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# TREATMENT OF PATIENTS WITH CHRONIC LOW BACK PAIN

## Comparison between Rehabilitation Centre and Outpatient Care

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**ABSTRACT. The results of three weeks' treatment for low back pain were studied in 88 patients at a rehabilitation centre and in 63 outpatients. All the patients were male, and between 54 and 63 years of age. Physical measurements of spinal function were made before and two months after treatment; a questionnaire on back-pain symptoms was filled in before treatment and 2, 6 and 12 months after treatment. A back-pain index based on the replies to the questionnaires was used for evaluating the effects of the treatment. The average results showed that the effects of the treatment lasted six months but disappeared almost completely within a year. The material studied revealed no substantial difference between the results of the rehabilitation centre and outpatient treatment according to the physical measurements or the pain index.**

*Key words:* Low back pain, rehabilitation

In Finland, medical rehabilitation courses are sponsored by the National Board of Health for veterans with health problems. Some 6000 veterans annually (1983) take part in these two- to three-week programmes, which are aimed at maintaining functioning and working capacity. A physician must certify the need for rehabilitation. Final selection is made by local-authority boards of health.

Veterans' rehabilitation is given at rehabilitation and recreational centres whose treatment has become a significant alternative in Finnish health care in the past ten years.

These centres have been modelled on spas in continental and eastern European countries, which form a substantial part of the rehabilitation system there.

The traditional spa treatments of hydrotherapy, balneotherapy and climatotherapy are used little or not at all at Finnish rehabilitation centres. Their treatment is based on ordinary physiotherapy but their facilities cover a wider range than those of normal outpatient treatment. Pleasant surroundings with the opportunity for exercise, mental relaxation and social recreation form an essential part of the rehabilitation. The programmes also include health education.

Since treatment in these centres is far more expensive than outpatient treatment, plans have been drawn up to start outpatient rehabilitation for veterans as an alternative. This calls for a comparison between the effects of inpatient and outpatient treatment. Conservative treatments of low-back pain have been studied with regard to different methods of physical therapy (15, 11, 6), multidisciplinary treatments (17, 4) and spa treatments (7, 13). But not many comparative studies have been made on different procedures for treatment. The purpose of this paper is to study the effects of treatments on chronic low-back pains in veterans. Treatment given in a rehabilitation centre is compared to that given to outpatients.

## MATERIAL AND METHODS

### 1. *Material and procedure*

Two groups were studied: a Rehabilitation Centre Group of 88 patients treated at the Siuntio Spa, and an Outpatient Group of 63 patients at the Vantaa Municipal Health Centre. The Rehabilitation Centre Group was selected from among all those 54 to 63-year-old male war veterans in Greater Helsinki who had been accepted within given dates for veterans' rehabilitation at the Siuntio Spa. The Outpatient Group was selected from among a random sample of men of the same age, who had been treated at the Vantaa Municipal Health Centre during the preceding year. The selection of both groups were based on a questionnarie and a medical examination, according to the following criteria: (*a*) chronic or recurrent low-back pain which interfered with daily activities, (*b*) absence of other incapacitating long-term illness, and (*c*) in the Outpatient Group: subjective need for back treatment and willingness to participate in the programme (this was taken for granted in the inpatient group because the patient themselves had applied for rehabilitation).

All the patients underwent a pre-treatment examination which included questionnaires, examination by a G. P., standard laboratory tests, lumbar X-rays (if recent X-rays were not available), systemic examination by a physiotherapist, and a physiatric examination. The treatment lasted three weeks for both groups.

The first follow-up included a questionnaire and exami-

Table I. *Back treatment given to the Rehabilitation Centre Group and Outpatient Group (figures indicate average numbers of times per patient, except for those of the back school, which show participants as percentage of all the patients)*

| | Rehabilitation Centre | Outpatient |
|---|---|---|
| Heat and electrotherapy | 9.8 | 6.7 |
| Massage | 5.9 | 6.4 |
| Back exercise | 13.1 | 9.4 |
| Physical exercise (jogging, ball games, water exercise, etc.) | 6.9 | – |
| Black school | 100% | 100% |

nations by a physiotherapist and a physiatrist two months after the end of treatment.

