ABSTRACT. The aim of this paper was to study the physical performance, pain, pain behavior and disability in patients with subacute low back pain (LBP). The patients were blue-collar workers and had been sicklisted for 8 weeks due to subacute low back pain. A total of 183 patients were randomized, 51 of them to the intervention group and the other to a control group. Recordings of physical performance and complaints of LBP were done before and after treatment in the intervention group. The proportion of patients with no complaints of LBP was significantly greater in the intervention group than in the control group at the one-year follow-up. The patients who intra-individually improved their physical performance also intra-individually decreased their complaints of LBP. The intra-individual improvements were suggested to be important for the individual return to work.

Key words: low back pain, rehabilitation, pain, pain behavior, subjective disability, physical capacity, treatment, physical therapy.

The low back pain (LBP) dilemma is a multidimensional problem (19, 20, 21, 28). LBP usually has a benign course (20, 21, 28). Eighty percent of the patients with acute LBP recover within 6 weeks (20, 21, 28). Pain cannot be regarded as a single, homogeneous phenomenon. Pain occurs in connection with diseases or physical complaints (20, 21, 24, 28, 29). In all contacts with patients suffering from pain, the point of departure must be that all pain is real (2, 8, 13, 21, 28, 29). Pain itself is not a disease. It is a symptom (8, 11, 13, 28, 29). Pain is defined by the International Association for the Study of Pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage (24). Pain behavior should be understood as a social communication, the meaning of which remains to be discovered in the individual case (8, 11, 13). Pain behavior can automatically come under the control of learning (8, 11, 13). Patients with LBP can have difficulties distinguishing between hurt and harm (8, 11, 13). There is often a discrepancy between what patients say and what patients do (8, 11, 13, 28). Physical impairment is the objective structural limitation and subjective disability is the result of failed function (8, 13, 26, 28).

Each patient’s perception of the LBP problem can, for example, be shown by low physical performance, expressed verbally as pain or subjective disability or displayed as pain behavior (7–11, 13, 24, 26–28). The patient’s expressions of the problem often include complaints of pain, which then often guide the treatment (7, 10, 13). Pain reduction by analgetics and rest is not enough after the acute phase of LBP (8, 13, 20, 21, 28). Patients with LBP are not a homogeneous group, nor are their reports and experiences of LBP uniform (2, 6, 9, 11, 13–16, 20, 21, 22, 25, 27–30). Comprehensive programs for LBP patients have been implemented to restore functional capacity; few of them are randomized controlled studies (20, 21). Most of the treatment programs for LBP patients are directed to patients with chronic LBP (20, 21). Patients with LBP sick-leave for more than 6 weeks are at considerable risk of becoming chronic LBP sufferers. Early intervention programs are suggested by several researchers dealing with patients suffering from LBP (20, 21, 28).

We have earlier reported that traditional care plus an individually graded activity program is superior to traditional care (14), that mobility, strength and fitness improve significantly after treatment but are not correlated to the rate of return to work, except for abdominal muscle endurance, lifting capacity and spinal rotation (13), and also that pain behaviors predict return to work (22). The aims of this randomized prospective controlled study were: to analyze the effect of intervention on pain, pain behavior and disability, to study the


PHYSICAL PERFORMANCE, PAIN, PAIN BEHAVIOR AND SUBJECTIVE DISABILITY IN PATIENTS WITH SUBACUTE LOW BACK PAIN

Ingemill Lindström, Carl Öhland and Alf Nachemson

From the Department of Orthopaedics, University of Göteborg, Sahlgren’s Hospital, Göteborg, Sweden
inter-relation between pain, pain behavior and diseases is studied in relation to intra-individual improvements of pain, pain behavior and disability, to compare the pre-treatment recordings of physical performance and complaints of LBP and to analyze the effect of the intervention program in comparison to the subjects with the control group.

The study was approved by the Ethics Committee of the Medical Faculty of the University of Göteborg, Sweden.

MATERIAL AND METHODS

Patients
The patients had to fulfill three inclusion criteria to be referred to the pre-treatment examinations: i) blue-collar workers, ii) sick-listed for 6 weeks because of any LBP diagnosis and iii) no sick-leave because of any LBP diagnosis during a period of 12 weeks before the current sick-listing episode.

