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EFFECTS AND FOLLOW-UP OF A MULTIMODAL TREATMENT PROGRAM INCLUDING INTENSIVE PHYSICAL TRAINING FOR LOW BACK PAIN PATIENTS

Ann-Mari Estlander,[1] Guy Mellin,[1] Heikki Vanharanta[2] and Markku Hupli[1]

From the [1]Rehabilitation Foundation, Helsinki and the [2]Department of Physical Medicine and Rehabilitation, University of Oulu, Oulu, Finland

ABSTRACT. The results of a comprehensive 4-week treatment program including intensive physical training were evaluated in 65 chronic low back pain patients. Marked increases in measures of spinal mobility, trunk muscle strength and lifting capacity were found during the treatment, but no average increase in pain ratings. At 3-week and 12-month follow-ups a statistically significant decrease in subjective disability and pain was found, but the percentage of patients who were working was unchanged. This points to a need for more work-oriented rehabilitation efforts in the treatment.

Key words: low back pain, comprehensive treatment, intensive physical training, physical measurements.

Specific treatment for chronic low back pain (LBP) is in most cases difficult. Some new nonspecific treatment methods developed during the past few years have, however, been reported to be effective (3, 7, 10, 11). The rationale for them has been the "disuse-induced deconditioning syndrome" derived from prolonged, fear-related and often iatrogenically encouraged protectiveness and passivity. In the treatment of these symptoms physical exercise where pain is not the limit of activity, instead of the earlier "let the pain be your guide" rationale, has become the primary form of treatment, in addition to addressing psychological factors influencing the back problem (19).

This kind of treatment described by Mayer et al. (10) included intensive physical training guided by repeated noninvasive measurements of back strength and mobility, work hardening, psychological management, and general counseling. The results showed markedly increased physical functioning and a high return to work rate. Improvement in physical functions correlated with return to work. The same type of treatment was studied by Hazard et al. (7), who also found it to be effective.

The aim of the present study was to evaluate results in our chronic low back patients treated within a comprehensive treatment program along these new lines. Changes in physical functioning, pain ratings, and mood during the intensive program were studied as well as changes in pain levels, daily functioning, and work status at 3-week and one-year follow-ups.

SUBJECTS AND METHODS

Selection of subjects

The material consisted of 65 patients participating in a multimodal in-patient treatment program for chronic low back pain patients at the Rehabilitation Foundation in Helsinki during 1987. The patients were referred to the program by their physicians. Inclusion criteria were: chronic or recurrent low back trouble threatening working capacity; currently working, sick listed or on a temporary disability pension because of low back trouble; age 19–60 years; and willingness to participate in the program. Exclusion criteria were: surgery indicated; other significantly disabling illness or severe psychological disturbance; and lack of motivation. The treatment was sponsored by the Finnish Social Insurance Institution. Eighty-four patients were referred to the program. Eight patients (10%) cancelled before the pre-program, most of them due to practical reasons (inconvenient timing of the treatment) or lack of motivation. Ten patients (13%) participated in the pre-program, but not in the intensive program. The main reason for drop-out after the pre-program were lack of motivation or health problems other than LBP (incontinence, cardiovascular symptoms etc.). One patient withdrew from the intensive program after the first week owing to increased pain.

Description of patients

The mean age of the 65 patients who completed the program was 41.6 years (range 23–54, SD 7.18). Fifty-four per cent of the patients were men; 71% were married; 54% were working immediately prior to treatment; 26% (17 patients) were sick-listed, and 15% (10 patients) had a temporary disability

pension. In the sick-listed group, 10 patients had applied for disability pension. The average time since the first back symptoms was 9.9 years (range 1–30 years), whereas average absence from work due to LBP during the preceding year was 5.5 months. Twenty-two percent of the patients had undergone back surgery, the majority of them once. The average time since back surgery was 3.1 years ranging from 9 months to 12 years. Subjective health status was rated as bad or very bad by 62% of the patients (5-point scale, 1 = very good, 5 = very bad). Seventy-four per cent reported that they had LBP more often than four days per week. Average pain intensity was rated as moderate by 40% and as severe by 46% of the patients.

