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A CONTROLLED STUDY ON THE OUTCOME OF INPATIENT AND OUTPATIENT TREATMENT OF LOW BACK PAIN

Part I. Pain, Disability, Compliance, and Reported Treatment Benefits Three Months after Treatment

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ABSTRACT. Outcome of inpatient and outpatient treatment of low back pain was studied in 459 patients (aged 35–54 years, 63 % men); 156 inpatients, 150 outpatients and 153 controls. Changes in low back pain and in disability caused by it, and adherence and accomplishment of back exercises were used as short-term outcome criteria. The overall results showed a significant decrease in pain and disability and better compliance in the two treated groups when compared to the controls. There was also a significant difference in treatment gains between the inpatients and outpatients; i.e. the decrease in pain was greater and the frequency of back exercises higher in the inpatients. The inpatients also estimated their treatment benefits more positively than the outpatients.

Key words: low back pain, rehabilitation, compliance.

Back pain is a major health problem in industry causing many sick leaves and, in many cases, leading to temporary or permanent disability. Rehabilitation and retraining seem to become progressively more difficult and the share of those returning to work strongly decrease after the prolongation of pain (e.g. 1). Therefore, the need for preventive and early rehabilitation measures has been strongly emphasized (e.g. 1, 7, 13, 28).

To predict the occurrence and course of back pain is difficult; this makes the proper timing and allocation of prevention and early rehabilitation problematic. As possible criteria for screening those under risk, individual as well as environmental factors have been evaluated. Of the individual factors, a history of previous back pain has been regarded as one of the most important criteria (7, 30, 32). Although conclusive evidence on the role of work place factors in the etiology of low back pain is still lacking, physical demands of work seem to have at least a triggering function in the occurrence of low back pain (2, 4, 8, 18, 28). Back pain also affects more easily the working capacity of those in physically strenous work than those in sedentary work (e.g. 2, 26).

Suggested preventive and rehabilitative measures comprise, for instance, selection of employees, job design, instruction in ergonomics, fitness training, back school, physical therapy, and comprehensive multidisciplinary treatment programmes also including psychotherapeutic methods (7, 31, 32, 33). Only few controlled studies have been carried out, however, and conclusive evidence on the long-term efficacy of prevention or rehabilitation of low back pain is lacking (3, 11, 14, 16, 19, 25, 29). In the treatment of chronic low back pain the most appropriate strategy seems to be the use of comprehensive multidisciplinary treatment where somatic and psychological methods are combined (31).

The present study is a controlled prospective study on the outcome of interventions, which include both preventive and rehabilitative components. For the study, a group of subjects with a risk of back pain disability was chosen on the basis of the subjects' former back pain and work history. Two kinds of interventions were used, i.e. inpatient and outpatient treatment. The interventions consisted of educational components, e.g. ergonomics, back and relaxation exercises, and other physical therapy modalities, emphasizing the role of self-care in the prevention and early rehabilitation of low back disability. The study includes an intensive follow-up of 2.5 years. The aim of this substudy was to find out the short-term effects (3-month follow-up) of the two intervention modalities, using pain, disability and compliance to self-care as criteria. Results on ratings of treatment benefits are also reported. These ratings can be regarded as reflecting the degree of the patient's satisfaction with the received care, which has been

pointed out as one factor affecting or connected to treatment outcome (e.g. 9).

MATERIAL AND METHODS

Subjects and procedure

Subjects. The subjects (n=476, aged 35–54 years, 63% male) were selected from among blue-collar workers employed by the Finnish State Railways, the Post and Telecommunications Establishment and various enterprises in the Helsinki Metropolitan Area, and farmers from Southern Finland. Selection of the subjects was carried out with a mailed questionnaire and the final selection was made in an examination by a physiatrist. The main selection criteria were the following: (*a*) the subject had been in physically strenuous or moderately strenuous work for at least ten years, (*b*) he/she had suffered from chronic or recurrent low back pain for at least two years, (*c*) it had affected his/her working and physical capacity, (*d*) it had caused sick leaves during the past two years, and (*e*) low back pain was the major health problem of the subject and no other severe long-term illness were present. After the selection the Ss were randomly assigned to three intervention groups: the *inpatient* group, the *outpatient* group, and the *control* (no treatment) group. The questionnaire survey at the 3-month follow-up after the first treatment programme was completed by 459 patients. Seventeen patients had dropped out (1 inpatient, 9 outpatients, and 7 controls). The present follow-up results thus comprise 156 inpatients (99 men, 57 women), 150 outpatients (91 men, 59 women), and 153 controls (99 men, 54 women).