All patients were medically examined by an orthopedic surgeon and psychosocially evaluated by a social worker before randomization. The medical examination excluded roughly 25% of the referred patients because of 1) herniated disc, spondylolisthesis, spinal stenosis and instability, where surgery was indicated, 2) earlier back surgery, vertebral fracture, and tumors of the spine, 3) inflammatory disease, 4) pregnancy, 5) major medical disease, 6) major psychiatric disease, or 7) drug addiction or alcoholism.

The psychosocial screening did not exclude any patients. Age, lumbar range of motion, finger-distance, modified Schober, pain, pain behavior, subjective disability and physical work demands did not differ significantly between the groups.

All patients with sick-leave, referred patients (n = 103) suffering from benign LBP were randomized either to the intervention group (51 men, 22 women) or to the control group (32 men, 20 women). Two patients allotted to the intervention group and 3 in the control group refused to participate (14). Seventy-five percent of the patients were immigrants from 13 different countries. The immigrants did not have to speak Swedish. Property translated forms of each native language were available. The patients were in average 41 years old (SD 11 yrs, Range 19-64 yrs).

All patients in both the intervention and control groups were continuously and traditionally cared for by their regular physicians, not by the orthopedic surgeons (OS) in the study, before, during and after the intervention. The forms of sick-listing were included in the case record for patients in both groups were at the discretion of their regular physicians. After the pre-intervention examination, the patients in the control group were referred to their regular physician. The intervention program was followed by the same physician.

The physical therapist was the same for the patients in both groups. The patients in the control group were not referred from getting information from the physical therapist. The physical therapists were trained and qualified in accordance with the Swedish School of Back Health. The therapists were instructed to use the physical therapy program as recommended by their physical therapists. They were instructed to give each patient feedback on gained function during the exercise program. The patients were initially obtained to be used for positive reinforcement of each patient's gained feedback. A work environment was not controlled by the therapist to investigate each patient's physical work demands.

The patients were informed about the possibility of participating in the physical therapy program. A modified version of the Swedish School of Back Health was individually taught. The pain information was based on, not on LBP disability (i.e. only positive reinforcing information was included). i) The individually graded exercise program with a behavioral therapy approach was based on individual capacity and individual work performance. As pertains to exercises, the essentials of the pre-treatment recordings of physical performance and complaints of LBP were used for comparison of the recordings of physical performance and complaints of LBP in the intervention group.

The text was used to compare the one-year follow-up recordings in the intervention and control group. Thus, the influence of the time factor was assumed to be controlled for, as LBP patients with LBP over time.

Different statistical methods (e.g. i) comparing the proportion of patients with and without complaints of LBP, and ii) comparing the change in complaints of LBP were used when analyzing the complaints of LBP recordings for two reasons: First, an effect of intervention was obtained if the patients became free from complaints of LBP second, an effect of intervention was obtained if the patients intra-individually decreased their complaints of LBP.

A decrease of complaints of LBP and an increase of the physical performance recordings in the intervention group was to be expected according to the content of the intervention (14). A significant decrease of at least one of the recordings of complaints of LBP was expected if the pre-treatment recordings were >0. A significant increase of at least one of the recordings of physical performance was expected. Since no normal values exist for LBP patients, all recordings were included in the analysis.

The correlation between the rate of return to work and the amount of sick-leave during the second follow-up year and the complaints of LBP was analyzed with the Spearman rank-order correlation.

A significant level of p ≤ 0.01 was chosen since in studies with many comparisons p-values ≥ 0.01 can be regarded as trends.

RESULTS

Complaints of LBP

Improvement after treatment. The intervention program improved the complaints of LBP of patients with complaints of LBP (i.e. pain, pain behavior or subjective disability) was significantly (p ≤ 0.01) larger after than before treatment (Fig. 1).

The recordings of pain, pain behavior and subjective disability of the patients in the intervention group was individually lower than before treatment (Table I).

A large proportion of patients (80%) in the intervention group had no pain before treatment.

The subjective disability was decreased or reduced to 75% of the patients.

