Scand J Rehab Med 30: 211–219, 1998

EFFECTIVENESS OF IN-PATIENT REHABILITATION FOR SUB-CHRONIC AND CHRONIC LOW BACK PAIN BY AN INTEGRATIVE GROUP TREATMENT PROGRAM (SWISS MULTICENTRE STUDY)

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ABSTRACT. In this multicentre intervention study, we compared an integrated group treatment program which combines psychological and education methods into a more active training approach, with the traditional individual approach of physiotherapy and physical procedures for sub-chronic and chronic low back pain. Our 411 patients had a 4-week in-patient treatment: 243 patients in an experimental program and 168 in a traditional program. Outcomes of 283 patients were assessed 3 months and 1 year after entry. The dropout rate was 31.1%. Both conditions demonstrated favourable initial effects on functional and psychological parameters, but the integrated approach showed better long-term results for work rehabilitation than the traditional approach. The most successful patients ($n = 58$) were younger and had a higher educational level in comparison to the unsuccessful subgroup ($n = 71$). The main conclusion is that an integrated approach promoting self control and behaviour change through educational measures achieves better long-term results than the traditional individual physiotherapy approach.

Key words: behaviour therapy, exercise therapy, low back pain, outcome assessment, physical therapy, psychology, rehabilitation.

INTRODUCTION

During the past decades, chronic low back pain has become a burden with ensuant severe economic impact (19, 23, 31). For the long-term, no *single* treatment method seems to be better than placebo (11, 16, 34, 41, 46). An intensive multidisciplinary approach, as practised in traditional pain clinics, may reduce pain and make patients happier (3), but does not necessarily bring them back to work and, therefore, may not reduce disability payment costs. In light of criticisms such as these, return-to-work rates rather than well-being have become the crucial criteria for the efficacy of rehabilitation programs (12, 20, 28). The traditional medical approach often relies on passive measures, such as medication, tissue stimulation (e.g. TENS, ultrasound), rest and orthotics (braces) (10), which can further the development of chronic, disabling back pain by reducing physical fitness ("deconditioning") (15). The course of low back pain is more often determined by psychosocial factors ("barriers") (35) than by the specific pathology of the spine.

These observations were taken into account in novel concepts for rehabilitation (functional restoration) of low back pain patients by combining an intensive training intervention, the so-called "sports medicine" approach (25, 35), with cognitive–behavioural methods. A number of studies have demonstrated that such an integrated approach can bring better long-term results, especially with regard to return-to-work rates (26, 27, 30, 36, 37, 39).

The goal of this multicentre intervention study was to evaluate the introduction of such an approach under the conditions of existing rural rehabilitation centres in Switzerland, which cater to a variety of patients with musculoskeletal disorders. The main hypothesis was that this new kind of therapy could achieve a more effective rehabilitation for patients with persisting symptoms, in terms of long-term working capacity, than could the traditional physical therapy approach practised to date. A second hypothesis was that psychosocial factors could

also predict outcome and help identify patients who need special attention in order to prevent permanent disability. A third hypothesis was that the new treatment approach would save costs by reducing the medical consumption during the one-year follow-up period.

METHODS

Treatment program

The new treatment program comprised 15 days of standardized in-patient treatment during a 4-week (27 days) hospitalization in a rehabilitation centre for musculoskeletal disorders. Five days were used for initial assessment, patient orientation and discharge evaluations; no treatments occurred on Saturdays and Sundays. Through the introduction of group activities and new training facilities, such as resistance machines, swimming with flippers or wet-vest training, the intensity of the treatment was increased from 1 or 2 to 4 hours daily, including about 1 hour each of the following therapeutic activities: (1) general fitness training (aerobics) in groups for improvement of flexibility, endurance, and general strength; (2) specific training in groups for strength and endurance of trunk muscles with resistance machines, floor exercises and simulated work situations ("work hardening"); (3) educational group sessions and discussions with occupational therapists, physiotherapists, psychologists, and physicians for improving information, promoting motivation, self-responsibility, and self-help strategies; (4) individual symptomatic treatments with physiotherapy or counselling (psychotherapy) if needed, for acute pain, limited mobility or other barriers to the training therapy. Educational and group activities were of central importance. These included topics of the traditional back school as well as recommendations for training and sports. In order to improve self-control, counselling focused on coping strategies for back pain and behavioural changes, such as stress management and relaxation training.