Procedure. The study comprised pre-treatment examinations, two treatment periods with a 1.5 year interval, and five follow-ups. The pre-treatment examinations were carried out approximately one week before the treatment. They consisted of examinations by a physiatrist and a physiotherapist, a physical exercise test (only for workers in the Helsinki Metropolitan Area), and questionnaire surveys. The follow-ups were carried out 3, 8, and 18 months after the first treatment and 3 and 12 months after the second treatment. Apart from the 8-month follow-up, which was a questionnaire survey, all other follow-ups also comprised physical measurements and/or a physiatrist's examination.

Physical examinations consisted of measurements of spinal and hip mobility, and trunk muscle strength. A more detailed description of the physical measurements is given in Mellin et al. (23). The physiatric examination comprised a medical history concerning back pain and other possible diseases, and a physical examination. The physical examination involved recording of motion, spinal mobility, neurological signs and back pain in palpation and various movements. At the follow-ups the physiatrist also checked the patients' accomplishment and frequency of back exercises.

The questionnaires included items on, e.g. the frequency and intensity of back pain, disability caused by low back pain (e.g. 6, 24), previous back care, and the number of days of absenteeism due to low back pain. Data on psychological and behavioural factors connected to low back trouble was also gathered.

Contents of treatment

For the inpatients the first treatment programme consisted of a 3-week rehabilitation period at the Siuntio Spa or the Siilinjärvi Rehabilitation Center. The outpatients took part in a 15-session back treatment programme either at the work place or at the local health centre. Sessions were held twice a week during a 2-month period. The outpatients were allowed to participate in the programme during their working hours. The inpatients had a 3-week leave from work during their treatment.

Both treatment modes were carried out in groups of 6–8 patients. The programmes comprised a 4-session modified Swedish back school (15, 33) (there were, e.g., topics on physiology of the back, etiology of low back pain, ergonomics, and exercises of proper working postures and movements), 15 sessions of back exercises, and 9 sessions of relaxation exercises. These sessions were led by a physiotherapist. The patients were given heat or electrotherapy prior to the back exercise sessions. In addition, the inpatients received massage and attended physical exercises and muscle strength exercises during their treatment programme. These additional treatments were prescribed for the inpatients by the physician of the rehabilitation center in question. Both treatment modes also comprised two structured group discussions, led by a psychologist, on how to cope with chronic pain, plus one discussion on back care led by a physician.

All in- and outpatients were taught a back exercise programme to be carried out after treatment. The programme included chiefly strengthening and stretching exercises of the trunk and lower limbs. Instructions were given in a written form. The home programme was selected for each patient individually; the physioterapist checked the accomplishment of the back exercises at the end of the treatment.

The aim of the second treatment programme (2 weeks for inpatients, 8 sessions for outpatients) 1.5 years later was to rehearse and refreshen the self-care skills learned earlier.

The control group received no systematic treatment, but attended the same examinations and questionnaire surveys as the in- and outpatients. They received written and oral instructions on back exercises and ergonomics at the beginning of the study during the physiatrist's examination.

At the first follow-up the accomplishment of the back exercises was checked in all groups and corrected, if necessary, by the physiatrist.

Variables and indexes

The following indexes and variables were used:

1. *The Pain Index.* The severity of low back pain was rated with four 100 mm visual analogue scales (range 0–100; endpoints: no pain–unbearable pain) which described the level of pain (*a*) in general, (*b*) in the morning, (*c*) after the work day, and (*d*) in the evening (e.g. 6). The *Pain Index* (range 0–400) was a sum of the four items. The reliability of the index (Cronbach's Alpha) was 0.89 on the basis of pre-treatment data. The same ratings were repeated at the 3-month follow-up.

