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OUTCOME OF AN 8-WEEK MULTIPROFESSIONAL WORK- RELATED REHABILITATION PROGRAMME FOR PATIENTS SUFFERING FROM PERSISTENT MUSCULOSKELETAL-RELATED PAIN

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Ja visst gör det ont

Ja visst gör det ont när kroppar brister.
Varför skulle annars vården tveka ?
Varför skulle all vård annars,
bindas i det frusna bitterbleka ?
Höljet var ju kroppen hela vintern.
Vad är det för nytt som tär och spränger ?
Ja visst gör det ont när kroppar brister,
ont för det som växer
och det som stänger.

(J-R Norrefalk, fritt efter Karin Boye)

”To my Gun”

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ABSTRACT

The prevalence of persistent pain is estimated to be 40-50 % in a normal population. Musculoskeletal-related pain represents the main part of persistent pain with a reported prevalence of about 38 % for women and 31 % for men. This has led to more people on long-term sick-leave, increased amount of early retirements and to rising social costs. Patients suffering from persistent musculoskeletal-related pain were offered an 8-week multiprofessional work-related rehabilitation programme at the Pain Unit at the Department of Rehabilitation Medicine, Huddinge University Hospital. The objectives were: 1) Return-to-work 2) Increased activity level 3) Reduced pain intensity.
The main objective of the studies reported in this thesis was to evaluate the programme at follow-ups at 1, 3 and 6 years. Further aims were to find predictors for those patients who would gain most from the programme and whether immigrants had more difficulties to reach the objectives than non-immigrants. An economic analysis was carried out to evaluate whether the programme was cost effective or not.

Sixty-seven patients enrolled in the programme were analysed after 1 and 3 years and another 122 patients after 6 years. The socioeconomic cost of the programme was analysed at the one-year follow-up. The multiprofessional rehabilitation team evaluated impairment and disability (IDEA) to assess possible work ability. The patients' own perceptions of returning to work were evaluated. The return-to-work rate was also evaluated using the modified somatic perception questionnaire (MSPQ) and the disability rating index (DRI) before the clients entered the programme. For comparison, a group of patients completed an evaluation but were not referred to a work-related multiprofessional rehabilitation programme.

At the one-year follow up, 63 % of the patients had returned to work or were in work-related activities. There was a positive, statistically significant correlation ($p< 0.01$) between the IDEA and the actual return-to-work rate. The results on MSPQ or DRI, the patients' own perceptions of returning to work, the pain intensity, age or the period of time out of work did not predict the return-to-work ability. It was not possible to predict the return-to-work rate at an individual level but it was possible at group level.
At the 3-year follow up 50 % of the patients were working and at the 6-year follow up 52% had returned to work ($p <0.001$). In the control group 13 % had returned to work ($p <0.001$). There was a statistically significant higher level of activity ($p =0.037$), pain reduction was experienced by 51% of the patients ($p <0.001$) and 47% of the patients had decreased their consumption of analgesics ($p <0.001$). There was no significant difference in the return-to-work rate between immigrants and native Swedes. However**,** the patients' prediction of the ability to return to work was higher among the non-immigrants. The level of activity was lower, and the pain intensity and use of analgesics higher, among the immigrants than among the non-immigrants.

Investigation of the cost effectiveness showed that the successful patients had to work between 6 and 8 months for the benefits to just outweigh the costs. After having worked for 6-8 months, their contribution in terms of increased production had paid not only for their own rehabilitation but also for that of those who did not return to work. Thus the rehabilitation programme was estimated to be economically beneficial within a year of the successfully rehabilitated patient's return to work.. After three years, the gain had increased to more than five times the running cost. After six years the economic benefit for society will be at least ten times the running cost.