The treatment program

The goal of the treatment was to increase the overall functioning of the patient by improving physical functions and work-related skills (lifting, body coordination), by overcoming the fear of pain, and by increasing feelings of control and mastery. A reduction of pain was not the primary goal: it was assumed that pain diminishes as a consequence of improved functioning in the long run.

The program consisted of a pre-program, a period of home training, and an intensive in-patient treatment program. During the pre-program (3 days) the rationale and methods of the program were explained to the patients, a broad range of assessments were made, and the patient together with the staff decided whether he/she would participate in the whole program. The idea of the 5-week home training was that the patients, mainly by stretching and light physical exercises, would aquire readiness for the intensive treatment program.

The intensive treatment period (4 weeks, in-patient group treatment) consisted of physical exercises, cognitive-behavioral group therapy, back school education, relaxation training, and socio-economic counseling.

Physical exercises constituted the main part of the program. Muscle strength exercises of the trunk and limbs were performed for 2 hours/day. They were based on a program of progressive resistance beginning on a 40–50% level of the patient's maximum performance. Mobilization exercises of the spine and lower limbs were done several times per day with a total rate of about one hour/day. Exercises (e.g. with bicycling and rowing apparatuses, gymnastics), and work simulation/work hardening including such exercises as repeated lifting, carrying, and bending were performed for one hour/day. Outdoor activities (walking, running, bicycling, skiing) took up 2 hours weekly.

The back school (2 hours/week) was modified from the Swedish model (8). Daily relaxation training (3 hours/week) consisted of, at first, progressive and, later, autogenic relaxation.

The aim of the cognitive-behavioral group therapy (3 hours/week) was to discuss and structure pain-related concepts and experiences; to teach the patients a comprehensive view of pain, mind-body relationships, and coping strategies for pain and emotional distress.

Assessment of background data, pain levels, disability, and mood

Before the pre-program a mailed questionnaire including items concerning socio-demographic data; medical, social and work history; pain intensity and frequency; disability in daily functioning etc., was filled in by the patients. A Pain Index (4) was based on three 5-point numerical scales concerning pain intensity on an average and at worst, as well as pain frequency. The range of scores was 3–15, a lower score indicating less severe and less frequent pain. Disability and limitations in daily functioning were assessed by the Disability Questionnaire (17) consisting of 24 items (range 24–48), especially designed for low back pain patients. The Finnish translation of this questionnaire is called the Functional Capacity Questionnaire, a higher score indicating better psychosocial and physical functioning and fewer limitations.

During the intensive program the patients rated their pain levels on a numerical scale (1–5) twice a day, a higher score indicating more severe pain. The means of pain ratings for the first day as well as for the first, second, third and fourth week were calculated.

A mood index consisting of seven pairs of adjectives rated on a numerical scale (1–10) was filled in by the patients during the pre-program as well as on the first and last day of the intensive program. A higher score indicated a more depressed mood. The mood scale had an internal consistency (Cronbach's alpha) of 0.91 and its correlation with Beck's Depression Inventory (1) was 0.69.

Assessment of physical functions

Trunk flexion and extension strength were measured isometrically by a dynamometer method described by Mellin (12). The subject lay on a bench exerting maximal flexion or extension force against a tightened belt passing over the trunk just under the axillas. The belt was connected to a spring balance dynamometer. The best one of three subsequent trials was recorded.

Isokinetic lifting strength was measured with a mechanical, friction-based centrifugal force-controlled device constructed by Digitest and Dr T. Videman. The speed of the isokinetic lift was 2 m/s. The lift was performed from floor to above the head. The lift force was recorded graphically with a plotter curve from which maximal force and repeated trials could be calculated.