The *traditional treatment program*, which has been used to date at these centres, consisted of a 3-week (20-day) hospitalization, with about 13 days of mostly *individual* therapy, such as physiotherapy, massages and other modalities (heat, cold). A few sessions of flexibility class, back school or relaxation training had already become standard at a few centres, but no structured group program with regular educational sessions or structured fitness training was in place, nor were psychologists employed.

Procedures

The pilot committee (P. K., U. D., O. K., H. S.) planned and tested a new standard in-patient treatment program and introduced it at one rehabilitation centre in 1990. This served as a pilot clinic where training seminars were organized for the participating staff of all 3 experimental clinics. During the first year, the remaining 6 centres continued with their traditional program. In the second year (1991), the new concept was extended to 2 other clinics, while the remaining 4 centres continued with their standard traditional programs. As a result of using groups instead of individual settings, and of prolongation of the treatment period from 20 to 27 days, the number of treatment activities increased significantly without an increase of staff, as only part-time psychologists were hired. To compare the duration of patient–therapist contact, an index of individual attention was calculated from the hours of individual therapy per patient, plus the hours of group treatment, divided by the number of group members. This index turned out to be almost identical under both treatment conditions (experimental: 19.4 hours therapist contact per patient vs traditional: 20.0 hours).

Comprehensive pre-treatment and follow-up evaluations at 3 and 12 months after termination included a questionnaire on sociodemographic variables, working situation (2), physical activities, pain history, assessment of present pain (VAS, verbal pain rating (40), pain drawing (43), scored with the grid by Capra et al. (8)), disability due to back-pain (Roland & Morris Disability Questionnaire (RMDQ) (44), validated German and French translations) and psychological well-being (Psychological General Well-being Index, PGWB (14), validated German and French translations (6, 21)). Furthermore, various measures of quality of life (32), e.g. impairment in activities of daily living, work, general satisfaction, reactions of significant others, sexuality adapted for back pain, and health costs were assessed before treatment and at the one-year follow-up. Physical parameters, such as flexibility, strength and endurance were assessed, but excluded from outcome analysis, as data were incomplete.

Pre- and post-treatment and intergroup comparisons were calculated with multivariate analysis of variance or the Kruskal-Wallis rank-order test, controlling for pre-treatment intergroup differences (age, sex, duration of illness, etc.). Cluster analysis was used to identify types of reactions to treatment. Only variables with sufficient numbers of valid data were included. Analysis of variance or χ^2 calculations were used to test for differences among the sociodemographic and psychological variables of the three types of treatment reaction (improved, unchanged, deteriorated).

Patient sample

Patients had to be admitted by their physician for in-patient rehabilitation due to persistent, intractable, low back pain. Pain could radiate to the legs and neurological deficits, or signs of spinal stenosis could be present, but without immediate indication for surgical intervention. Postoperative patients were accepted at least 6 months after disscectomy or only 12 months after spinal fusion. Work-related injuries considered accidents under the strict definitions of the "Swiss Accident Insurance Company" (SUVA) comprised only 9% of the cases.

Patients were only accepted into the program if they had been on full-time sick leave for a total of at least 6 weeks during the last 2 years. Housewives or self-employed persons had to have been partially unable to work for the duration of at least 3 months. However, patients had to have worked for some time during the past 12 months (no long-term disability). Minimal age was set at 20 and maximal age at 60. Sufficient mastery of either German or French was required.

No strict randomization could be used, since the choice of the treatment centre and program depended mainly on the place of residence and language (French or German), as the majority of patients had to be admitted to their local rehabilitation centres. In one area, there was a choice of two places for the patients: Rheinfelden and Zurzach. Otherwise, only patients with special insurance coverage had a choice of several centres. Since admitting physicians and patients were kept blind for the kind of treatment performed before admission, selection of treatment condition occurred mainly by chance. However, during the course of the study, it became known to some admitting physicians where the "new program" had been introduced (e.g. through discharge summaries).