2. *The LBP Disability Index.* The Ss rated the disability caused by low back pain during the past month in 15

Table I. *Baseline data of the three study groups and of men and women*

The asterisks indicate the statistical significances of the differences between men and women

	In-patients (n=156)	Out-patients (n=150)	Controls (n=153)	Males (n=289)	Females (n=170)
Men	63%	61%	65%		
Mean age (years)	44.8	44.8	45.2	44.3	46.1*
Basic education					
<9 years	92%	90%	97%	95%	89%
9 years or more	8%	10%	3%	5%	11%
Vocational education	49%	49%	57%	58%	42%**
Daywork	76%	84%	75%	76%	83%
Work physically quite or very strenuous	78%	74%	78%	71%	85%*
Work mentally quite or very strenuous	36%	39%	46%	40%	42%
Average days of absenteeism due to LBP during the past 2 years	37.7	33.6	31.3	37.8	28.1*
Average time (years) since the first symptoms of LBP	14.2	14.6	13.4	14.6	13.2
Continuous LBP during the past year	42%	39%	41%	35%	49%*
Severity of LBP during the previous year					
Moderate	14%	10%	18%	18%	11%
Severe	83%	85%	76%	79%	86%
Unbearable	2%	3%	3%	3%	3%
Use of analgesics for LBP	62%	65%	67%	65%	62%
Pain Index					
M	184.9	178.6	175.8	164.5	205.8**
SD	76.9	81.8	87.3	81.1	76.8
LBP Disability Index					
M	16.7	17.6	16.7	15.6	19.3**
SD	7.9	7.4	8.4	8.0	7.2

*$p<0.01$. **$p<0.001$.

different situations and activities (e.g. 20–30 min of physically strenuous work, lifting a heavy load, standing for a long period of time, tying shoelaces) with a 4-point scale (0 = causes no disability, ..., 3 = cannot be done because of low back pain) (e.g. 12). The *LBP Disability Index* was a simple sum of these items (range 0–45). On the basis of pre-treatment data the reliability of the index was 0.89. The same ratings were repeated at the 3-month follow-up.

The correlation between the pre-treatment scores of the Pain Index and the LBP Disability Index was Pearson r=0.50.

3. *Compliance* was assessed at the 3-month follow-up by the physiatrist who checked the accomplishment of the exercises and their frequency between pre-treatment and 3-month follow-up phases. Ratings of *accomplishment* were done on a 4-point scale (0–3) indicating the number of faultless back exercises demonstrated by the patient at the examination. Data on the *frequency* of exercises, i.e. average times per week, was based on the patients' interview at the physiatrist's examination.

4. *Subjective benefits* from the treatment rated by the in- and outpatients at the 3-month follow-up.

Statistical analyses

Treatment effects, based on the Pain Index and the LBP Disability Index, were tested with three- and two-way analyses of variance for repeated measures (BMDP2V) using the Pain Index and LBP Disability Index as dependent variables, time (pre-treatment and follow-up) as a within factor, and study group and gender as grouping factors. Differences between the study groups were also analyzed in pairs with two-way analyses of variance for repeated measures in order to check between-group differences in the magnitude of change in the index scores.