Spinal mobility was measured with Myrin inclinometers applied to auxiliary tools (13). The instruments were placed on the sacrum below a line joining the posterior superior iliac spines and on a point 20 cm above that level. Measurements were carried out while the patient was standing; sagittal measurements were calculated as the change from the curvature in the natural standing position. Measurements of left and right lateral flexion were combined.

Follow-up

The follow-up consisted of a mailed questionnaire filled in by the patient 3 weeks and 12 months after the end of the intensive treatment period. The Pain Index and the Functional Capacity Index, among other items, were included in the follow-up questionnaire. The response rates were at the 3 week follow-up 92% ($n=60$), and at the end of one year 86% ($n=56$).

Statistical analyses

Means and standard deviations of the measures of physical functions and self-report data were calculated as well as dis-

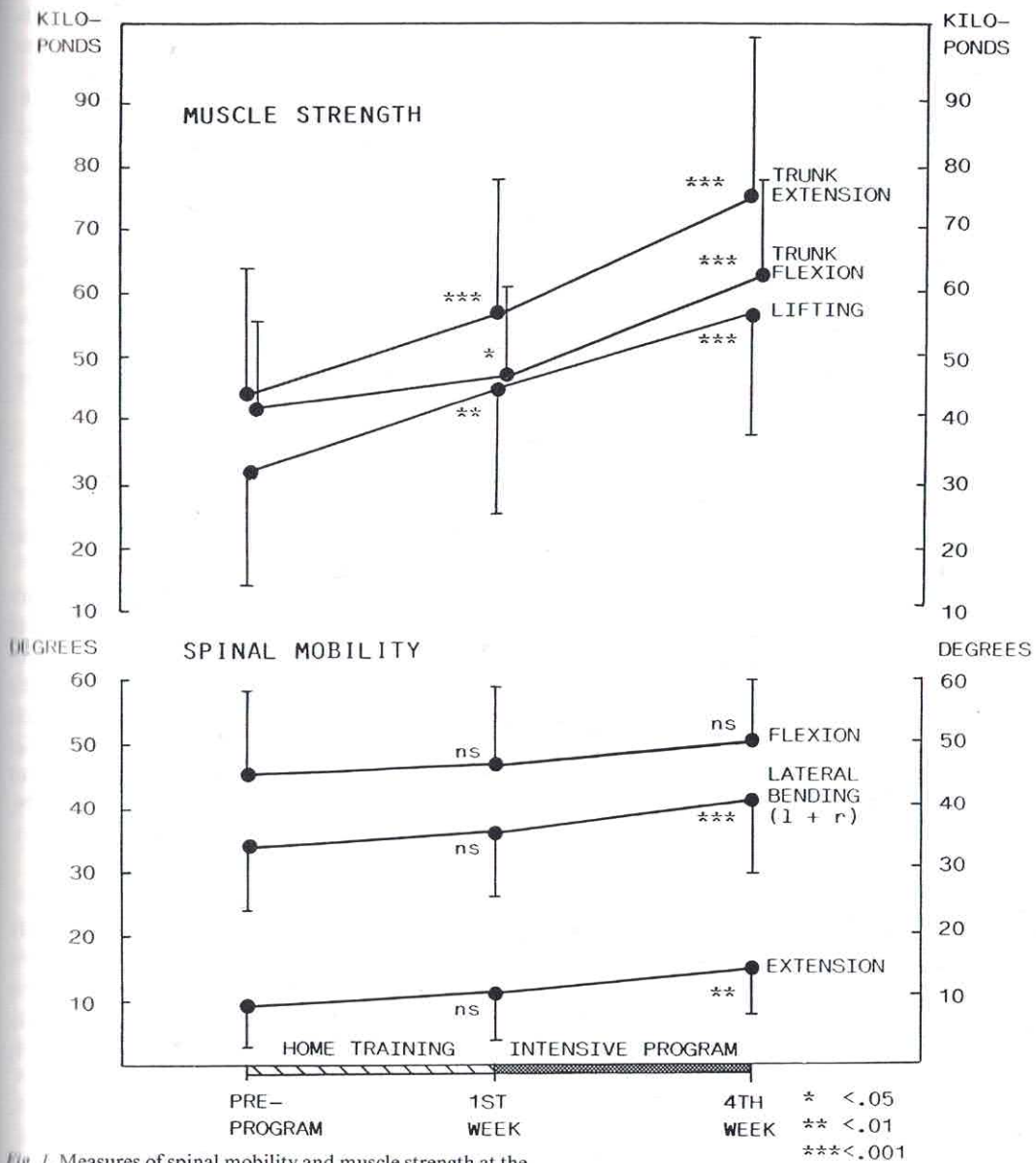

Fig. 1. Measures of spinal mobility and muscle strength at the pre-program, in the beginning, and at the end of the intensive program.

tributions and statistical significances of differences between successive measurements and between men and women (*t*-tests, χ^2).

RESULTS

Physical functions

The results of the physical measurements at the pre-program as well as at the first and fourth weeks of the intensive period are presented in Fig. 1. No significant differences between the two sexes were found for the mobility measurements. The men performed better than the women as regards the strength measures. The increases in all measures in physical functions were similar in both groups, and thus men and women are presented together.

The results showed a statistically significant increase in the values for trunk flexion strength, trunk