The second and the third follow-ups comprised a questionnaire filled in 6 months and 12 months after the end of treatment.

2. *Questionnaire variables*

The questionnaire variables describing the severity of back pain are given in Appendix A. I. The same variables were included in both the pre-treatment and follow-up questionnaires. A subjective back-pain index, based on these variables, was formed (Appendix A. II) as a global index of the severity of the back symptoms (range 0–27).

The reliability of the back pain index, using coefficient alpha (14), was 0.78. This estimate of reliability is based on the internal consistency of the index.

3. *Examination by a physiotherapist*

The preliminary and two-month follow-up examinations of both groups were conducted by the same physiotherapist. They included the following measurements:

Spinal flexion (Flexion 1) was measured by placing marks on the sacrum and on the processus prominence in an upright position and measuring the distraction of the two marks during maximum forward bending (10).

Spinal lateral flexion was measured as the distance the tip of the middle finger moved down the thigh by purely lateral bending.

Spinal rotation was measured with the patient sitting on a stool, with his arms folded across his stomach. A compass was placed on the forearms and its reading in the extreme positions was recorded.

Tightness of knee flexors was measured according to Kendall (9), and tightness of knee extensors and hip flexors according to Janda (8).

Dynamic exercises used in the examination included the following: sit-ups from a supine, knees-bent position; bridging by raising the hips (supine, knees bent); trunk raising (prone), and bilateral straight-leg raising (prone).

Each exercise was done a maximum of ten times with one-minute pauses between each type of exercise.

Table II. *Pre-treatment data on the patients in the two groups studied*

| | Rehabilitation Centre $n=88$ | Outpatient $n=63$ |
|---|---|---|
| Age (years) | | |
| $\bar{x}$ | 58.8 | 59.0 |
| SD | 2.7 | 2.6 |
| Height (cm) | | |
| $\bar{x}$ | 172.6 | 173.6 |
| SD | 6.7 | 5.3 |
| Weight (kg) | | |
| $\bar{x}$ | 81.2 | 77.8 |
| SD | 13.8 | 11.4 |
| Currently employed (%) | 45 | 59 |
| Physical condition subjectively worse than average (%) | 68 | 55 |
| Back disorders began at under 45 years of age (%) | 53 | 68 |
| Back pain requires the use of analgesics (%) | 47 | 43 |
| General Back-Pain Index | | |
| $\bar{x}$ | 15.8 | 16.2 |
| SD | 4.1 | 3.4 |

Trunk flexion and extension strength were measured dynamometrically, by a method resembling those previously used by Alston et al. (1) and Nachemson & Lindh (12).

During each mobility measurement and the maximum-extension measurement, the occurrence of back pain, as reported by the patient when asked, was recorded. The

Table III. *Severity of back pain estimated from clinical history and clinical findings (%)*

| | Rehabilitation Centre Group | Outpatient Group |
|---|---|---|
| *Severity of clinical history* | | |
| Very mild | 10 | 5 |
| Mild | 36 | 46 |
| Moderate | 48 | 43 |
| Severe | 6 | 6 |
| Total (%) | 100 | 100 |
| ($n$) | 88 | 63 |
| *Severity of clinical findings* | | |
| Negligible | 36 | 19 |
| Slight | 40 | 59 |
| Moderate | 22 | 21 |
| Severe | 2 | 2 |
| Total (%) | 100 | 101 |
| ($n$) | 88 | 63 |

Table IV. *Means and standard deviations of spinal mobility measurements performed at pre-treatment and follow-up examinations, and statistical significances of changes between pre-treatment and follow-up means*

