International Journal of
Rheumatic Diseases

International Journal of Rheumatic Diseases 2012; **15:** 144–153

ORIGINAL ARTICLE

The efficacy of Back School on chronic low back pain of workers of a pharmaceutical company in a Tehran Suburb. COPCORD stage II study

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Abstract

Aim: Low back pain (LBP) is the second most frequent reason for seeking medical advice. Various treatments are proposed from no intervention, to analgesics, rest, exercises, local interventions and surgical procedures. Results and outcomes are differently reported. Back School (BS), a combination of patient education and physical exercises, seems to have good results. The aim of this study was to check the effect of BS in factory workers.

Patients and Methods: All (70) workers were interviewed and 26 of them (37.1%) had chronic LBP. Secondary causes were excluded. Anatomy, physiology, biomechanics of the spine, correct postures at work and back exercises were taught. Pain on a visual analog scale (VAS) of 0–100, and Short Form (SF)-36 health survey were applied, before, at the end of BS sessions, and 3 months after BS. Analysis was done by *t*-test, Wilcoxon and Pearson's correlation test.

Results: The mean VAS on pain before BS was 43.4 ± 22.3, improving to 38.6 ± 17.5 at the end of BS. The difference was not significant ($P = 0.19$). The mean VAS improved to 27.5 ± 20 at 3 months after BS. The difference was significant compared to before BS ($P = 0.001$). The quality of life measured by the SF-36 questionnaire, did not improve significantly, except for two of its eight subgroups (Role Physical, Social Functioning) at the end of BS, and two of its subgroup (Mental Health, Social Functioning) at 3 months after BS.

Conclusion: Among industrial workers, BS is mainly effective on pain, but is less evident on SF-36.

Key words: back exercise, back school, low back pain, patient's education, sciatica.

INTRODUCTION

Low back pain (LBP) is one of the most frequent of human physical complaints. Two-thirds of adults complain of LBP (at one time or another during their life). After upper respiratory problems, it is the most frequent reason for seeking medical advice.[1] The prevalence varies in different parts of the world.[2]

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The prevalence of LBP as reported in Community Oriented Program for the Control of Rheumatic Diseases (COPCORD) studies, in urban areas was: Australia 22%,[3] Bangladesh urban slum 9.9% and Bangladesh urban affluent 9.2%,[4] China Shanghai 5.6%,[5] China Chenghai 10.2%,[6] Indonesia urban 23.3%,[7] Iran urban pilot study 22.2%,[8] Iran urban 21.7%,[9] Philippines urban 2.1%[10] and Vietnam 11.2%.[11] LBP as reported in COPCORD studies, in rural areas was: Australia (aboriginal) 12.5%,[12] Bangladesh rural 6.6%,[4] China north 35%, China Shantou 13.1%,[13] Egypt 5.1%,[14] Indonesia 15.1%,[7] India 11.4%,[15] Iran (1993) 18.5%,[16] Iran (2006) 41.9%,[17] Malaysia 11.6%,[18] Pakistan 1.9%,[19] Philippines rural 11.3%[20] and Thailand 4%.[21]

The treatment of LBP ranges from no intervention, to analgesics, rest, exercises, and different kinds of local interventions, from manipulations, acupuncture, heat or cold and different physiotherapy modalities, to local injections (anesthetics, steroids, chemonucleolysis) and surgical interventions. Results are variable and the outcome differently reported. In one study 90% of patients were cured in 2 weeks[22] and in another study only 21% had completely recovered in 3 months and 25% in 12 months.[23] The controversies become more important when comparing medical treatments and surgical interventions. However, one recent study shows that there is no difference between them.[24] Among all these therapeutic methods, patient education and exercise seems to have good results.[25–34] The combination of both seems to have better results than each separately.[35] Back School (BS) is a combination of patient education and exercises.[36–42] The improvement of pain in the low back was 50% for Poteau-Cassard,[37] while it was controversial for Hadler[36] and in contrast, not as good as that observed by Shirado *et al*.[38] A Cochrane review on papers published up to 2003 revealed that BS was efficient, compared to placebo or other treatments, on pain, functional status and return to work.[43] In Iran, a study done on patients with LBP, coming to a rheumatology outpatient clinic, showed a very good outcome with BS[39] on the quality of life assessed by the 36-item Short Form health survey (SF-36).[44,45]

