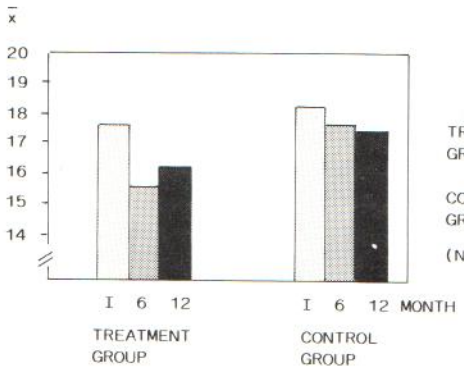


*Fig. 2.* Mean values of the low back pain index at the initiation of the study (I), and at the 6-month and the 12-month follow-up in the treatment group and in the control group. Significances of changes from initial values appear on the right.

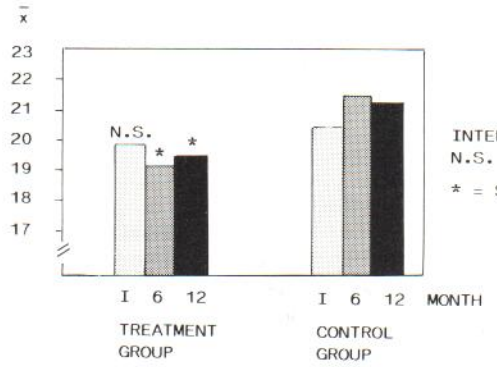


*Fig. 3.* Mean values in the Oswestry Low Back Pain Disability Questionnaire at the initiation of the study (I), at the 6-month and the 12-month follow-up in the treatment group and in the control group. No statistically significant changes occurred in either group during the follow-up.

*Muscle strength.* The most significant change in muscle strength was the increase in trunk flexion and extension strength in the treatment group ($p<0.001$). There was a similar trend in the control group but the change was smaller. In dynamic trunk muscle strength, the only statistically significant change noted during the follow-up was for the stomach muscle test in the treatment group ($p<0.05$). In the latter test, there was a statistically significant difference in favour of the treatment group at the 12-month examination ($p<0.05$, Table III).

*Palpation pain and pain during standard body movements.* The number of painful spots in the lumbar area and in the shoulder-neck area decreased significantly in both groups during the follow-up. At the 12-month examination there was no difference between the groups in this respect (Table IV). Nevertheless, at the 12-month examination there were significantly fewer subjects reporting pain in the treatment group than in the control group during the dynamic back muscle strength test ($p<0.01$) and lateral flexion of the spine ($p<0.05$, Table V).

*Sick leave.* The back school had no effect on the average duration or number of sick leaves for low back pain or for any other reason. Even the number of sick leaves of various duration was analysed and no significant differences were found before and after the back school intervention or between the treatment group and the control group at any point of analysis.

## DISCUSSION

There are no universally accepted criteria for the outcome of low back pain treatment. LBP is a complex problem also with socioeconomic implications. Therefore a wide range of measurements and evaluations was employed in this study: subjective evaluation of low back pain and the resultant disability, clinical measurements and evaluations of spinal mobility

Table II. *Means and standard deviations (SD) of spinal mobility values at the initial (A) and the 12-month examination (B), and the statistical significance (p) of changes during follow-up (t-test for paired sample)*

| | Treatment group, $n=93$ | | | Control group, $n=92$ | | |
|---|---|---|---|---|---|---|
| | A $\bar{x}$ SD | B $\bar{x}$ SD | $p$ | A $\bar{x}$ SD | B $\bar{x}$ SD | $p$ |
| Forward flexion 1 (cm) | 8.4 | 8.9 | 0.001 | 8.2 | 8.3 | NS |
| | 1.4 | 1.7 | | 1.7 | 1.7 | |
| Forward flexion 2 (cm) | 11.0 | 10.8 | | 11.0 | 10.5 | 0.01 |
| | 1.8 | 2.1 | | 2.1 | 1.8 | |
| Lateral flexion (cm) | | | | | | |
| Right | 14.5 | 16.0 | 0.001 | 14.6 | 15.5 | 0.05 |
| | 3.6 | 3.7 | | 3.2 | 3.8 | |
| Left | 15.0 | 16.1 | 0.01 | 14.6 | 15.4 | 0.05 |
| | 3.8 | 3.8 | | 3.4 | 4.1 | |

NS = not significant.

Table III. *Means and standard deviations of dynamic trunk muscle strength values and of static muscle strength values for back and stomach muscles at the initial (A) and the 12-month examination (B), and the statistical significance (p) of changes during follow-up (t-test for paired samples)*

| | Treatment group, $n=93$ | | | Control group, $n=92$ | | |
|---|---|---|---|---|---|---|
| | A $\bar{x}$ SD | B $\bar{x}$ SD | $p$ | A $\bar{x}$ SD | B $\bar{x}$ SD | $p$ |
| Dynamic trunk muscle strength | | | | | | |
| Back muscle exercises (max 10) | 9.3<br>2.2 | 9.5<br>1.7 | NS | 9.6<br>1.4 | 9.4<br>1.8 | |
| Stomach muscle exercises (max 10) | 9.2<br>2.2 | 9.8<br>1.1 | 0.05 | 9.4<br>1.8 | 9.2<br>2.3 | NS |
| Static trunk muscle strength | | | | | | |
| Extension strength (kp) | 29.5<br>12.8 | 34.1<br>12.8 | 0.001 | 30.8<br>13.4 | 32.3<br>14.9 | NS |
| Flexion strength (kp) | 22.5<br>10.9 | 26.8<br>8.5 | 0.001 | 22.8<br>8.9 | 25.5<br>11.9 | 0.5 |

NS = not significant.

and trunk muscle strength, and the number and duration of sick leaves.