| | Rehabilition Centre Group | | | | Outpatient Group | | | |
|---|---|---|---|---|---|---|---|---|
| | | Pre-treatment $\bar{x}$ | Follow-up $\bar{x}$ | | | Pre-treatment $\bar{x}$ | Follow-up $\bar{x}$ | |
| | *n* | SD | SD | *p* | *n* | SD | SD | *p* |
| Forward flexion 1 (cm) | 75 | 9.1<br>1.9 | 9.2<br>1.8 | NS | 63 | 9.1<br>1.7 | 9.4<br>1.4 | NS |
| Forward flexion 2 (cm) | 88 | 6.1<br>1.4 | 6.1<br>1.3 | NS | 63 | 6.0<br>1.2 | 6.3<br>1.1 | 0.01 |
| Lateral flexion (cm) Right | 87 | 13.6<br>3.2 | 13.4<br>4.0 | NS | 63 | 12.6<br>3.3 | 12.6<br>3.1 | NS |
| Left | 87 | 13.6<br>3.6 | 13.7<br>3.6 | NS | 63 | 12.5<br>3.1 | 12.5<br>3.0 | NS |
| Rotation (right + left) (degree) | 87 | 74.1<br>16.3 | 75.9<br>16.3 | NS | 63 | 73.7<br>17.7 | 78.6<br>18.4 | NS |

sum of the pain reports formed a bending-pain index. Correspondingly, pain recorded during the dynamic exercises constituted an exercise-pain index.

4. *Physiatric examination*

Patients underwent physiatric examinations before and two months after treatment. Case histories and lumbar X-rays were used for these examinations, which also included spinal flexion measurements (Flexion 2) according to a modification of Schober's method (16) used by Macrae & Wright (10). Based on the clinical histories and examinations, the degree of back-pain disability during the last two months was estimated according to the criteria listed in Appendix B.

5. *The treatment*

The Rehabilitation Centre Group underwent three weeks' treatment. The patients in the Outpatient Group were treated at the health centre ten times during a three-week period.

Table I shows the most important types and methods of back treatment used in each group. The patients at the Rehabilitation Centre Group were also given other treatments like baths, relaxation exercises and hydromassage.

Other physical symptoms—neck pain in most cases—were treated in 72% of the patients in the Rehabilitation Centre Group, and 56% in the Outpatient Group. In the Rehabilitation Centre Group 33% received additional treatment for one affected area, 31% for two, and 8% for three. In the Outpatient Group, the only additional symptom treated was neck pains.

6. *Statistical analysis*

Participation in the pre-treatment and first follow-up examinations alike was 100% in both groups. The response rate at the six-months follow-up was 100% in the Rehabilitation Centre Group and 92% in the Outpatient Group. At the 12-months follow-up, the response rate was 98% in the Rehabilitation Centre Group and 87% in the Outpatient Group.

In the Rehabilitation Centre Group, flexion 1 and dynamic exercise measurements were performed only for 76 patients (86%) and trunk extension and flexion strength measurements for 63 patients (72%). Other measurements were made for all 88 patients.

Missing data for the back-pain index were estimated by regression analysis, using the corresponding items in the pre-treatment questionnaire and other back-pain variables in the follow-up questionnaire as explanatory variables.

The statistical analysis included measurement of the significance of the differences between (*a*) the means of the pre- and post-treatment situations (matched groups *t*-test); only cases for which data were available from both situations were included, (*b*) the means of treatment groups (independent groups *t*-test). (*c*) two correlated proportions (McNemar test), and (*d*) two independent ratios (5).

## RESULTS

1. *Group descriptions*

Table II shows pertinent data for the two groups before treatment. According to the back-pain index, there were no significant differences between the groups.

At the physiatric examination (Table III), back disability during the previous two months was estimated from the clinical history as severe or moderate for over half of the patients. Severe or moderate

Table V. *Means and standard deviations of dynamic exercises and trunk flexion and extention strengths measured at pre-treatment and follow-up examinations, and statistical significance of change between pre-treatment and follow-up means*

| | Rehabilitation Centre Group | | | | Outpatient Group | | | |
|---|---|---|---|---|---|---|---|---|
| | | Pre-treatment $\bar{x}$ | Follow-up $\bar{x}$ | | | Pre-treatment $\bar{x}$ | Follow-up $\bar{x}$ | |
| | *n* | SD | SD | *p* | *n* | SD | SD | *p* |
| Dynamic exercises (max 40) | 73 | 26.3<br>13.6 | 30.4<br>11.9 | 0.001 | 61 | 29.9<br>10.6 | 33.5<br>10.5 | 0.01 |
| Trunk flexion strength (kp) | 61 | 41.9<br>10.9 | 43.9<br>12.9 | NS | 62 | 44.6<br>13.9 | 44.7<br>14.3 | NS |
| Trunk extension strength (kp) | 59 | 58.9<br>23.6 | 68.1<br>23.4 | 0.001 | 62 | 60.0<br>22.1 | 65.0<br>24.4 | 0.05 |

clinical findings occurred in only a quarter of those examined in both groups. There was no statistically significant difference between the groups.