Inter-correlation of complaints of LBP. The recordings of complaints of LBP in the intervention group were significantly inter-correlated. For example, patients who reported more severe pain, higher pain behavior and more subjective disability were more likely to have complaints of LBP before treatment.
Physical performance, pain, pain behavior and subjective disability in patients with subacruic low back pain

The complaints of LBP were defined as pain, pain behavior and subjective disability. The perceived pain was measured with a category scale with ratio properties (Appendix I) developed by Borg (10). Possible exercises were prescribed and rated with the 10-item scale of the University of Alabama at Birmingham (UAB) pain behavior scale developed by Richards et al. (23). Subjective disability was recorded with the subjective disability index (Appendix II) developed by Waddell & Misra (26).

Measurements of physical capacity

Physical capacity (i.e. mobility, strength and fitness) was measured by currently used methods (15). Backward and lateral bending was measured according to the procedure of Frost et al. (17). Spinal rotation was measured using a procedure modified from that of Meller (18). The lumbar range of motion (ROM) was forward-backward bending was measured with a kyphometer, as described by Debbaut (19). Forward bending was measured by the finger-floor test and the modified Schober test (20). Active leg raising was measured with the patient lying supine and the patient lifting one leg, using a pre-drawn wall goniometer (21). Back muscle endurance time (in seconds) was measured with a stopwatch using a procedure modified by Biering-Sorensen (22). Abdominal muscle endurance time (in seconds) was also measured with a stopwatch with the patient in a partial sit-up position using a procedure modified after McQuade et al. (11). The ability to walk, to perform deep knee bends unilaterally and bilaterally, to climb onto a 25 cm high step and jump from the step, to squat and to stand from a seated position was recorded (1 - unable; 2 - with some difficulty; 3 - without any difficulty). The patient's mobility was calculated in a simple walking test. A work test was performed on a stationary bicycle with a fitness computer (1). The results of mobility, strength and fitness recordings have been presented in detail earlier (15).

The intervention program

The purposes of the intervention program were to restore occupational function and to facilitate return to the previous non-modified work place (14). The goal of the program was the individual return to work. The patients were not obliged to stay in the program for a specific number of weeks. The intervention program, conducted by a physical therapist, consisted of the following parts: a) Measurements of physical capacity were made for patients in both groups at the beginning of the intervention program. The measurements showed that the patient or he/she was able to perform physical capacity tests. The patients were also used to give each patient feedback on gained function during the exercise program. b) Measurements of extra-individual capacity were initially obtained to be used for positive reinforcement of each patient's gained function. c) A workshop was made it possible to investigate each patient's physical work demands, which was determinant of the individually graded exercise program. d) A modified version of the Swedish Back School was individually taught. The information was based on ability, not on LBP disability (i.e. only positive reinforcing information was included). e) The individually graded exercise program with a behavioral therapy approach was based on individual capacity and individual physical work demands. As part of the exercises, the essentials of the operant conditioning approach are to develop an individually graded exercise program and teach the patient that it is safe to move while also increasing his or her activity level. f) The influence of the time of the day that the patient was used (19). The individually graded exercises were set to quota (i.e. the patients did not stop the exercise because of pain or other tolerances, in the quota was always set at below tolerance). Exercises were selected. A small number of initial baseline trials was carried out in which the patient exercises were limited to a few minutes of low baseline trials. The therapist then sets quotas of exercises to be performed in each trial based on the patient's baseline levels. Initial quotas are lower than the baseline levels (e.g. 50-75% of baseline levels), but are systematically increased. Quotas were set for frequencies, loads, laps, repetitions, and endurance time for each exercise. Each patient performed his or her individually graded exercise program 3 days a week until his or her return to work. The physical therapist gave continuous positive reinforcement for performed quotas and increased functional capacity. The physiotherapist observed and recorded each patient's complaints of LBP, but made no attempt to change the program in response to such display. The patient's return is his or her previous non-modified work place was the goal of the individually graded exercise program (14, 15, 16).