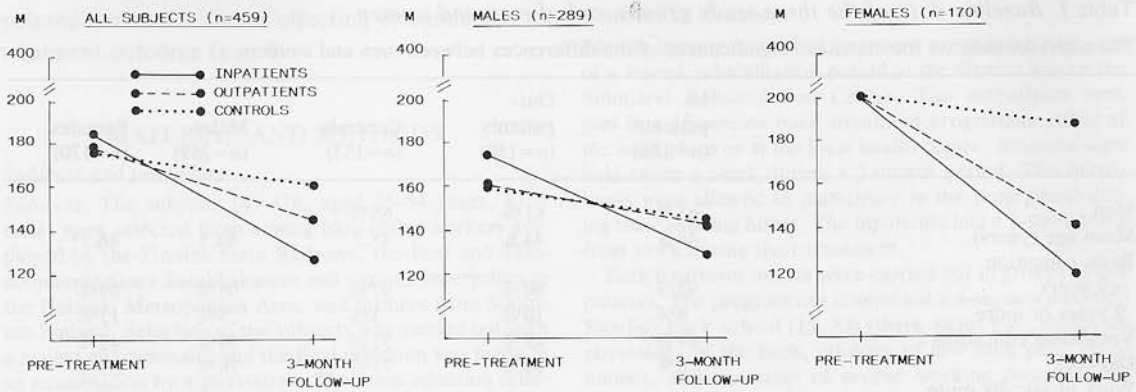

Fig. 1. Mean scores of the Pain Index at the pre-treatment phase and the 3-month follow-up with all subjects and with men and women.

Differences between the study groups in the accomplishment and frequency of exercises and reported treatment benefits were tested with χ^2.

RESULTS

There were no statistically significant differences between the study groups in the pre-treatment data (Table I). Men and women differed, however, in age, physical strenuousness of work, number of sick leaves and in the frequency of LBP during the past year. Women had also higher scores in the Pain Index and the LBP Disability Index. These differences were evident in all study groups, but there were no significant differences between the study groups by gender.

Changes in the Pain Index. Mean scores of the Pain Index before treatment and at the 3-month follow-up are presented in Fig. 1. A summary of the three-way analysis of variance of all subjects using treatment group, gender and time (pre-treatment, follow-up) as independent variables and the Pain Index as a dependent variable is presented in Table II. The interaction terms of Time × Treatment and Time × Gender were statistically significant indicating that the change in the intensity of low back pain over time was different in the three study groups and that in women the overall decrease was more pronounced regardless of the treatment group (see also Fig. 1).

Paired two-way analyses of variance between the study groups showed that the decrease in the index score of both the inpatients ($F(1, 307)=19.94$, $p<0.001$) and outpatients ($F(1, 301)=4.40$, $p<0.04$) was significantly greater than that of the controls. In addition, the decrease was significantly greater in the inpatient group than in the outpatient group ($F(1, 304)=5.55$, $p<0.02$).

With both men and women the interaction term of Time × Treatment was statistically significant. Male inpatients differed statistically significantly from male outpatients ($F(1, 188)=5.55$, $p<0.02$) and

Table II. *Changes in the Pain Index: a summary of results of the three- and two-way analyses of variance.*

Dependent: Pain Index; Grouping factors: gender and treatment group; Within factor: repeated ratings (pre-treatment and follow-up)

Source of variance	*F*	df	*p*
All subjects			
Treatment	2.04	2/445	NS
Gender	14.80	1/445	0.0001
Treatment × Gender	1.67	2/445	NS
Time	95.52	1/445	0.0001
Time × Treatment	10.05	2/445	0.0001
Time × Gender	10.54	1/445	0.001
Time × Treatment × Gender	1.79	2/445	NS
Males			
Treatment	0.01	1/286	NS
Time	31.69	1/286	0.001
Time × Treatment	4.60	2/286	0.001
Females			
Treatment	2.61	1/167	NS
Time	69.42	1/167	0.001
Time × Treatment	7.31	2/167	0.001