2. *Changes in physical measurements*

Most of the follow-up figures for spinal mobility did not differ significantly from those at the pretreatment examination, though there was a slight tendency toward improvement. One exception was forward flexion 2 in the Outpatient Group ($p<0.01$), in which mobility improved statistically after treatment (Table IV).

In the dynamic exercises, the means at the follow-up were significantly better ($p<0.01$–$0.001$) than those at pre-treatment examination in both groups (Table V).

The mean values for trunk extension strength improved significantly in both groups, but more clearly in the Rehabilitation Centre Group. The trunk flexion mean at follow-up of the Rehabilitation Centre Group was also slightly better than that at the pre-treatment examination, but the difference was not statistically significant (Table V).

The mean values in the bending and exercise pain indexes changed in a favourable direction in both groups; the change was greater in the Outpatient Group than in the Rehabilitation Centre Group (Table VI). Muscle tightness decreased clearly in the Outpatient Group and to a lesser extent in the Rehabilitation Centre Group (Table VII).

3. *Back-pain index*

Fig. 1 shows the mean values for the back-pain index in both groups at pre-treatment and follow-up. In both groups, the severity of the pain was lower at both the two-month and the six-month

Table VI. *Means and standard deviations of bending and exercise pain indexes recorded at pre-treatment and follow-up examinations, and statistical significances of changes between pre-treatment and follow-up means*

| | Rehabilition Centre Group | | | | Outpatient Group | | | |
|---|---|---|---|---|---|---|---|---|
| | | Pre-treatment $\bar{x}$ | Follow-up $\bar{x}$ | | | Pre-treatment $\bar{x}$ | Follow-up $\bar{x}$ | |
| | *n* | SD | SD | *p* | *n* | SD | SD | *p* |
| Bending-pain index (max 6) | 87 | 2.5<br>2.1 | 1.7<br>2.0 | 0.05 | 63 | 2.2<br>1.9 | 1.1<br>1.7 | 0.001 |
| Exercise-pain index (max 4) | 73 | 2.0<br>1.6 | 1.6<br>1.6 | 0.05 | 61 | 1.9<br>1.5 | 1.1<br>1.3 | 0.001 |

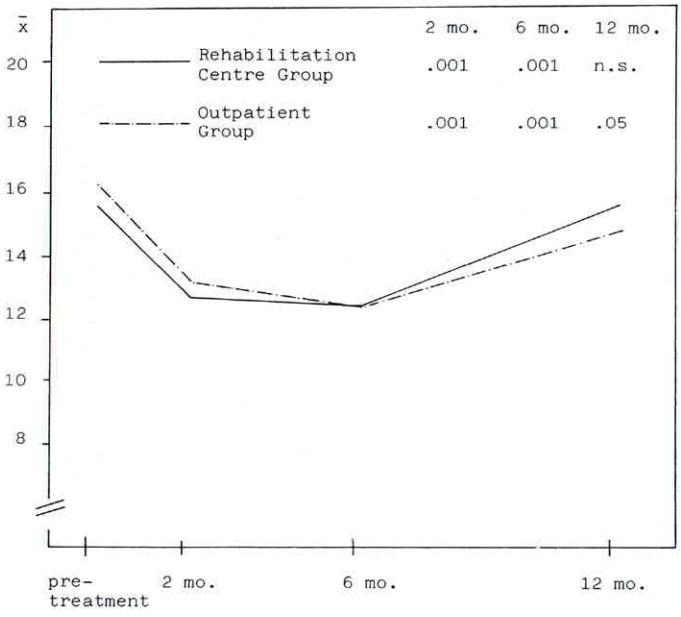


*Fig. 1.* Mean curves of back-pain index at pretreatment, and at 2-, 6- and 12-month follow-ups: statistical significance of changes between the pre- and post-treatment means.

follow-ups than at pre-treatment ($p<0.001$). At the 12-month follow-up, the mean figures for the Outpatient Group were still somewhat lower than those before the treatment ($p<0.05$).