RESULTS

Complaints of LBP

The records of pain, behavior and subjective disability of patients with complaints of LBP (i.e. pain, pain behavior or subjective disability) was significantly (p ≤ 0.01) larger before than after treatment (Table I). The recordings of pain, behavior and subjective disability were individually was lower than before treatment (Table I). A large proportion of patients (80%) intra-individually decreased their pain or had no pain before treatment. The subjective disability was intra-individually decreased or zero before treatment in 75% of the patients.

Inter-correlation of complaints of LBP

The recordings of complaints of LBP in the intervention group were significantly correlated. For example, patients who reported more severe pain were more likely to have increased subjective disability.
pain also displayed more pain behaviors as well as more subjective disability (Table II).

Physical performance

The patients in the intervention group increased their physical performance during the intervention program. In the intervention group, the recordings of physical performance were significantly higher after treatment than before treatment, as earlier reported (15). The recordings of physical performance were also significantly higher in the intervention group than in the control group at the one-year follow-up (15).

Comparison of physical performance and complaints of LBP

The pretreatment recordings in the intervention group of mobility and strength, but not fitness, were significantly correlated to the pretreatment recordings of complaints of LBP (Table III). The recordings of complaints of LBP were lower if the recordings of physical performance were higher. The finger-floor distance, jumping and squat lifting recordings were inter-correlated to pain and pain behavior as well as to subjective disability. The subjective disability index was correlated to a larger number of mobility and strength recordings than were the pain and pain behavior recordings.

The intra-individual improvements

A large proportion of patients (83%) in the intervention group intra-individually improved in at least one of their complaint recordings after the intervention program. Seventy-four percent of the patients in the intervention group intra-individually improved in at least one of their recordings of physical capacity after the intervention program.

Intra-individual improvement in both the complaint recordings and physical capacity recordings was found in 74% of the patients.

Correlation between complaints of LBP and sick-leave

The rate of return to work was in the intervention group correlated to the pre-randomization measurements of pain ($r = 0.57$, $p < 0.01$), pain behavior ($r = 0.65$, $p < 0.01$), subjective disability ($r = 0.54$, $p < 0.01$), and pain behavior ($r = 0.42$, $p = 0.06$). The patients with the more sick-leave during the second follow-up year was correlated to the pretreatment recordings of pain ($r = 0.52$, $p < 0.01$), pain behavior ($r = 0.66$, $p < 0.01$) and subjective disability ($r = 0.52$, $p < 0.01$). Thus, the more complaints of LBP, the more sick-leave during the second follow-up year.

Effect of intervention

The proportion of patients who reported complaints of LBP was significantly larger ($p < 0.01$) in the control group than in the intervention group at the one-year follow-up (Fig. 2).

The average scores for complaints of LBP were higher in the control group than in the intervention group at the one-year follow-up, but significantly ($p < 0.01$) so for subjective disability only (Table IV).
Physical performance

The patients in the intervention group increased their physical performance during the intervention program. In the intervention group, the recordings of physical performance were significantly higher after treatment than before treatment, as earlier reported (15). The recordings of physical performance were also significantly higher in the intervention group than in the control group at the one-year follow-up (15).

Comparison of physical performance and complaints of LBP

The pretreatment recordings in the intervention group of mobility and strength, but not fitness, were significantly correlated to the pretreatment recordings of complaints of LBP (Table III). The recordings of complaints of LBP were lower if the recordings of physical performance were higher. The finger-glove distance, jumping and squat lifting recordings were inter-correlated to pain and pain behavior as well as to subjective disability. The subjective disability index was correlated to a larger number of mobility and strength recordings than were the pain and pain behavior recordings.

The intra-individual improvements

A large proportion of patients (83%) in the intervention group intra-individually improved in at least one of their complaint recordings after the intervention program. Seventy-four percent of the patients in the intervention group intra-individually improved in at least one of their recordings of physical capacity after the intervention program. Intra-individual improvement in both the complaint recordings and physical capacity recordings was found in 74% of the patients.