RESULTS

Pre-treatment comparisons and dropout analysis

There were 411 patients originally included in the study, 243 in the experimental program and 168 in the traditional one. Control clinics had difficulties in recruiting patients for study participation, as their patients were not taking part in a special group program. At the 3-month and one-year follow-ups, 282 (68.6%) could be reached for evaluation (171 experimental, 111 traditional program). There was no significant difference in the characteristics or numbers of dropouts between the two treatment conditions. Reasons for dropping out were primarily interfering medical conditions (e.g. dissectomy), change of residence, and inability or unwillingness to participate in the follow-up evaluation, since it often meant a full day trip (these former spas are often located in remote mountain regions). Dropouts had been socially less integrated and satisfied (less often married and more often living alone), as well as more disabled and disturbed in their well-being. A number of socio-demographic characteristics and a selection of pain parameters of the two final samples are shown in Table I. There were significantly more men in the traditional program (76% vs 63%). Accordingly, there was a higher percentage of housewives in the experimental program, while unfavourable working conditions were more common in the traditional sample. Other than a clearly significant difference for disability (RMDQ), only a few of the many measures of pain and well-being differed by a very low level of significance. These pre-treatment differences were partialled out in the outcome assess-

Table I. *Characteristics of patients in experimental and traditional programs*

	Experimental	Traditional	*p*
n	171	111	
Age (years)	44	43	n.s.
Sex (men/women) (%)	63/37	76/24	0.038
Marital status (%):			
single	16	15	n.s.
married	73	73	n.s.
separated/divorced/widowed	10.5	13	n.s.
Formal education (%):			
elementary school only	81	88	n.s.
high school	8.5	9	n.s.
college/university	4	3	n.s.
Position in occupation (%):			
unskilled worker	29	19	n.s.
skilled worker	16	27	n.s.
foreman	18	20	n.s.
Occupational status (%):			
employed	68	66	n.s.
independent	8	7	n.s.
housewife/husband	18	8	0.018
Working conditions:			
unfavourable physical demands (lifting, bending, etc.; mean of 7 items, no = 0/yes = 1)	0.40	0.51	0.007[1]
unpleasant conditions (noise, temperature, stress, monotony, etc.; mean of 8 items, range 0–2)	1.6	1.71	0.007[1]
mean pain intensity (verbal scale of MPQ: 1 = no pain/ 6 = unbearable; 3 measures: present, best, worst past week)	3.26	3.49	0.034
Disability (RMDQ: 0–1)	0.54	0.61	0.002
Number of days out of work	135	133	n.s.
First occurrence of pain (no. of yrs. ago)	14	13	n.s.
Health insurance involved (%):			
health insurance	97	96	n.s.
accident insurance	8	11	n.s.
general ward insured	56	67	n.s.
private/half-private insured	44	33	n.s.

[1] Pooled for analysis of variance.
RMDQ: Roland & Morris Disability Questionnaire.

Table II. *Working status after one year*

Work status	Not working	Retraining	In former profession		In other profession		Total
			Part-time	Full-time	Part-time	Full-time	
Traditional	18	4	30	33	4	8	97
(%)	(18.6)	(4.1)	(30.9)	(34.0)	(4.1)	(8.2)	(38.5)
Experimental	23	8	40	58	15	11	155
(%)	(14.8)	(5.2)	(25.8)	(37.4)	(9.7)	(7.1)	(61.5)
Total	41	12	70	91	19	19	252
(%)	(16.3)	(4.8)	(27.8)	(36.1)	(7.5)	(7.5)	(100.0)

(no significant group differences)

ment. Duration of pain during the past year (assessed in 4 categories) did not differ significantly between the two samples: 41.1% of the patients had been suffering from continuous pain from 31 to 150 days, 14.2% less than 31 days, the rest 151 to 270 days (19.5%) or more (8.9%).