The stage 2 COPCORD study is an interventional program: education of primary health care physicians, paramedical professionals and the community. The aim of this study was to observe whether BS, by teaching the proper posture and exercises, had any beneficial effect on the severity and the duration of LBP attacks among workers of a pharmaceutical factory in the suburbs of Tehran. To have a homogenous group of patients and to minimize the effect of psychosocial environmental factors on individual patients, we selected the workers of a factory, and included all the workers with LBP in the study. Psychosocial factors influence LBP greatly and patient outcomes.[46–48] In the one factory, workers have the same environmental factors, and the work-related psychosocial factors are closer than in patients from the general population. Another important factor is the physical work. In a pharmaceutical factory, the physical work is lighter than in other manual industries, putting all workers under rather similar work stress. The study was designed in the Rheumatology Research Center (RRC), Tehran University of Medical Sciences (TUMS) and was approved by the Research Committee of the RRC. The protocol was registered on ClinicalTrials.gov under the ID: NCT00596076.

PATIENTS AND METHODS

Ethics and registrations

The research carried out here with human subjects was in compliance with the Helsinki Declaration. It was approved by the Research Committee and the Ethical Committee of Tehran University of Medical Sciences, registered under the ID 132–12486.

Patients

All 70 workers of the factory were interviewed (Fig. 1). Workers with chronic LBP were selected for the study. There were 26 and they underwent a clinical examination by two trained practitioners. The inclusion criteria was the presence of mechanical LBP at the time of interview, or a history of LBP during the last 6 months. The exclusion criteria were the absence of history of inflammatory spinal diseases, severe scoliosis, spinal surgery or malignancy. The BS training course was held over six sessions, during 6

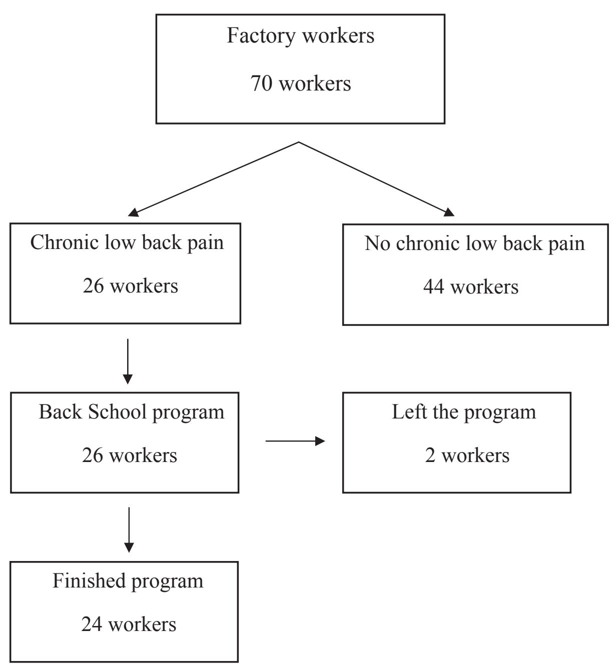

Figure 1 Flowchart of patients' selection and the Back School program.

consecutive weeks. Two previously trained physiotherapists were responsible for the training course. Each series had a maximum of 10 participants. The first session was devoted to the vertebral column anatomy, the physiology and biomechanics. Then a summary was given and simplified explanations of what is common LBP, the significance of the pain, and what to do to avoid it by knowing postures and movements that could possibly aggravate it. The course was given in a very simplified language. The next four sessions were devoted to teaching proper postures to reduce or inhibit LBP, and exercises to strengthen the muscles of the abdominal wall and lumbar spinal column. The sixth session was devoted to answering questions and checking how exercises were performed.

The exercise program

Four kinds of exercises were given.