The validity of the subjective pain evaluations used in this study is fairly well documented (3, 4, 6, 11). The clinical measurements employed have been used and, to some extent, validated in earlier studies (18, 19, 20). The question remains, though, which of the clinical parameters are relevant and which are not. Million et al. (21) criticised e.g. the spinal mobility tests because of their weak correlation with the degree of pain. These questions warrant further study.

In this set-up, a control group was considered necessary so that the natural course of LBP could be evaluated. In comparisons of different regimens or in open trials one cannot exclude the effect of spontaneous recovery or deterioration. On the other hand, the follow-up period must be sufficiently long to allow any placebo effect to fade away.

The back school had a decreasing effect on subjective LBP and disability. The visual analogue scale and the low back pain index showed the most marked changes at the 6-month examination but an effect was still noted at the 12-month examination. These results on subjective pain and disability were also supported by data on the use of analgesic drugs. With respect to other medical treatment, no distinct changes occurred in either group. This indicates that the observed changes in experienced LBP in the treatment group were not caused by changes in other medical treatment.

The pain observed in the physiotherapist's examination (palpation pain in the lower back area and in the shoulder-neck area, pain during various standardised movements of the body) decreased more clearly in the treatment group than in the control group. There was, however, a distinct decrease in the number of painful spots on palpation of the lumbar

Table IV. *Means and standard deviations of the number of painful spots in the lumbar and the shoulder-neck area during palpation at the initial (A) and the 12-month examination (B), and the statistical significance of changes (p) during follow-up (t-test for paired samples)*

| | Treatment group, $n=93$ | | | Control group, $n=92$ | | |
|---|---|---|---|---|---|---|
| | A $\bar{x}$ SD | B $\bar{x}$ SD | $p$ | A $\bar{x}$ SD | B $\bar{x}$ SD | $p$ |
| Painful spots in the lumbar area | 9.9<br>8.0 | 6.8<br>7.0 | 0.001 | 10.6<br>8.3 | 8.5<br>7.3 | 0.01 |
| Painful spots in the shoulder-neck area | 4.0<br>2.0 | 2.5<br>2.3 | 0.001 | 3.9<br>2.7 | 2.9<br>2.5 | 0.001 |

Table V. *Proportions of patients (%) reporting pain during standard body movements at the initial (A) and the 12-month examination (B), and the statistical significance of the changes during follow-up (chi-square test)*

| | Treatment group, $n=93$ | | | Control group, $n=92$ | | |
|---|---|---|---|---|---|---|
| | A | B | $p$ | *A* | *B* | $p$ |
| Pain during flexion forward | 45.2 | 33.3 | 0.05 | 51.1 | 46.7 | NS |
| Pain during lateral flexion of spine | 67.8 | 58.1 | 0.05 | 70.6 | 64.1 | NS |
| Pain during dynamic stomach muscle exercise | 46.7 | 34.7 | NS | 48.3 | 34.5 | 0.5 |
| Pain during dynamic back muscle exercise | 47.3 | 30.1 | 0.01 | 54.3 | 52.2 | NS |

and shoulder-neck areas during the follow-up also in the control group. This emphasises the importance of a control group in this kind of study. Without a control group one might have overestimated the effect of back school intervention.

The mobility of the lumbosacral section of the spine increased statistically significantly during the follow-up year in the treatment group, and the spinal mobility was greater on an average in the treatment group than in the control group at the 12-month examination. This may be considered as an indication of positive outcome of the treatment, though the interpretation of mobility tests is somewhat obscure. Spinal mobility tends to decrease with age, and it is a fairly common belief that decreasing mobility may also be accompanied by decreasing pain. With this in mind, one might question the value of pursuing increased spinal mobility. There is a distinction, however, between restricted spinal mobility caused by aging and one caused by noxious tissue irritation. Mobility limitation of the first kind should perhaps not be opposed whereas one of the second kind should. If the painful tissue irritation decreases, there is a better chance of achieving full range of motion of the spine; this is probably what happened in the treatment group of this study.

The most significant change in trunk muscle strength was the increase in static extension and flexion strength in the treatment group. In general, the results of dynamic muscle strength tests corresponded to the static muscle strength measurements. The results have at least two interpretations. Firstly, the back school may have affected the behaviour of the subjects so that they did at least some physical exercise during the follow-up. Increased strength and fitness has then enabled these patients to cope better with everyday tasks, resulting in less experienced pain and disability. Secondly, however, even the opposite may be true. An initial alleviation of LBP may have made it easier to perform strength tests. In this set-up, the question remains unanswered.