Effects of treatment and group differences

Return to work and working capacity. After 1 year, 78.9% of all patients had returned to work (43.6% full-time, 35.3% part-time), most of them to their previous employment (63.9%), but 15% changed jobs (Table II). The rest of the patients remained unable to work (16.3%) or were in a retraining program (4.8%). These ratios are similar for both treatment conditions (no significant group difference). A more precise measure of changes in working capacity emerged from the patients' reports about the past evaluation period (3 months or 9 months for follow-up evaluations) in comparison to previous assessments. In the experimental group, work incapacity decreased by 23%, on average, while it remained unchanged among the control cases. Experimental patients also worked 1.4 hours more per day, on average, in comparison to the controls. To test for significance, these two measures were included in a multivariate analysis of variance which proved a significant treatment effect ($F8;410 = 9.65$, $p = 0.000$) and a significant group effect (superiority of experimental program; $F4;175 = 2.98$, $p = 0.021$; Table III). The high number of working hours before treatment does not reflect the working status at the time of study entry, since patients had to be out of work. It indicates the hours "usually worked" per day during the past 12 months. The changes in quality of life (see below) confirmed this increase of working capacity.

Disability, general well-being, quality of life. Disability (RMDQ) was significantly lower for both groups at the one-year follow-up in comparison to pre-treatment ($F2;364 = 24.0$, $p < 0.000$); however, no group effect could be detected (Table III). The GWB index also changed on all sub-scales in the expected direction ($F12;706 = 7.57$, $p < 0.000$) for both groups. The 17% decrease in pain intensity (VAS) was not significant (Table III), but a significant reduction of 14% in spatial distribution occurred under the experimental conditions, while a 15% increase was noted in the control group (time effect: $F15;1124 = 3.70$, $p = 0.000$; group effect $F1;198 = 4.54$, $p = 0.034$; Table III).

Measures of quality of life showed several treatment effects. Professional handicaps (11 items concerning changes in work-related quality of life) significantly decreased by 10% in the experimental program, but increased among patients in the traditional program (group effect $F1;200 = 4.53$, $p = 0.034$; Table III). Limitations in activities of daily life decreased in both treatment conditions (time effect: $F\ 6;608 = 6.74$, $p = 0.000$, no group difference) and the same occurred for other quality of life measures like general satisfaction, reactions of important others, sexuality (multivariate analysis over 4 sub-scales: $F\ 8;486 = 2.89$, $p = 0.004$; no table).

Costs and medical utilization. Analysis of costs revealed that both groups required significantly fewer medical consultations (Table IV; time effect: $F1;183 = 30.95$, $p = 0.000$, no group difference) and spent less time for treatments daily (time effect: $F1;210 = 8.8$, $p = 0.003$, no group difference). While there was no difference between groups and no treatment effect for drug consumption, the use of other treatments showed some significant changes (Table V). Patients in the traditional program significantly increased their use of various modalities (heat, cold, etc.), while a significant decrease in the use of massages could be observed in the

Table III. *Treatment effects: differences between experimental and traditional conditions*

	Pre-treatment		Post-treatment		After 3 months		After 12 months			
	mean	SD	mean	SD	mean	SD	mean	SD	nT[1]	nP[1]
Working capacity:										
Impairment at work (1 = none/5 = total):										
experimental	2.33	0.88	n.a.	n.a.	1.91	1.17	1.78[2]	1.10	106	185
traditional	2.06	0.90			1.82	1.18	2.06[2]	1.30		
Hours worked per day										
experimental	7.68	2.89	n.a.	n.a.	5.43	3.59	6.06[2]	3.38	106	185
traditional	7.53	2.72			5.29	3.69	4.65[2]	4.06		
Pain intensity (VAS)	5.60	2.28	4.58	2.58	4.84	2.63	4.61	2.78	139	NS
experimental	5.36	2.27	4.30	2.60	4.54	2.64	4.32	2.74		
traditional	6.31	2.17	5.36	2.39	5.69	2.44	5.44	2.75		
Spatial distribution of pain:										
experimental	20.46	14.37	14.49	12.40	17.32	16.91	17.57[2]	16.86	139	206
traditional	20.56	15.49	15.42	13.68	20.58	15.13	23.58[2]	21.93		
Quality of life (handicaps):										
Professional activity										
experimental	37.8	17.8	n.a.	n.a.	32.3	19.6	34.0[2]	23.8	155	206
traditional	43.1	26.4			38.4	26.8	48.4[2]	33.1		
Activities of daily living										
experimental	5.23	1.72	n.a.	n.a.	4.54	2.11	4.45	2.30	155	206
traditional	5.64	1.97			5.08	2.01	5.18	2.27		
Disability (RMDQ)	0.568	0.193	n.a.	n.a.	0.481	0.247	0.464	0.256	184	NS
experimental	0.522	0.187			0.425	0.232	0.419	0.248		
traditional	0.655	0.176			0.586	0.240	0.548	0.251		

n.a.: not assessed after treatment.
[1] Sample size for analysis of time (nT) and group (nP) effects.
[2] $p < 0.05$ (significant group effect). All time effects significant ($p < 0.000$). For F statistics, see text.
RMDQ: Roland & Morris Disability Questionnaire.

experimental group. Their use of modalities slightly increased, as did their use of fitness training and relaxation, the latter two changes being much more pronounced.