The means for the Rehabilitation Centre and Outpatient Groups did not differ from each other significantly at any stage.

4. *Use of analgesics*

The use of analgesics for back-pain relief at different stages in the study is shown in Fig. 2. In both groups, the percentage of those using medication was significantly less at the two-month follow-up than before treatment (Rehabilitation Centre Group $p<0.001$; Outpatient Group $p<0.05$).

## DISCUSSION

The design of the study was quasi-experimental because the groups studied did not have the pre-experimental sampling equivalence of a true experimental design. The absence of a non-intervention control group also complicated the design, which represents a combination of a non-equivalent-

Table VII. *Percentages of muscle tightness at pre-treatment and follow-up examinations, and statistical significances of changes in the ratios*

| | Rehabilitation Centre Group | | | | Outpatient Group | | | |
|---|---|---|---|---|---|---|---|---|
| | *n* | Pre-treatment | Follow-up | *p* | *n* | Pre-treatment | Follow-up | *p* |
| Knee flexors | | | | | | | | |
| Right | 84 | 73 | 70 | NS | 60 | 74 | 53 | 0.001 |
| Left | 85 | 68 | 67 | NS | 61 | 75 | 51 | 0.001 |
| Knee extensors | | | | | | | | |
| Right | 81 | 41 | 17 | 0.001 | 62 | 36 | 11 | 0.01 |
| Left | 81 | 40 | 30 | NS | 62 | 42 | 21 | 0.01 |
| Hip flexors | | | | | | | | |
| Right | 85 | 6 | 0 | NS | 63 | 8 | 0 | NS |
| Left | 85 | 6 | 0 | NS | 63 | 5 | 0 | NS |

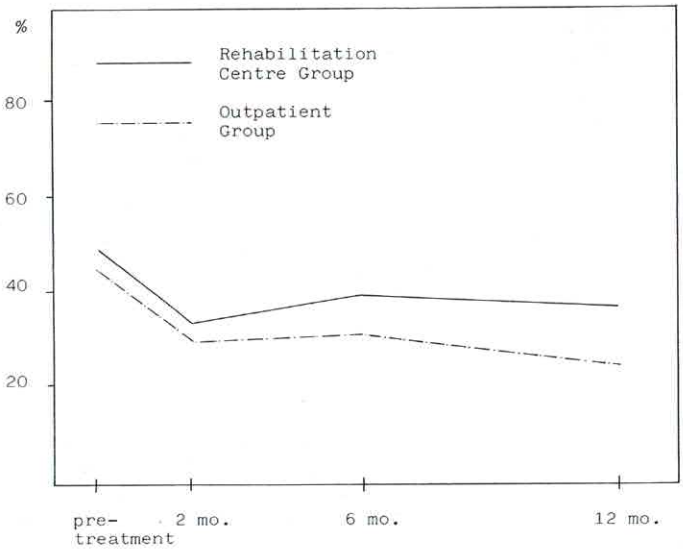


*Fig. 2.* Percentages of patients using analgesics for back-pain relief before the treatment, and at the 2-, 6- and 12-month follow-ups.

groups design and a time-series one. The design allows certain conclusions to be drawn from the treatment effects, though extra caution is required (3).

The first question is whether the changes measured can be regarded as an outcome of the treatment or could have been produced by factors extraneous to it. The reliability of the back-pain index was shown to be relatively good, and the validitity of this type of index as an indicator of treatment effects has been demonstrated earlier (e.g. Bergquist-Ullman & Larsson, 1977). In both groups, the back-pain index showed a statistically significant decrease of symptoms at the two- and six-month follow-ups, with a return towards the pre-treatment level at the 12-month follow-up. Further evidence of this finding was the diminution of the bending and exercise pain indexes based on the physiotherapist's measurements at the two-moth follow-up, and the decrease in the use of analgesics. Variables confusing the evaluation of the treatment result included other events occurring between the pre- and post-treatment stages, maturation (e.g. spontaneous recovery), the effect of the measurement itself, and regression toward the mean. The U-shaped trend of the back-pain index rules out most of these as rival explanatory variables. The effect of season was controlled afterwards, and it did not explain the changes produced. So there are good reasons to conclude that the results represent specific effects of the treatment.