1 Strengthening exercises. These were the most important. They were William's type 2 flexibility and stretching exercise. Among them is hamstring muscle stretching and hip flexor muscle stretching. This was the second most important type of exercise.
2 Flexibility.
3 Aerobic exercises. These were only done if they did not aggravate the back pain. Different types were taught, and patients had to try them and find the one that suited them the best, like swimming, jogging, fast-pace walking.
4 Relaxation exercises. These exercises were to be done at least once a day, and if possible (not interfering with the daily work and life of the patient) twice a day.

The sessions were to be half an hour in length, divided into 10 min for strengthening exercises, 10 min for flexibility and stretching exercises and 10 min relaxation exercises. If the patient does one session per day, then it is better to divide the relaxation exercise into two sessions of 5 min, one in the morning and one in the afternoon. Aerobic exercises were to be done three times a week, for 20–30 min.

The primary outcome was the severity and the duration of each attack. It was measured 4 weeks before BS training, at the end of BS (week 5), and 3 months after the end of he BS. A visual analogue scale (VAS) was used for the severity of pain. The VAS marked the severity and duration of each LBP attack during the last 3 months. The scale ranged from 0 (for none) to 100 (maximum pain).

The quality of life was measured by the SF-36 questionnaire,[44] validated for Iranian patients.[45] SF-36 has two components: the physical component and the mental component. The physical component has four subgroups: Physical Function, Role Physical, Bodily Pain and General Health. The mental component also has four subgroups: Mental Health, Role Emotional, Social Function and Vitality. They were calculated as regards severity and duration of the pain attacks, 4 weeks before BS training, at the end of BS (week 5) and 3 months after the end of BS.

Statistical analysis

The results were analyzed using PASW 18 for Windows (http://download.cnet.com/PASW-Statistics/3000-2053_4-43773.html). For continuous variables, mean, standard error of mean (SEM), standard deviation (SD), minimum and maximum values and the median were calculated. For dichotomous variables, percentage and 95% confidence intervals (CI) were calculated. Means were compared with the paired-samples *t*-test. For the data with no normal distribution, the logarithm of data was used. Analysis was done both in ''intention to treat analysis'' and in ''completed treatment analysis''.

RESULTS

Subjects and gender distribution

Twenty-six workers fulfilled the entry criteria, which was 37.1% of all workers. The 95% CI was 26.8–48.9%. There were nine women (34.6%, 95% CI: 19.4–53.9%) and 17 men (65.4%, 95% CI: 46.1–80.6%). One man and one women did not complete the study. One left the factory before the end of BS sessions, and one just after the completion of the BS sessions. The completed treatment analysis was done on 24 patients, eight women (33.3%, 95% CI: 18–53.5%) and 16 men (66.7%, 95% CI: 46.5–82%). As only two patients did not complete the project, the results did not change significantly between the two groups. Results of the ''intention to treat analysis'' are given bellow.

Age, weight, height, and BMI

The mean age of participants was 33.4 years (9.42 SD). The mean weight was 74.2 kg (11.5 SD). The mean height was 169.3 cm (10.8 SD). The BMI was normal in 12 subjects (46.2%, 95% CI: 28.8–64.5%), overweighted in 10 subjects (38.5%, 95% CI: 22.5–57.5%), and obese in four (15.4%, 95% CI: 5.7–34.3%). In women, two had normal BMI, five were overweighted, and two were obese. In men, 10 had normal BMI, five were overweighted and two were obese. The mean BMI was 26.1 (4.6 SD). The gender distribution for age, weight and height is given in Table 1.

Education

Among the workers, 7 (26.9%) had higher education.

Table 1 Age, weight, height and BMI of patients

	Mean	SEM	SD	Low	High	Median
All patients						
Age	33.4	1.85	9.42	23	51	29
Weight	74.2	2.3	11.5	55	102	72
Height	169.3	2.1	10.8	150	188	169.5
BMI	26.1	0.9	4.6	19.5	37.3	25.5
Males						
Age	30.7	2.0	8.1	23	46	26
Weight	74.9	2.5	9.9	60	91	73.5
Height	174.6	2.3	9.1	162	188	174
BMI	24.4	0.9	3.6	19.5	32.1	24.2
Females						
Age	40.5	3.3	9.4	26	51	44
Weight	74.9	5.4	15.4	55	102	74
Height	159.4	2.4	6.8	150	169	158.5
BMI	29.2	1.6	4.8	23.6	37.3	28.2

BMI, body mass index; Height, in cm; High, highest value; Low, lowest value; SD, standard deviation; SEM, standard error of mean; Weight, in kg.