Table IV. *Effects on treatments (physician visits, time for treatments)*

	Pre-treatment	After 12 months	n
Physician visits (number)	43.9	25.7	185
experimental	44.6	27.2[1]	109
traditional	42.9	23.5[1]	76
Time spent for treatments (minutes/day)	63.9	50.6	212
experimental	62.0	54.2[1]	129
traditional	66.7	44.9[1]	83

[1] Significant time effect ($p < 0.001$). There were no significant group effects. For F statistics, see text.

Overall treatment reaction and predictors of outcome

On the basis of the one-year outcome, three types of overall treatment reaction (improved, unchanged, deteriorated) could be identified by cluster analysis. A selection of relevant outcome measures was used to define these three types of outcome. To be included in this analysis, an outcome variable had to be sensitive for treatment effects (sufficient variation) and not be affected by too many dropouts. According to these criteria, the following variables were selected: work incapacity, physical leisure activities, average pain intensity (three measures), GWB, RMDQ, work-related impairment and quality of life (general index of satisfaction). Sufficient data to undergo this analysis was available on 254 of the 282 cases. Twenty-eight had to be omitted due to missing data for certain key variables. Fifty-eight patients (22.8%) clearly *improved* on all outcome parameters (Table VI). They were generally younger than the other patients, and more

Table V. *Comparison of treatments performed before treatment and after 12 months (percentage of patients using method)*

	Pre-treatment	After 12 months	χ^2 (before/ after)	p	n
Fitness training	23.1	41.5	21.74	0.000	228
experimental	28.4	54.9	7.32	0.007	139
traditional	15.1	20.0	14.03	0.000	89
Relaxation	45.3	47.0	27.42	0.000	228
experimental	48.9	54.9	17.39	0.000	139
traditional	39.8	34.4	8.57	0.003	89
Massages	56.4	47.0	11.71	0.000	228
experimental	56.0	41.0	6.67	0.010	139
traditional	57.0	56.7	5.33	0.020	89
Modalities	60.3	62.4	8.53	0.003	228
experimental	60.3	61.1	9.43	0.002	139
traditional	60.2	64.4	0.65	0.419	89

often housewives. In comparison to those 125 patients (49.2%) who remained largely *unchanged*, their psychological well-being was more impaired upon admission. Seventy-one patients (28%) *deteriorated* on all measures. Their educational level was generally lower and, compared to the patients with a more favourable outcome, a larger proportion of them did not have professional training. They also complained more often about troublesome environmental influences at work. Some 23% of the patients from both treatment conditions clearly improved, but a larger proportion of patients from the traditional program worsened, while more patients from the experimental condition remained unchanged. However, these differences are not statistically significant.

DISCUSSION

In this controlled study, we compared two similar treatment programs for two similar samples of patients with sub-chronic and chronic low back pain in 7 comparable rural rehabilitation centres in Switzerland (former spas). We concentrated our intervention on patients who were at high risk for a chronic course by having been out of work for at least 6 weeks, but who still had a fair chance of returning to their previous job and were not yet eligible for disability pensions (out of work less than one year). While the less intensive traditional program focused mainly on individual physiotherapy and modalities with the goal of pain relief, the experimental program promoted activity in spite of pain, with intensive fitness training in groups supported by educational sessions. Although no strict randomization could be used, the two samples do not differ in their most relevant characteristics. Both conditions brought similar short-term (3-month follow-up) improvements in disability, well-being, pain, and quality of life in the expected direction. While most improvements of the traditional group tended to disappear between the 3-month and the one-year follow-up, they were maintained or even amplified in the experimental group, where more lasting effects were observed in the work capacity. The reduction of spatial distribution of pain follows the same pattern, but the significance of this isolated finding should not be overestimated. It might be an expression of a reduced psychological disturbance (38). However, parameters of psychological well-being did not confirm this change.