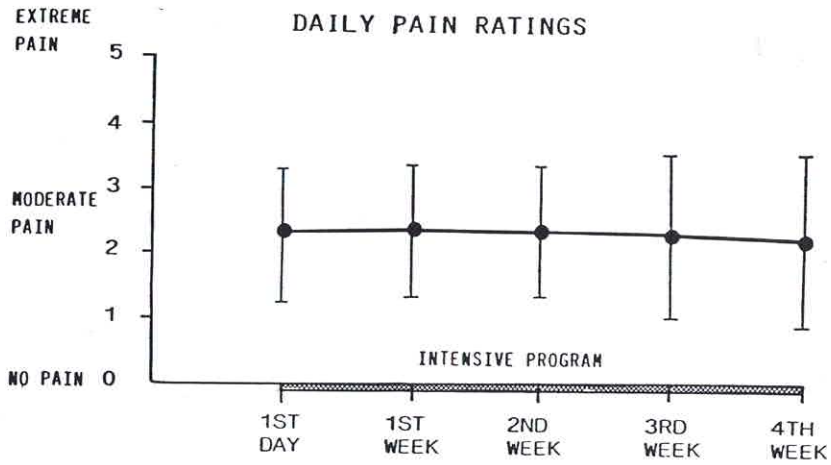

Fig. 2. Average daily pain ratings during the intensive program.

extension strength, and lifting capacity from the pre-program to the beginning of the intensive program and from the beginning to the end of the intensive program ($t=2.42$–11.35, $p>0.05$–0.001).

Spinal mobility (lumbar flexion, extension, and lateral bending) did not change significantly between the pre-program and the intensive period. During the intensive treatment program, lumbar lateral bending and extension increased significantly ($t=2.82$–4.74, $p<0.01$–0.001). The increase in lumbar flexion during the intensive program was not statistically significant.

Pain and mood

The daily pain ratings during the 4-week intensive treatment period showed no average changes in pain (Fig. 2). Average pain varied between 2.36 and 2.33 on the 0–5 point scale (SD 0.99–1.35). The percentage of patients whose daily pain ratings showed increased, unchanged or decreased pain is presented in Table I. Thirty-four per cent of the patients had less pain at week 4 than at week 1; 43% had no changes in pain, and 23% had more pain at the end than at the beginning of the intensive program.

On the Pain Index, there was a significant ($t=4.20$, $p=0.001$) decrease from pre-treatment (X 10.9, SD 2.4) to the 3-week follow-up (X 9.3, SD 3.6). The decrease was on the whole maintained at the one-year follow-up (X 9.5, SD 3.8). The distribution of changes on the Pain Index (Table I) shows that 42% of the patients had less pain at the 3-week follow-up and 39% at the end of one year than at the pre-program. Fifty-three per cent of the patients showed no changes in pain at the follow-ups. Three patients (5%) at the 3-week follow-up and 5 patients (8%) at the one year follow-up had more pain than at the pre-program.