Past history of LBP

Past history for LBP was positive in 25 patients (96.2%, 95% CI: 79.3–100%). Nine workers had LBP before coming to the factory for their present job (34.6%, 95% CI: 19.4–53.9%). All workers had chronic LBP (mechanical, during daily activity) in the last 6 months. Their LBP exacerbated or improved according to their activities.

Acute, sub-acute attacks, and exacerbations of LBP

Seventeen workers had at least one episode during the past 6 months (65.4%, 95% CI: 46.1–80.6%). Among them, nine had one episode, one had two episodes, two had three episodes, three had six episodes, ibe had 10 episodes, and ibe had continuous pain during working days but not weekends (Table 2).

Duration of attacks or exacerbations

Duration of attacks was from 1 day to 21 days. For 10 subjects only 1 day was needed to return to the usual daily pattern, three needed 2 days, two needed 3 days, one needed 4 days, three needed 1 week, two needed 10 days, two needed 2 weeks, and three needed 3 weeks (mean 6.04 days; 1.31 SEM; 6.68 SD; median 2.5 days). Five workers were obliged to be absent from work (19.2%, 95% CI: 8.2–38.5%). Their absence ranged from 1 to 14 days (mean 5.6 days, median

Table 2 Clinical assessment of patients at selection session

		Female	Male	Total
Attacks of LBP	One attack	5	4	9 (34.6%)
	Between two and nine attacks	5	1	6 (23%)
	More than 10 attacks	2	0	2 (7.7%)
Duration of attacks or exacerbations in day	Mean	3.11	7.59	6.04
	SD	3.21	7.56	6.68
	Median	2	4	2.5
Pain intensity in the last 6 months on VAS	Mean	42.22	45.18	44.15
	SD	23.33	23.00	22.69
	Median	45	40	45
Disability in the last 6 months on VAS	Mean	21.67	18.82	19.81
	SD	30.41	23.98	25.78
	Median	15	0	5
Scoliosis		4	2	6 (23%)
Limitation in forward flexion		1	3	4 (15.3%)
L3–L4 tenderness		1	4	5 (19.2%)
L4–L5 tenderness		0	5	5 (19.2%)
L5–S1 tenderness		1	5	6 (23%)
Lasègue sign		0	0	0 (0%)

LBP, low back pain; VAS, visual analog scale.

7 days). Twenty-one (80.8%) of them improved by rest, the remaining let the time pass and improved gradually. Only two of them needed non-steroidal anti-inflammatory drugs (NSAIDs) for a few days. The amount of improvement, on a Likert scale (1–5, one being a small improvement and five for the complete disappearance of pain) was as follows: in six subjects the attack disappeared (23.1%), 8 (30.8%) had high improvement, 6 (23.1%) had moderate improvement, 6 (15.4%) had small improvement and 2 (7.7%) had no improvement (Table 2).

Work intensity

The workers designated their activity as "very low, low, moderate, high, and very high". Two (7.7%) reported their activity to be very low. Five reported their activity as low (19.2%), 10 (33.5%) as moderate, eight (30.8%) as high, and only 1 (3.8%) as very high.

Daily pain impact

Seventeen subjects (65/4%, 95% CI: 46.1–80.6%) complained of some limitation in their actual daily activity: bending eight subjects (30.8%), lifting objects nine subjects (34.6%), standing five subjects (19.2%), sitting five subjects (19.2%), and walking two subjects (7.7%). Nine subjects (34.6%) were not limited in their daily activity by their LBP.

Pain intensity of the last 6 months on VAS

On a scale of 0–100, pain intensity ranged from 8 to 80 (mean 46.1; 4.1 SEM; 20.8 SD; median 50) (Table 2).