Table VI. *Overall treatment reaction (types of treatment reaction)*

	Unchanged	Deteriorated	Improved	Total
Total	125 (49%)	71 (28%)	58 (23%)	254
Experimental	82 (54%)	36 (23%)	35 (23%)	153
Traditional	43 (43%)	35 (35%)	23 (23%)	101

This slight superiority confirms our first and third hypothesis to some extent. The gross return-to-work rates after one year reflect these changes too; however, they were less pronounced and statistically not significant. In addition, these rates would be lower if the 31.4% dropouts were included, since a larger proportion of the latter most likely stayed idle. Similar return-to-

work rates for a comparable population of sub-chronic and chronic low back pain patients in a similar social security system were reported by Mellin et al. (39).

The different outcome for the two treatment conditions can hardly be explained by the few pre-treatment differences between the two samples, nor by the lack of strict randomization. The overrepresentation of housewives with good prognoses (according to the analysis of overall outcome) in the experimental program must play only a minor role, since a mere 14% of all participants were housewives. Sex generally did not predict a better treatment result. In addition, such a bias would generally influence outcome and show up at *both* follow-up evaluations. The longer maintenance of treatment effects in the experimental program, in comparison to the traditional approach, is typical for the difference between effective psychotherapy (i.e. the cognitive-behavioural approach) and placebo treatment (mostly passive modalities) (17). A similar loss of effectiveness after one year was observed after spa therapy (22), and among the non-responders of an exercise program (33). The small changes in physical measures also support the interpretation that the reduction of work-related disability is due more to a change of attitude towards pain control through self-help, than to an increase in strength and endurance. Such changes are linked with a reduction of post-treatment disability (42). According to our findings, this change of attitude can induce more active behaviour in pain control with exercise and relaxation, rather than doctor consultations and passive massages. The active training approach, with psychological support, seems feasible for this non-selected sample of patients with impending long-term disability, as has been shown by other authors (1, 18, 26, 35, 45).

The small differences in results between the two treatment conditions can be explained by the short duration and low intensity of the in-patient period, and the lack of out-patient interventions before and after the admission, as was the rule in the above-mentioned studies (1, 18, 25, 26, 35, 45). Similar effects with a comparable program were reported in a study with waiting list controls (29). In addition, control patients were not just offered an inert placebo treatment; they were treated individually, some of them by highly-motivated therapists who were well aware of the experimental concepts. However, it is generally difficult to find valid comparison groups that can be evaluated after one year, since waiting lists or placebo treatments are not suitable for this purpose. It is not acceptable to use patients who could not get into the treatment program as controls, since a negative bias for the controls cannot be excluded (26, 36).

This study clearly demonstrates that neither our traditional rehabilitation concepts nor our novel approach could clearly stop the process of chronification, especially in the high-risk groups of unskilled workers with persisting pain, as comparison of the improved, unchanged, and deteriorated cases showed. This confirms our second hypothesis. The importance of psychosocial factors in predicting the outcome in acute and sub-chronic low back trouble was recently demonstrated in a one-year prospective study using a sample of 152 cases in a primary care setting (7). The return to their previous heavy work in construction or industry is often not recommended by physicians, which can have a negative impact on outcome (24). In addition, return to work was impeded by long duration of illness and higher age, as reported in other studies (4, 5, 9, 13). To improve and maintain the positive effects of our treatment program, as well as to support professional reintegration, early intervention with a more vigorous program might be necessary. As in other more efficient programs (25, 26, 36), it should include a specific pre-training phase, a longer period of in-patient treatment (5 to 6 weeks) for better endurance training and more intense work hardening, and case management and rehabilitation counselling *after* discharge. However, this was beyond the capacity of our staff during a limited 4-week intervention, at the end of which we had to discharge our patients to their admitting physicians with no further influence on future interventions.

ACKNOWLEDGEMENTS

This study was supported by the Swiss National Science Foundation as part of the National Research Program No. 26B (Project No. 4026–27074).

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Accepted November 28, 1997

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