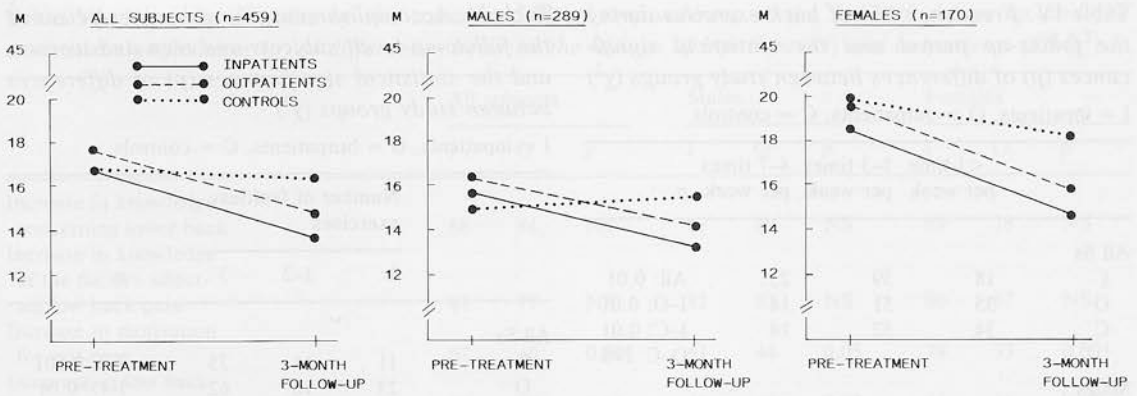

Fig. 2. Mean scores of the LBP Disability Index at the pre-treatment phase and the 3-month follow-up with all subjects and with men and women.

from male controls ($F(1, 196)=6.90$, $p<0.01$). Female inpatients and outpatients had a significantly greater decrease in the index score than female controls ($F(1, 109)=17.01$, $p<0.001$ and $F(1, 111)=6.40$, $p<0.01$), (Table II).

Changes in the LBP Disability Index. The pre-treatment and follow-up mean scores of the LBP Disability Index are presented in Fig. 2. The three-way analysis of variance (Table III) showed statistically significant interaction terms of Time × Treatment and Time × Gender. They indicate that the change in disability over time was different in the three study groups and more pronounced in women. According to the paired analyses, the decrease in the index score was statistically significantly greater in both the inpatient and the outpatient group than in the control group ($F(1, 307)=8.30$, $p<0.004$ and $F(1, 301)=7.30$, $p<0.01$).

With men the interaction term of Time × Treatment was statistically significant; the paired analyses showed that the decrease in the index score over time was significantly greater in the inpatient and outpatient groups than in the control group ($F(1, 196)=5.88$, $p<0.02$ and $F(1, 188)=4.82$, $p<0.03$). With women the only significant effect was the main effect of Time indicating that the index score had decreased over time irrespective of the treatment group (Table III).

Table III. *Changes in the LBP Disability Index: a summary of results of the three- and two-way analyses of variance*

Dependent: LBP Disability Index; Grouping factors: gender and treatment group; Within factor: repeated ratings (pre-treatment, follow-up)

Source of variance	*F*	df	*p*
All subjects			
Treatment	1.76	2/452	NS
Gender	16.54	1/452	0.0001
Treatment × Gender	0.48	2/452	NS
Time	34.68	1/452	0.0001
Time × Treatment	4.44	2/452	0.01
Time × Gender	4.88	1/452	0.03
Time × Treatment × Gender	0.15	2/452	NS
Males			
Treatment	0.41	1/286	NS
Time	8.67	1/286	0.004
Time × Treatment	3.89	2/286	0.02
Females			
Treatment	1.42	1/167	NS
Time	31.78	1/167	0.001
Time × Treatment	1.50	2/167	NS

Compliance to self-care. The groups differed from each other in the reported frequency of home exercises (Table IV). The inpatients had done their back exercises more frequently than both the outpatients and controls. Male study groups did not differ from each other in the reported frequency, whereas female inpatients reported having done their exercises more frequently than female outpatients and controls.