Disability of the last 6 months on VAS

On a scale of 0–100, disability ranged from 0 to 90 (mean 19.8; 5.1 SEM; 25.8 SD; median 5). It is interesting to note that half of the workers did not complain of work disability due to LBP. Their mean pain on VAS was 42.9, while the other half had a mean pain on VAS of 49.2 (Table 2).

Physical examination on selection session

Six workers (23.1%) had lumbar spine functional scoliosis on standing position (lateral deviation due to pain, disappearing on prone decubitus). Four patients (15.4%) had a limitation of forward flexion due to pain. Tenderness of the intervertebral space was found in five patients on L3–L4, in five patients on L4–L5, and in six patients on L5–S1. Overall, only nine patients (34.6%) had a tenderness of one or more of their intervertebral spaces; two had tenderness of L3–L5–S1, two had tenderness of L3–L5, one had tenderness of L4–L5–S1, one of L3–L4, and three of L5–S1. Lasègue (strait leg rising) test was negative in all patients (Table 2).

Pain at "4 weeks before" the beginning of BS

On a scale of 0–100, pain at 4 weeks before BS ranged from 8 to 100 (mean 43.4; 4.4 SEM; 22.3 SD; median 47.5) (Table 3).

Pain at "the end of BS"

On a scale of 0–100, pain at the end of BS ranged from 10 to 80 (mean 38.6; 3.4 SEM; 17.5 SD; median 35) (Table 3).

Pain at "3 months after" the end of BS

On a scale of 0–100, pain 3 months after BS ranged from 2 to 65 (mean 27.5; 3.9 SEM; 20 SD; median was 20) (Table 3).

The difference between the mean VAS of pain, before the BS and at the end of the BS, was not significant ($t = 1.340$, $P = 0.19$). The comparison between "before the BS" and "3 months after the end of the BS" was highly significant ($t = 3.577$, $P = 0.001$), as it was between "the end of the BS" and "3 months after the end of the BS" ($t = 3.576$, $P = 0.001$).

Quality of life based on SF36 questionnaire

The details of the eight subgroups are given in Table 4. The mean index for the Physical Component for "4 weeks before", "at the end", and "3 months after" the BS were 59.2, 64.4, and 61.9, respectively. For the Mental Component it was 66.9, 63.3, and 61.4, respectively. The comparison of Physical Component by paired sample *t*-test between "4 weeks before" and "at the end", and between "4 weeks before" and "3 months after" the BS was not significant ($P = 0.13$

Table 3 Pain

	Mean VAS	SEM	SD	Median	P25	P75
4 weeks before BS	43.4	4.4	22.3	47.5	25.00	60.00
End of BS	38.6	3.4	17.5	35	23.75	50.00
3 months after BS	27.5	3.9	20.0	20	10.00	42.50

BS, Back School; SD, standard deviation; SEM, standard error of mean; P25, percentile 25; P50, percentile 75; VAS, visual analog scale on a scale of 100.

Table 4 Functional health status by SF-36

		PF	RP	BP	GH	PC	VS	MH	RE	SF	MC
4 months before	Mean	69.2	39.4	65.8	62.5	59.2	68.6	74.1	47.1	77.9	66.9
Back School	SD	20.0	35.4	16.0	20.0	19.0	16.8	18.5	33.4	16.6	16.8
	Median	70	50	58	62	59	72	76	62	75	66
	P25	59	0	55	49	46	55	68	0	62	55
	P75	85	75	77	81	75	80	85	75	87	79
End of Back School	Mean	67.5	69.2	63.0	58.1	64.4	66.9	68.6	48.1	69.7	63.3
	SD	20.3	26.7	20.8	16.4	16.0	14.2	16.8	32.3	14.2	13.5
	Median	70	75	67	60	62	75	70	62	75	64
	P25	55	50	52	44	54	50	63	0	50	60
	P75	86	81	77	66	79	75	81	75	78	75
3 months after	Mean	71.7	55.8	63.1	57.1	61.9	63.5	63.7	51.0	67.8	61.5
Back School	SD	17.9	36.9	22.6	17.8	17.3	22.0	22.9	29.5	20.3	18.1
	Median	70	62	62	60	61	70	68	62	75	66
	P25	60	19	45	45	53	47	56	25	50	47
	P75	81	81	78	70	73	80	77	75	78	73
Comparison between	*Z* or *t*	−0.55	−2.89	−1.07	−1.38	−1.58	−0.63	−1.48	−1.42	−2.14	1.34
A and B	*P*-value	0.58	0.004	0.29	0.17	0.13	0.53	0.14	0.89	0.03	0.19
Comparison between	*Z* or *t*	−0.45	−1.49	−0.75	−1.19	−0.72	−1.22	−2.45	−0.42	−2.00	1.35
A and C	*P*-value	0.65	0.14	0.45	0.23	0.48	0.22	0.01	0.67	0.04	0.19