Correlation between complaints of LBP and sick-leave

The rate of return to work was in the intervention group correlated to the pre-randomization measurements of pain ($r = 0.57, p \leq 0.01$), pain behavior ($r = 0.46, p \leq 0.01$) and subjective disability ($r = 0.45, p \leq 0.01$) after the intervention program. The more complaints of LBP, the more sick-leave during the second follow-up year ($r = 0.54, p \leq 0.01$) and subjective disability ($r = 0.57, p \leq 0.01$). Thus, the more complaints of LBP, the more sick-leave before return to work. The amount of sick-leave during the second follow-up year was correlated to the pretreatment recordings of pain ($r = 0.52, p \leq 0.01$), pain behavior ($r = 0.65, p \leq 0.01$) and subjective disability ($r = 0.52, p \leq 0.01$). Thus, the more complaints of LBP the more sick-leave during the second follow-up year.

Effect of intervention

The proportion of patients who reported complaints of LBP was significantly larger ($p \leq 0.01$) in the control group than in the intervention group at the one-year follow-up (Fig. 2). The average scores for complaints of LBP were higher in the control group than in the intervention group at the one-year follow-up, but significantly ($p \leq 0.01$) so for subjective disability only (Table IV).

Table III. The significant ($p \leq 0.01$) correlations between pretreatment recordings of mobility, strength and fitness and pretreatment recordings of pain, pain behavior and subjective disability in the intervention group ($n = 49$)

<table>
<thead>
<tr>
<th>Mobility</th>
<th>Pain</th>
<th>Pain behavior</th>
<th>Subjective disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finger-glove</td>
<td>0.46</td>
<td>0.42</td>
<td>0.53</td>
</tr>
<tr>
<td>Mod. Scholer</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Backward bending</td>
<td>-0.46</td>
<td>-</td>
<td>-0.54</td>
</tr>
<tr>
<td>Lumbar range of motion (ROM)</td>
<td>-0.44</td>
<td>-</td>
<td>-0.60</td>
</tr>
<tr>
<td>Lateral bending</td>
<td></td>
<td>-</td>
<td>-0.49</td>
</tr>
<tr>
<td>Spinal rotation</td>
<td></td>
<td>-</td>
<td>-0.50</td>
</tr>
<tr>
<td>Active leg lift</td>
<td></td>
<td>-</td>
<td>-0.50</td>
</tr>
<tr>
<td>Walking</td>
<td></td>
<td>-</td>
<td>-0.50</td>
</tr>
<tr>
<td>Kneeling</td>
<td></td>
<td>-</td>
<td>-0.50</td>
</tr>
<tr>
<td>Climbing</td>
<td></td>
<td>-</td>
<td>-0.50</td>
</tr>
<tr>
<td>Jumping</td>
<td>0.43</td>
<td>0.51</td>
<td>0.53</td>
</tr>
<tr>
<td>Squatting</td>
<td></td>
<td>-</td>
<td>0.45</td>
</tr>
<tr>
<td>Tip-toe</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Strength</td>
<td>-0.38</td>
<td>-</td>
<td>-0.41</td>
</tr>
<tr>
<td>Arm strength</td>
<td>-0.38</td>
<td>-</td>
<td>-0.44</td>
</tr>
<tr>
<td>Abdominal muscles</td>
<td>-0.44</td>
<td>-</td>
<td>-0.44</td>
</tr>
<tr>
<td>Back muscles</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pulling</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pushing</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Squat lifting</td>
<td>-0.42</td>
<td>-0.46</td>
<td>-0.62</td>
</tr>
<tr>
<td>Fitness</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

NS = not significant $p > 0.01$.

Table IV. The mean and SD of pain, pain behavior and subjective disability at the 1-year follow-up in the intervention group ($n = 49$) and control group ($n = 49$)

<table>
<thead>
<tr>
<th>Intervention group</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>2.1</td>
<td>2.4</td>
<td>3.0</td>
<td>2.4</td>
<td>2.4</td>
<td>2.4</td>
<td>NS</td>
</tr>
<tr>
<td>Pain behavior</td>
<td>1.0</td>
<td>1.4</td>
<td>1.4</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>NS</td>
</tr>
<tr>
<td>Subjective disability</td>
<td>0.8</td>
<td>1.6</td>
<td>2.0</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
<td>$p \leq 0.01$</td>
</tr>
</tbody>
</table>

NS = not significant $p > 0.01$.

Fig. 1. Proportion of patients with complaints of LBP before and after treatment in the intervention group ($n = 49$). The proportions of patients with complaints were significantly ($p \leq 0.01$) smaller after treatment.