The level of knowledge showed no inter-group difference at 6 months. The kind of method used in this study has to be considered insufficient, though. It is easy to agree with Linton & Kamwendo (15) that "further research is needed to investigate the amount of information participants in low back schools retain, in addition to the amount of behavioral changes actually implemented".

*Comparison with earlier studies.* Bergquist-Ullman & Larsson (2) found that the back school decreased the duration of sick leave after an acute period of LBP, but the intervention had no effect on subjective pain and disability. The results in this study are almost the opposite. The back school did not decrease the duration or number of sick leaves caused by LBP, but did lessen subjective pain and disability. In the study of Bergquist-Ullman & Larsson only acute and subacute cases were included whereas this study was limited to chronic LBP, which may explain the differences in the results. It should also be noted that the majority of patients in Bergquist-Ullman & Larsson's study (2) were men while in this study all were women.

Lindequist et al. (14) also studied the effect of the Swedish type back school in acute LBP patients. They could not demonstrate any significant differences to controls either concerning the initial duration of symptoms or sick leave, or the number of relapses and their duration during the observation year. Their interpretation was that the heterogeneity of the patient series caused the lack of the expected positive effect of the regimen. There were, however, more patients with periods of sick leave for reasons

other than LBP in the control group. In contrast, homogeneity of the sample was pronounced in this study: all the patients were working for the same employer, and the quality of their work and their level of education were quite similar.

Backache in pregnancy has also been attempted to influence with back care advice similar to that used in back schools. Mantle et al. (16) conducted a study of primiparous women who attended two classes of back care advice. It was shown that they experienced significantly less troublesome and severe backache ($p<0.01$) than a control group for which such advice was not available. Again, the homogeneity of the sample and similarity of the problems (all in early pregnancy) may have been a promoting factor in the favourable results.

Moffet et al. (22) conducted a randomized study with chronic low back pain patients in order to evaluate the effectiveness of a back school to an exercise-only regimen. Changes in patients' levels of pain, functional disability, and other related variables showed an improvement at six weeks in both groups. At 16 weeks, the back school patients continued to make an improvement according to pain and functional disability scores, while the patients in the exercise-only regimen reverted to their original levels of disability. It was concluded that the back school makes maximal use of limited resources and appears to be effective especially in the longer periods of time.

Dehlin et al. (5) studied the effect of physical training and ergonomic counselling on the psychological perception of work and on the subjective assessment of low back pain with nursing aides. No definite influence on low back symptoms was observed either in the ergonomics group or the training group compared with the control group. A small number of subjects (totally 45) makes interpretation somewhat difficult, though.

Lankhorst et al. (13) conducted a controlled study of the effect of the Swedish back school in chronic idiopathic LBP. During a follow-up of one year, no statistically significant differences between the treatment group and the control group were observed regarding subjective scores of pain and functional capacity or objective measurements of spinal mobility. There is a major difference in the patient series used between this study and that of Lankhorst et al. The latter included patients with chronic LBP of more than 6 months' duration, not responding to conventional physiotherapy. This points to the symptoms of LBP having been quite persistent and probably severe. In the present study symptoms were mostly mild or moderate, and in spite of their LBP all of the patients were working when entered into the study. The lack of positive effect of earlier treatments was no criterion. This basic difference between the series of subjects may explain the differences in the results.

Noncontrolled studies of the effect of the back school have been reported by Hall & Iceton (8) and Mattmiller (17). Both came up with a favourable outcome of the treatment, but because of the noncontrolled study design it is difficult to assess the role of spontaneous recovery.

Kvien et al. (12) has also evaluated the benefits of the low back school. Some differences were found in favour of the back school compared to the control group. However, the non-randomized set-up and the retrospective formation of the control group decreases the value of observations.

Åberg (24) compared subjects in a six-week inpatient treatment programme consisting of physical therapy, low back school, and vocational training with patients of the control group who were on a waiting list. Few differences were found in favour of the treatment group. The members of the inpatient group had a significantly higher increase in income, had started to train their backs more often, and had a greater belief in that they could prevent back pain. No significant differences were found as to sick leaves, employment, or pain. One problem in this type of study is the evaluation of the specific effect of the back school. It is better to speak about the back programme than to attribute the results to the back school solely. The same problem concerns the study by Gilbert et al. (7). Two groups of patients with acute low back pain participated in low back school education combined with physical therapy. Control groups were prescribed bed rest or no treatment. It was concluded that the low back school and physical therapy were more harmful than beneficial; bed rest was of no value.

In conclusion, this study indicates that chronic low back pain patients may benefit from the back school regimen. It nevertheless seems that different patient groups may react diversely to treatment. In a study by Härkäpää et al. (9), women suffering from LBP adhered to health education and recommendations more readily than did men. This observation may also partly explain the favourable results of the back school in this study. Better knowledge of the factors

affecting the outcome will enable us to modify the back school accordingly and to direct the regimen to appropriate patients.

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