The accomplishment of back exercises, assessed by the physiatrist, was best in the inpatient group and worst in the control group (Table V). All

Table IV. *Frequency (%) of back exercises during the follow-up period and the statistical significances (p) of differences between study groups (χ^2)*
I = inpatients, O = outpatients, C = controls

	<1 time per week	1–3 times per week	4–7 times per week	*p*
All Ss				
I	18	59	23	All: 0.01
O	35	51	14	I–O: 0.01
C	34	52	14	I–C: 0.01
				O–C: NS
Males				
I	23	59	18	All: NS
O	33	53	14	I–O: NS
C	37	49	14	I–C: NS
				O–C: NS
Females				
I	9	59	32	All: 0.001
O	39	49	12	I–O: 0.001
C	28	59	13	I–C: 0.01
				O–C: NS

Table V. *Accomplishment (%) of back exercises at the follow-up in all subjects and men and women, and the statistical significances (p) of differences between study groups (χ^2)*
I = inpatients, O = outpatients, C = controls

	Number of faultless exercises			
	0	1–2	3	*p*
All Ss				
I	11	14	75	All: 0.001
O	23	16	62	I–O: 0.01
C	52	16	32	I–C: 0.001
				O–C: 0.001
Males				
I	10	17	73	All: 0.001
O	23	20	57	I–O: 0.05
C	58	14	28	I–C: 0.001
				O–C: 0.001
Females				
I	12	19	79	All: 0.001
O	23	9	68	I–O: NS
C	41	20	39	I–C: 0.001
				O–C: 0.05

groups differed significantly from each other. With women, both in- and outpatients had significantly higher scores in accomplishment than the controls. With men all three study groups differed significantly from each other. The correlations of accomplishment and frequency were statistically significant ($p<0.01$) in all subjects ($r=0.32$) and in men ($r=0.29$) and women ($r=0.38$).

Benefits of treatment. The benefits of the treatment, reported by the inpatients, were more positive than those of the outpatients (Table VI). The groups did not, however, differ in the estimations concerning increased knowledge on lower back or on factors causing back pain. These results were also evident in the separate analyses of men and women.

DISCUSSION

The subjects of the study can be described as being in risk of low back disability on account of their history of back pain and the nature of their present work. The subjects were, however, in active work life and cannot, therefore, be directly compared to low back pain patients in pain clinics or multimodal treatment centres (e.g. 20, 21, 27), or even those referred to treatment because of acute back pain (e.g. 3). The treatment programme aimed at preventing long-term or permanent disability. The main part of the treatment consisted of instructions in self-care skills, physical training and individual physical therapy. To learn and maintain active self-care skills was emphasized. Although the main contents of treatment were standardized across treatment modes, individualization of its parts was carried out as far as possible. The programmes did not comprise direct interventions in work environments; these kind of changes were only facilitated by directing attention to their significance.

The design was experimental, i.e. a randomized trial with two experimental interventions and one control intervention, which gives a valid basis for conclusions. The control group, which forms the basis for the evaluation of in- and outpatient treatment effects, does not represent a pure »non-intervention» group. Besides spontaneous recovery and reactive effects, also the effects of the physical examinations and self-care instructions given at the pre-treatment phase are, thus, controlled for in the design (e.g. 5).

The results showed a decrease in pain and dis-

Table VI. *Reported benefits of the treatment (% of respondents) at the 3-month follow-up and the statistical significances (p) of differences between the ratings of inpatients (I) and outpatients (O) (χ^2)*

	All subjects			Males			Females		
	I	O	*p*	I	O	*p*	I	O	*p*
Increase in knowledge concerning lower back	88	84	NS	87	89	NS	89	78	NS
Increase in knowledge of the factors affecting low back pain	81	77	NS	82	83	NS	80	67	NS
Increase in motivation for self-care	67	40	0.001	61	44	0.05	79	33	0.001
Decrease in low back pain	57	38	0.01	58	40	0.02	55	36	0.05
Mental recreation	56	25	0.001	47	28	0.02	73	21	0.001
Improved physical condition	55	23	0.001	47	26	0.01	70	17	0.001
Improved working capacity	45	22	0.001	42	22	0.01	50	22	0.01
Decrease in fears concerning illness	37	25	0.05	31	31	NS	46	17	0.001
Decrease in other illness symptoms	24	10	0.001	23	10	0.02	25	9	0.02

ability in the two treated groups when compared to the controls. The decrease in pain was greater in the inpatients than in the outpatients. In the decrease in disability, however, there was no significant difference between the in- and outpatients. Overall results on the treatment effects correspond with those of an earlier study of men aged 54 to 63 years (24).