Fig. 2. The proportion of patients with complaints at the 1-year follow-up was significantly ($p \leq 0.01$) smaller in the intervention group than in the control group ($n = 49$, $n = 49$).
In this controlled study, all patients were sick-listed for 6 weeks when they entered the preintervention examination. The randomized patients were still on sick-leave at week 8. Complaints of LBP, i.e. pain, pain behavior and subjective disability, initially occurred in a large proportion of the patients, but not in all. The complaints of LBP could be regarded as one of the motives for sick-listing and physical capacity as another.

Many patients complained or displayed signs of LBP when they returned to work, which was the end-point of the intervention program. However, most patients intra-individually improved their scores for complaints of LBP as well as their physical capacity before returning to work. Thus, not all patients were necessarily free from complaints of LBP when they returned to work. This may imply that most patients intra-individually need to decrease their complaints of LBP and increase their physical capacity before return to work. The individual scores of complaint measurements were not the most important factor since the intra-individual decrease of complaints of LBP was of greater importance.

The average scores for complaints of LBP recordings at group level were not used to decide the individual return to work. The individual score must take into account the fact that some patients are “high” raters and others are “low” raters. Cultural differences influencing “high/low” raters must be considered in this study with patients from 13 different countries. The average score does not take into account cultural or ethnic differences. The intensity and the change of complaints of LBP is always intra-individual. This indicates that the intra-individual reduction of complaints of LBP is more important than the intensity of the complaints, as others also have found (C. 8, 13, 25, 28, 29, 30).

The proportion of patients with no complaints of LBP was significantly greater in the intervention group at the one-year follow-up than in the control group, i.e. there was an intervention effect, not only a time recovery effect (29). The intervention program successfully intra-individually decreased the subjects’ complaints of LBP.

The mobility, strength and fitness average recordings were also found to increase more than can be explained by a time recovery effect, i.e. there was an intervention effect (15, 29). The increase of the numbers of physical capacity recordings was also an objective of the intervention program and of great importance for the individual return to work. The intervention program also successfully intra-individually increased the subjects’ physical capacity (15).

The pretreatment mobility and strength recordings, but not the fitness recordings, were significantly correlated to the complaints of LBP. Other reports (6, 17, 28) have also shown this correlation between complaints and physical capacity. However, most of the authors have compared reported complaints with reported physical capacity, not with observed recordings of physical performance.

The pretreatment recordings of complaints of LBP were correlated to the rate of return to work and to the amount of sick-leave during the second follow-up year, which indicates that the score of complaints of LBP influences the recovery process.

The patients who intra-individually improved their physical performance also intra-individually decreased their complaints of LBP, as also reported in some other studies (7, 11, 13, 19, 20, 21, 28). Patients who do more also complain less of LBP (7, 8, 11, 13, 20). Both the physical performance and the amount of complaints of LBP must be taken into account when deciding whether the patient is ready to return to work. Thus, the intra-individual improvement is suggested to be important both for complaints of LBP and physical performance in patients with subacute LBP. We therefore recommend simple recordings of physical performance, pain, pain behavior and subjective disability for patients with subacute LBP in any vocational rehabilitation program.

CONCLUSIONS

The intervention significantly reduced the patients’ intra-individual complaints of LBP and increased their intra-individual physical performance. Another effect of the intervention program was that more patients in the intervention group than in the control group were free from complaints of LBP. The intervention program was successful for patients with subacute LBP.

ACKNOWLEDGEMENTS

We thank Björn Arekoug, Lars-Erik Peterson, Leif Wallin and Claes Erik for their support of the study. This study was supported by Arbetsteknikens forsknings- enkätstiftelsen (AFKA), Stockholm, Sweden, the Velcro Company, Göteborg, Sweden, AMF-Trengsöförsäkring, Stockholm, Sweden, the Medical Faculty of the University of Göteborg, Sweden, and a grant from the Lennart Asplund Foundation, Göteborg, Sweden, and the Bertha och Felix Neuhäuser Foundation, Göteborg, Sweden.