According to the mood scale, depression did not change between the pre-program and the beginning of the intensive program, but a statistically significant average reduction in depression was found from the beginning to the end of the intensive program (mood scale at pre-program X 26.0, SD 10.8; at first week of the intensive program X 25.6, SD 12.0; at the end of the intensive program X 18.7, SD 9.6; $t=3.55$, $p<0.001$).

Functional capacity

The Functional Capacity Index showed a statistically significant average increase in functioning at the first follow-up as compared with the situation before the treatment, and the increase was on the whole maintained one year later (at pre-program X 34.4, SD 5.1;

Table I. *Percentage of patients with decreased, unchanged and increased pain during the intensive program and at both follow-ups*

	During the intensive program (daily pain ratings) %	From pre-program to 3 week follow-up (Pain index) %	From pre-program to 12-month follow-up (Pain index) %
Decrease	34	42	39
No change	43	53	53
Increase	23	5	8

at first follow-up $\bar{X}$ 38.3, SD 5.8, $t=5.21$, $p<0.001$; at second follow-up $\bar{X}$ 38.0, SD 6.6, $t=5.28$, $p<0.001$).

Work status

No statistically significant difference in the distribution of patients working, sick-listed or pensioned were found when comparing the situation before treatment with that at both follow-ups. The percentage of patients working was 54% before the pre-program and 48% at the end of one year. Twenty-six per cent were sick-listed before the program, 16% at the follow-up; 15% were on a temporary disability pension before and 29% at the follow-up.

DISCUSSION

The lack of a control group limits the interpretation of the effects of the treatment. However, changes during treatment and their interrelations as well as the tentative outcome can be evaluated even without a control group.

A considerable increase in the values for physical functioning during the intensive program without any average increase in pain was found. Only 3 patients (5%) reported more pain at the 3-week follow-up, which supports the assumption (14, 19) that intensive physical training was not detrimental for these patients.

It has been claimed (5, 9, 15, 16) that the avoidance of physical activities in chronic low back pain patients is based on the anticipation of pain and suffering, not on actual pain-activity relationships. The significant increase in muscle strength measurements observed during the pre-treatment period may be due to such mechanisms. Familiarity with the measurement situation, improved technique, and pre-treatment exercises may also have improved the performance.

Despite the positive changes in the measurements of physical functions and in ratings of pain, mood, and daily functioning, the percentage of patients working was unchanged. It is possible that statistically significant changes in subjective ratings do not imply clinically relevant changes. Furthermore, only modest correlations have been found, in earlier studies, between physical measurements and subjective disability (2, 12, 14, 18).

In previous studies (7, 10) more than 80% of the patients returned to work. The goal of our treatment was to increase physical functioning. Unlike the programs of Mayer and Hazard no attempt was made to find employment or to advice or encourage other activities aimed at getting the patients back to work. If the latter activities were included, in addition to increasing physical capacity to improve specific working skills and endurance, the return to work rates might be favourably influenced. On the other hand, work status as an outcome criterion is influenced by many factors beyond the control of any rehabilitation program (6) such as cultural factors, the social insurance system, the local job market, work satisfaction, and the attitude of employers towards persons with a history of back disorder.

The question of the significance of muscle strength and spinal mobility with respect to various aspects of the total problem of chronic low back pain still remains unanswered. If they are important, as has been suggested (14), this type of treatment where pain is not set as the limit for physical training is certainly valuable. To influence return to work rates, however, further efforts aiming at work-oriented rehabilitation are needed.

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Address for offprints:
Ann-Mari Estlander, Lic. Psych.
Finnish Back Institute
Salomonkatu 17B
00100 Helsinki
Finland