Attention is also drawn to the fact that the effect of the treatments (based on the mean values) had vanished or decreased strongly in both groups by the 12-month follow-up. So the treatments under study produced relatively short-lasting relief for chronic back pain.

The short duration of the treatment effects may be typical for the groups studied—elderly people with chronic or recurrent back pain. On the other hand, the results may indicate that the effects of present-day conservative methods of chronic low-back pain treatment do not generally last very long.

A second question concerns the differences of treatment effect between the in- and outpatient groups. The more similar such groups are, the more reliable is the basis for the comparison of their treatment effects. Similarity between the two groups was good in regard to the back-pain index and physical measurements. One problem was that the patients in the Rehabilitation Centre Group had themselves applied for rehabilitation whereas, in the Outpatient Group, the patients' consent was requested and then used as a criterium of selection. Nevertheless, acute pain was not the reason why the veterans applied for rehabilitation, so in this respect the need and motivation for rehabilitation should not have differed between the groups.

The subjective pain index and physical measurements revealed no major differences between the results of out-patient and rehabilitation-centre treatment. A few statistically significant differences

between the groups were found in the physical measurements, but they were not systematic, so they cannot be considered indicative of differential treatment outcome.

According to this study, therefore, the results achieved by treatment of chronic low-back pain in a rehabilitation centre and in an outpatient clinic were fairly similar. A change of emphasis from inpatient to outpatient treatment in veterans' rehabilitation could be justified in view of the difference in cost between the two types of treatment.

But a further question arises: do the measurements and indexes used here really measure the main effects of the two forms of treatment or are some other effects more important for the overall outcome of the treatment. For example, mental relaxation, recreation and physical exercises at a rehabilitation centre might play an important role in maintaining the working and functioning capacity of patients at this age.

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## APPENDIX A

*Questionnarie variables and back-pain index*

I. *Qustionnaire variables* (all the variables refer to the two preceding months):

1. Global index of the sum (classified range 0–5) of pain caused in nine different activities and situations—e.g. working in a bent position, taking long walks, coughing (0 = causes no pain ... 3 = impossible owing to the pain).
2. Frequency of pain (0 = no pain ... 4 = daily or almost daily).
3. Average degree of pain (1 = negligible ... 5 = almost unbearable).
4. Most severe degree of pain (scale as for variable 3)
5. Duration after start of pain (1 = not more than 1–2 hours ... 4 = several days).
6. Pain experienced in everyday activities (0 = no pain ... 4 = pain totally prevents usual activities).
7. Use of analgesics for relief of back pain.

II. *Back-pain index* (range 0–27): the sum of variables 1 to 6 above.

## APPENDIX B

*Criteria used in the physiatric examination to determine the degree of back disability*

I. Severity of back disability according to clinical history.

1. *Very mild*: no or very infrequent symptoms during the past two months. Back also withstands moderate strain, and little caution is needed.
2. *Mild*: pain occurs when the back is under strain, so the back is used cautiously. But this does not cause much discomfort, and does not substantially reduce functioning capacity.
3. *Moderate:* the back is very sensitive to strain, or there is continuous slight pain. Functioning capacity limited by back pain. Analgesics may be needed occasionally.
4. *Severe*: movement and daily life are essentially affected by back pain. Analgesics are possibly required.

II. Severity of back disability according to clinical fidnings.

1. *No significant findings*: possible slight spondylosis, lumbar spine flexion statisfactory, Schober ⩾6 cm.
2. *Slight findings*: stiffness in lumbar spine, essential postural or kinesiological deviation of lumbar spine.
3. *Moderate findings*: noticeable stiffness and/or spondylosis in the lumbar spine. Spinal movement may cause pain, but does not affect motion.
4. *Severe findings:* objectively verified pain reactions in the lumbar region and pain on motion.

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