BP, bodily pain; GH, general health; MC, Mental component; MH, mental health; SF, social functioning; PC, Physical Component; PF, physical functioning; P25, percentile 25; P75, percentile 75; RP, role physical; VS, vitality; RE, role emotional; A, 4 months before Back School; B, end of Back School; C, 3 months after back school; *Z*, Wilcoxon ranked sign test for PF, RP, BP, GH, VS, MH, RE, SF; *t*, Student's paired *t*-test for PC, MC.

and $P = 0.48$). The same was for the Mental Component ($P = 0.19$ and $P = 0.19$). However, it was significant for some of the subgroups: Role Physical and Social Functioning scale in comparing the data of "4 weeks before" and "at the end" of BS (Table 4). It was the same for Mental Health and Social Functioning scale in the comparison of "4 weeks before" and "3 months after" the BS (Table 4).

Before BS training, Pearson's correlation analysis (Table 5) showed a statistically significant correlation between both components of SF-36 and pain by VAS ($P < 0.01$). At the end of BS, physical component remained correlated to VAS ($P = 0.013$), while the Mental Component was no more correlated ($P = 0.44$). Three months after BS, none of the two components of SF-36 remained correlated to VAS, ($P = 0.513$ and 0.704 respectively).

Table 5 Correlation between pain and functional health status

		Physical health	Mental health
4 weeks before BS	Pearson	−0.662	−0.506
	P-value	< 0.001	0.008
End of BS	Pearson	−0.480	−0.398
	P-value	0.013	0.44
3 months after BS	Pearson	−0.134	−0.078
	P-value	0.513	0.704

BS, Back School; Pearson, Pearson's coefficient.

DISCUSSION

The reason for the selection of a pharmaceutical factory was the moderate physical burden of the work. In this kind of factory, there is no big difference between employees for the impact of the work, as one can see in some other factories. Our results show an improvement of pain during the BS sessions, while it was not significant. After the end of sessions, patients continued to improve and the difference became significant after 3 months. The quality of life, measured by SF-36, did not improve. However, some of its subgroups improved significantly.

Back School has not the pretention to cure patients from their LBP. The aim of BS is to strengthen the musculature needed to protect the lumbar spine and the discs from excessive stress, to teach the best posture for different working positions, to show how to lift or push heavy objects. Above all, BS is aimed to help people to cope with their back pain, by showing them the mechanism of the disease, or whenever they get inadvertent attack.

Low back pain is more frequent in factory workers 37.1% versus 21.7% in the urban population of Tehran.[9] The aim of our study was to test BS in a uniform setting, in all workers of the same factory, complaining of previous attacks or chronic LBP.

As seen in the results, the mean intensity of LBP, measured by different subjective and objective parameters, was around average. The pain intensity of the last 6 months (mean pain on VAS, scale of 100), on the selection day, was 42.9, and the disability was 19.8. The mean duration of attacks was 6 days.

The BS sessions *per se* did not have any improving effect on the pain. The mean pain improved from VAS 43.4 to VAS 38.6. The difference was not significant. The pain improved gradually, by applying the BS learning, during the 3 months post-BS. The mean pain improved to 27.5, which was highly significant compared to that of before BS and the pain at the end of BS. It seems that the improvement was mainly objective, although measured by a subjective method (VAS), because the improvement appeared 3 months after BS, and not at the end of BS where it had to has the best psychological impact. Our results, although very interesting, lack the high evidence, because it lacked a control group, selected on a random basis.