Although the outpatients' average level of pain after treatment was higher than the inpatients' they seemed to cope with their back trouble as well as the inpatients (cf. also 27). The difference in the decrease of pain can reflect the basic difference between the two treatment modes. The inpatient programme offered leave from work and opportunities for individual treatment and may, thus, have been more effective in alleviating pain than the outpatient treatment during which the subjects went to work regularly.

The decrease in pain was evident in male inpatients and female in- and outpatients, whereas disability decreased significantly only in male in- and outpatients in comparison with the controls. A direct comparison of treatment effects between men and women is not possible, because the baseline values of the criterion variables differed by gender.

The in- and outpatients had, also, learned their home programme more thoroughly when compared to the controls (cf. also 22). Instruction without an opportunity for guided practice seems to be insufficient for a patient to learn self-care skills properly. The frequency of exercises was highest in the inpatients, i.e. they seemed to have a higher motivation for carrying out the exercises than the outpatients and controls, which can be interpreted as a treatment effect. The reported frequency of home exercises in the two treated groups corresponds with that obtained by, e.g. Lutz et al. (17) and Lankhorst et al. (14).

To sum up, short-term treatment effects were quite clear in the in- and outpatient groups. The effects were most pronounced in the inpatient group which also rated the benefits of the treatment more positively. As Deyo & Diehl (9) pointed out, patient satisfaction is as such an important outcome; in the present study it seems to be accompanied with better compliance. The present analysis of treatment effects was solely based on average short-term changes; no attempts for identifying »successes» and »failures» (e.g. 20, 21) on the basis of baseline data were made. That kind of analysis is more appropriate after a longer follow-up period, when the effects of compliance can also be assessed more properly.