REFERENCES


Address for afffrets:
Ingalill Lindström
Garnve gatublv. Ryghsallan
Nordkingsgatan 12
S-41227 Göteborg
Sweden.

Appendix I

Borg’s category ratio scale (4)

0 nothing at all

0.5 very weak (just noticeable)

1 very weak

2 weak (light)

3 moderate

4 somewhat strong

5 strong (heavy)

6 very strong

8 very strong

9 very strong (almost max)

maximal

Scand J Rehabil Med 27
In this controlled study, all patients were sick-listed for 6 weeks when they entered the prerandomization examination. The randomized patients were still on sick-leave at week 8. Complaints of LBP, i.e. pain, pain behavior and subjective disability, initially occurred in a large proportion of the patients, but not in all. The complaints of LBP could be regarded as one of the motives for sick-listing and physical capacity as another.

Many patients complained or displayed signs of LBP when they returned to work, which was the end point of the intervention program. However, most patients intra-individually improved their scores for complaints of LBP as well as their physical capacity before returning to work. Thus, not all patients were necessarily free from complaints of LBP when they returned to work. This may imply that most patients intra-individually need to decrease their complaints of LBP and increase their physical capacity before return to work. The individual scores of complaint measure-ments were not the most important factor since the intra-individual decrease of complaints of LBP was of greater importance. The average scores for complaints of LBP recordings at group level were not used to decide the individual return to work. The individual score must take into account the fact that some patients are “high” raters and others are “low” raters. Cultural differences influencing “high/low” raters must be considered in this study with patients from 13 different countries. The average score does not take into account cultural or ethnic differences. The intensity and the change of complaints of LBP are always intra-individual. This indicates that the intra-individual reduction of complaints of LBP is more important than the intensity of the complaints, as others also have found (2, 8, 13, 25, 28, 29, 30).

The proportion of patients with no complaints of LBP was significantly greater in the intervention group at the one-year follow-up than in the control group, i.e. there was an intervention effect, not only a time recovery effect (29). The intervention program successfully intra-individually decreased the patients’ complaints of LBP.

The mobility, strength and fitness average recordings were also found to increase more than can be explained by a time recovery effect, i.e. there was an intervention effect (15, 29). The increase of the numbers of physical capacity recordings was also an objective of the intervention program and of great importance for the individual return to work. The intervention program also successfully intra-individually increased the subjects’ physical capacity (15).

The pretreatment mobility and strength recordings, but not the fitness recordings, were significantly correlated to the complaints of LBP. Other reports (6, 17, 28) have also shown this correlation between complaints and physical capacity. However, most of the authors have compared reported complaints with reported physical capacity, not with observed recordings of physical performance.

The pretreatment recordings of complaints of LBP were correlated to the rate of return to work and to the amount of sick-leave during the second follow-up year, which indicates that the score of complaints of LBP influences the recovery process.

The patients who intra-individually improved their physical performance also intra-individually decreased their complaints of LBP, as also reported in some other studies (7, 11, 13, 19, 20, 21, 28). Patients who more do also complain less of LBP (7, 8, 11, 13, 20). Both the physical performance and the complaints of LBP must be taken into account when deciding whether the patient is ready to return to work. Thus, the intra-individual improvement is suggested to be important both for complaints of LBP and physical performance in patients with sub-acute LBP. We therefore recommend simple recordings of physical performance, pain, pain behavior and subjective disability for patients with subacute LBP in any vocational rehabilitation program.

CONCLUSIONS

The intervention significantly reduced the patients’ intra-individual complaints of LBP and increased their intra-individual physical performance. Another effect of the intervention program was that more patients in the intervention group than in the control group were free from complaints of LBP. The intervention program was successful for patients with subacute LBP.