Back school was controversial from the beginning. The debate between Hamilton Hall and Nortin Hadler in 1995[36] is an example. However, even Hadler who was against BS, admitted its efficacy among factory workers, as our study showed. Poteau-Cassard[37] demonstrated 50% improvement in pain scale, which was better than the 37% improvement that we obtained between the "before" and the "3 months after" BS. An interesting review for the Cochrane Database systematic review done by Heymans *et al.* 2004 and published in 2005,[43] looked at 19 randomized controlled trials up to 2003. They found a moderate evidence that BS reduced pain better than other treatments (exercise, manipulation, myofascial therapy, advice or placebo) in the short- and intermediate-term. It was the same for the functional status and return to work.[43] Recent studies, after the Cochrane review also showed the same. Shirado *et al.*[38] obtained good results, improving the VAS from 62 to 28, which is a 55% improvement. Andrade *et al.*[41] too obtained a significant improvement. In contrast to our results, their results were already significant at the end of the BS, which was maintained during follow-up. They also compared their patients who received the BS training to those who did not. The difference was significant, in favor of BS. A review by Brox *et al.*,[49] did not find any benefit from BS compared to other treatments, even no treatment such as "waiting list". They conclude that "we cannot recommend back school", although they used the same reports as those used by the Cochrane review.[43] However, they recognize that further studies are necessary. It is most interesting to see that Haldman in an editorial of the same issue of the *Spine* journal, conclude that there is moderate evidence to show that BS is effective in short-term for chronic LBP.[50] They also conclude that no harm has been reported from BS.

In contrast, pain intensity, in our patients, the two components of the SF-36 did not improve statistically. Only two subgroups among the eight improved significantly when the data before BS and at the end were compared. One was from the Physical Component and one from the Mental Component. When the data before BS was compared to that of 3 months after BS, two subgroups improved significantly, both being from the Mental Component.

In contrast to our result, Tavafian *et al.*[39] obtained an improvement in all eight subgroups at the end of BS and after 3 months. The difference between their works and ours was that their patients were all women, they were from all categories of the society (ours were factory workers) and they received analgesics (ours did not). In their BS group, six patients dropped out, but like us, they did an "intention to treat" analysis. Another difference was that they had twice as many patients as we did. Therefore, if we did not have a significant difference for all the eight subgroups, it could be due to the low number of patients. To check for this, we doubled the number of patients by entering each patent's data twice, having therefore 52 patients. At analysis, although *P*-values improved, results remained the same. Therefore, the difference between the two studies is real, although they were done in the same city. The difference may be due to different study settings.

It is interesting to look at the correlation between the intensity of pain, measured by VAS, and the two components of the SF-36, the Physical Component and the Mental Component. Before BS, the Physical Component and the Mental Component were inversely correlated to the VAS; the higher the VAS (more pain), the lower were the Physical Component and Mental Component (lower physical and mental health). At the end of BS, the correlation decreased. Although it was still significant for the Physical Component, it was not more correlated to the Mental Component. Three months later, no more correlation remained between the pain and SF-36, showing that the low Physical Component and Mental Component scores were no longer related to pain, but to other parameters of life (working environment and/or personal life).

One of the most recent works is from Yang *et al.*[42] who tried BS on 142 patients. They obtained good results after the BS on several parameters (back disability, brief pain inventory, SF-36) but not the chronic pain inventory (except the exercise from the eight parameters). The latest report, from June 2011, is from Tavafian *et al.*[51] They found a statistically significant difference between their two groups of patients, one group receiving a multidisciplinary rehabilitation program plus oral medication and the other oral medication only. The difference favored those having the BS program by analyzing the SF-36 questionnaire.

CONCLUSION

Our study shows that Back School training reduces the severity and duration of low back pain in workers. The low scores of Physical and Mental Components of the SF-36, although somehow related to LBP, were mainly due to other parameters. However, the low number of participants in our study may raise some doubts on the obtained results. Therefore, there is a clear need for further randomized clinical trials, with a larger number of participants, to confirm the validity of these findings in the industrial environment.

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