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REFERENCES

1. Anderson, J. A. D.: Low back pain—cause and prevention of long-term handicap (a critical review). Int Rehab Med *3:* 89–93, 1981.
2. Andersson, G.: Low back pain in industry: Epidemiological aspects. Scand J Rehab Med *11:* 163–168, 1979.
3. Bergquist-Ullman, M. & Larsson, U.: Acute low back pain in industry. A controlled prospective study with special reference to therapy and confounding factors. Acta Orthop Scand, Suppl. 170, 1977.
4. Biering-Sorensen, F. & Thomsen, C.: Medical, social and occupational history as risk indicators for low-back trouble in a general population. Spine *11:* 720–725, 1986.
5. Campbell, D. T.: From description to experimentation: Interpreting trends as quasi-experiments. In: Problems in Measuring Change (ed. C. W. Harris), pp. 212–242. University of Wisconsin Press, Madison, 1963.
6. Carlsson, A. M.: Assessment of chronic pain. I. Aspects of the reliability and validity of the Visual Analogue Scale. Pain *16:* 87–101, 1983.
7. Dales, J. L. MacDonald, E. B. & Porter, R. W.: Back pain; the risk factors and its prediction in work people. Clin Biomech *1:* 216–221, 1986.
8. Damkot, D. K., Pope, M. H., Lord, J. & Frymoyer, J. W.: The relationship between work history, work environment and low-back pain in men. Spine *9:* 395–399, 1984.
9. Deyo, R. A. & Diehl, A. K.: Patient satisfaction with medical care for low-back pain. Spine *11:* 28–30, 1986.
10. Flor, H. & Turk, D. C.: Etiological theories and treatments for chronic back pain. I. Somatic models and interventions. Pain *19:* 105–121, 1984.
11. Hurri, H.: Selkäkoulu kroonisen kipuselän hoidossa (Back school in the treatment of chronic low back pain. English summary). Research reports 19, Rehabilitation Foundation, Helsinki, 1986.
12. Järvikoski, A., Härkäpää, K. & Mellin, G.: Symptoms of psychological distress and treatment effects with low-back pain patients. Pain *25:* 345-355, 1986.
13. Järvikoski, A. & Lahelma, E.: Early rehabilitation and its implementation at the work place. Int J Rehab Res *4:* 519–530, 1981.
14. Lankhorst, G. J., Van de Stadt, R. J., Vogelaar, T. W., Van der Korst, J. K. & Prevo. A. J. H.: The effect of Swedish back school in chronic idiopathic low back pain. Scand J Rehab Med *15:* 141–145, 1983.
15. Lidström, A. & Zachrisson, M.: Ryggbesvär och arbetsförmåga. Ryggskolan. Ett försök till mer rationell fysikalisk terapi. Socialmed Tidskr *7:* 419–422, 1973.
16. Linton, S. J. & Kamwendo, K.: Low back schools. A critical review. Phys Ther *67:* 1375–1383, 1987.
17. Lutz, R. W., Silbret, M. & Olshan, N.: Treatment outcome and compliance with therapeutic regimens: Long-term follow-up of a multidisciplinary pain program. Pain *17:* 301–308, 1983.
18. Magora, A.: Investigation of the relation between low back pain and occupation. IV. Physical requirements: Bending, rotation, reaching and sudden maximal effort. Scand J Rehab Med *5:* 186–190, 1973.
19. Martin, P. R., Rose, M. J., Nichols, P. J. R., Russell, P. L. & Hughes, I. G.: Physiotherapy exercises for low back pain: process and clinical outcome. Int Rehab Med *8:* 34–38, 1986.
20. Maruta, T., Swanson, D. W. & Swenson, W. M.: Chronic pain: which patients may a pain-management program help? Pain *7:* 321–329, 1979.
21. Maruta, T., Swanson, D. W. & McHardy, M. J.: Three year follow-up of patients with chronic pain who were treated in a multidisciplinary pain management program. Paper presented at the Fifth Congress on Pain, Hamburg, 2–7 August 1987.
22. Masur, F. T.: Adherence to health care regimens. In: Medical Psychology. Contributions to Behavioral Medicine (ed. C. K. Prokop & L. A. Bradley), pp. 441–470. Academic Press, Orlando, 1981.
23. Mellin, G. et al.: A controlled study on the outcome of inpatient and outpatient treatment of low back pain. Part II. Effects on physical measurements three months after treatment. Scand J Rehab Med (accepted for publication.)
24. Mellin, G., Järvikoski, A. & Verkasalo, M.: Treatment of patients with chronic low back pain. Comparison between rehabilitation centre and outpatient care. Scand J Rehab Med *16:* 77–84, 1984.
25. Moffett, J. A. K., Chase, S. M., Portek, I. & Ennis, J. R.: A controlled prospective study to evaluate the effectiveness of a back school in the relief of chronic low back pain. Spine *11:* 120–122, 1986.
26. Nachemson, A. L.: Low back pain. Its etiology and treatment. Clin Med *78:* 18–24, 1971.
27. Newman, R. I., Seres, J. L., Yospe, L. P. & Garlington, B.: Multidisciplinary treatment of chronic pain: Long-term follow-up of low-back pain patients. Pain *4:* 283–292, 1978.
28. Rowe, M. L.: Low back pain in industry. JOM *11:* 161–169, 1969.
29. Sims-Williams, H., Jayson, M. I. V., Young, S. M. S., Baddeley, H. & Collins, E.: Controlled trial of mobilisation and manipulation for patients with low back pain in general practice. Br Med J *2:* 1338–1340, 1978.
30. Troup, J. D. G., Martin, J. W. & Lloyd, D. C. E. F.: Back pain in industry. A prospective survey. Spine *6:* 61–69, 1981.

31. Turk, D. C. & Flor, H.: Etiological theories and treatments for chronic back pain. II. Psychological models and interventions. Pain *19:* 209–233, 1984.
32. Yu, T., Roht, L. H., Wise, R. A., Kilian, J. & Weir, F. W.: Low-back pain in industry. JOM *26:* 517–524, 1984.
33. Zachrisson Forssell, M.: The Swedish Back School. Physiotherapy *66:* 112–114, 1980.

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