ACKNOWLEDGEMENTS

We thank Björn Arneson, Lars-Erik Peterson, Lof Wallin and Claes Erik for their support of the study. This study was supported by Atherosclerosis Forstudie- ringasföreningen (AFA), Stockholm, Sweden, the Vello

REFERENCES


Appendix

Borg’s category ratio scale (4)

0 nothing at all

0.5 very weak (just noticeable)

1 very weak

2 weak (light)

3 moderate

4 somewhat strong

5 strong

6 very strong

7 very strong

8 very strong

9 very strong (almost max)

10 very strong (maximal)

Address for afffriates:

Ingalill Lindström

Grenen sykehus Ryggdivision

Nordhengskog 12

S-412 27 Göteborg

Sweden

Company, Göteborg, Sweden, AMF-Trägårförsäkring,
Stockholm, Sweden, the Medical Faculty of the University of Göteborg, the King Gustaf Vasa Foundation and Elina Askur Foundation, Göteborg, Sweden, and the Bertha and Felix Neuberg Foundation, Göteborg, Sweden.
Appendix III

Waddell's subjective disability index (26)

1 Heavy lifting
2 Ability to sit one-half hour
3 Ability to travel one-half hour
4 Ability to stand one-half hour
5 Ability to walk one-half hour
6 Sleep disturbance
7 Social life restriction
8 Sex life restriction
9 Help with footwear
10 Medication


SENSORY CHANGES ASSOCIATED WITH SEVERE ANKLE SPRAIN

Joanne H. Bullock-Saxton, PhD., B.Phty

From the Department of Physiotherapy, The University of Queensland, St. Lucia, Australia

ABSTRACT. An intact afferent nervous system is important in providing the feedback necessary for effective motor control. Joint injury may influence afferent feedback and, if the lower limb is involved, lead to a decrease in stability. Accordingly, the association between severe ankle sprain and local sensory deficits was examined. Measurements of vibration perception, two point discrimination and balance in one legged standing were made in subjects who had sustained a previous severe unilateral ankle sprain and in subjects with no history of lower limb injury. Comparisons between the two groups showed that subjects with previous severe ankle sprain had sensory deficits in all measured variables between the injured and non-injured sides. Such differences between sides was not apparent in the non-injured group. This study highlights that local sensory deficits are associated with severe ankle sprain.

Key words: ankle sprain, afferent sensation, vibration perception, two point discrimination, balance.

Ankle sprain, involving ligamentous and/or capsular injury is relatively common in people of all ages. Ankle instability and consequential recurrence of ankle sprain appears to be not uncommon. Indeed, in a survey of 201 patients with ankle sprain, 22% were found to have experienced a later ankle sprain on the second side, while 47% suffered further ankle sprains on the same side (2).

An intact sensory motor system is important for movement control and co-ordination and the existence of a complicated feedback system between muscles and joints and the central nervous system is well recognised. Previous research has highlighted the importance of feedback from capsular and ligamentous mechanoreceptors to the reflex stabilisation of the joint (5, 6, 7), perception of joint position and movement (24), muscle activation (17), and the control of the gamma muscle spindle system (11)

influencing the stability of the joint. These articular sensory receptors, or mechanoreceptors, are located within joint capsules, ligaments and joint structures and are considered damaged during joint injury (15).

Freeman et al. (6) have proposed that the basic mechanism of ankle instability following injury develops due to the lesion of mechanoreceptors in the joint capsule and ligaments and that these endings are stimulated both by the static position and by motion of the joint. Freeman (5) has also suggested that the afferent nerve fibres in the capsule and ligaments of the foot and ankle subserve reflexes which help to stabilise the foot during locomotion, that a sprained ankle can be considered as a partial disinnervated joint and that the "clumsiness" or "give-away foot" is a result of impaired reflex stabilisation of the foot.

The wider ramifications for limb movement of single joint injuries have been stressed by Wyke (24) who stated that "interuption of the flow of impulses from the mechanoreceptors in a joint capsule into the central nervous system should result in clinically evident disturbances of perception of joint position and movement and of the reflexes concerned with posture and gait". The impairment of balance and the loss of a smooth, co-ordinated gait pattern following ankle sprain are features often observed clinically and they have implications for therapeutic management.

It is apparent that changes in the sensory input can cause alterations in muscle function. The likelihood that changes in sensory information contribute to damage or degeneration of a joint has also been supported (1). The role of proprioceptive information in the initiation and progression of joint disease is suggested by Barrett and coworkers' (1) research of joint position sense in people with and without joint degeneration. The possible effects of sensory deficits on joint degeneration and altered muscle function support the need to learn more about the relationship of sensory deficits and joint damage.