In conclusion, the results of this work support the hypotheses that within a structured, multiprofessional, rehabilitation programme the majority of the patients on long term sick-leave and suffering from persistent musculoskeletal-related pain can gain and can return to work and remain at work, despite their pain. It demonstrates that it is not too late to achieve good results even if the patients have been on sick-leave for months or years. The programme was as effective, concerning the return-to-work rate, for immigrants as for non-immigrants. In economic terms, the rehabilitation programme paid off within a year after the successfully rehabilitated patients returned to work and after that would generate substantial net economic gains for society and this included the rehabilitation costs for the patients who did not return to work

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ABBREVIATIONS

AMI	(In Swedish). Arbetsmarknadsinstitutet, numera Arbetsförmedlingen-rehab (Af-rehab). The Labour Market Institute
DRI	Disability Rating Index
IASP	The International Association for the Study of Pain
ICF	International Classification of Functioning, Disability and Health
ICIDH	International Classification of Impairment, Disability and Handicap
IDEA	Impairment and Disability Evaluation and Analysis
MPI	Multidimensional Pain Inventory
MSPQ	Modified Somatic Perception Questionnaire
NRS	(In Swedish). Nationellt Register över Smärtrehabilitering. The National Register of Pain
SBU	(In Swedish). Statens beredning för medicinsk utvärdering. The Swedish Council on Technology Assessment in Health Care
VAS	Visual Analogue Scale
WAD	Whiplash-associated disorder
WHO	World Health Organisation

LIST OF PUBLICATIONS

This thesis is based on the following four papers, referred to in the text by their Roman numerals

I. **Can the back-to-work rate of patients with long-term non-malignant pain be predicted ?**

Norrefalk J-R, Svensson O, Ekholm J, Borg K.

International Journal of Rehabilitation Research 2005; 28(1):9-16.

II. **Ethnic background does not influence outcome for return-to-work in work-related interdisciplinary rehabilitation for long-term pain: 1 and 3 year follow–up**

Norrefalk J-R, Ekholm J, Borg K.

Journal of Rehabilitation Medicine 2006; 38:87-92.

III. **A 6-Year Follow up Study of 122 Patients Attending a Multiprofessional Rehabilitation Programme for Persistent Musculoskeletal-Related Pain**

Norrefalk J-R, Linder J, Ekholm J, Borg K.

In press. The International Journal of Rehabilitation Research 2007; 30(1).

IV. **Are there any Socioeconomic Benefits of a Multiprofessional Rehabilitation Programme for Persistent Musculoskeletal-Related Pain?**

Norrefalk J-R, Ekholm K, Linder J, Borg K, Ekholm J.

Submitted

1. INTRODUCTION

The prevalence of long-term pain in Sweden is about 40-50 % (1-3). This is about the same as in countries such as the United Kingdom and Australia (4-6). Musculoskeletal-related pain represents the main part of long-term pain (3) with a prevalence of 38 % for women and 31% for men (7). According to the Swedish part of the large multicentre study "Pain in Europe" in 2003, a study of the prevalence and treatment of persistent pain in Europe and its influence on daily activities, 18 % of the population reported long-term pain with an intensity of their pain of least 5 on a 10 degree visual analogue scale (VAS) (8).

1.1 The classification of pain

The International Association for the Study of Pain (IASP) has defined pain as: "an unpleasant sensory or emotional experience which is primarily associated with tissue damage or described in terms of tissue damage, or both" (9)**.**

Pain is a complex, individual perception that takes place only at higher levels of the central nervous system. Pain is always subjective. Each individual learns the application of the word through experience related to injury in early life (10). Accordingly, pain is the experience we associate with actual or potential tissue damage. It is unquestionably a sensation in a part or parts of the body, but it is also always unpleasant and therefore also an emotional experience. The emotional or affective component of pain leads to suffering so that pain can be reinforced by worry, stress, anxiety and depressiveness, while at the same time pain can induce worry and depressiveness (10). It also affects attention and cognition such as thoughts and memories and conditions behaviour such as avoidance, withdrawal escape and muscle contraction.

Therapeutic decision-making may be informed by inferences about the pathophysiology of pain. According to the IASP classification (9) the pathophysiology can be divided into nociceptive, neuropathic, idiopathic and psychogenic categories.

Nociceptive pain is presumed to be induced by actual or threatening tissue injury. Nociceptive pain is *somatic* when the ongoing activation is related to primary afferent nerves in somatic tissues (e.g., bone, joint, or muscle) and *visceral* when visceral afferents are activated by injury, mediated by a nervous system with normal peripheral and central function.

Neuropathic pain is pain due to injury or other dysfunction of the peripheral or central nervous system. It is projective with a neuro-anatomic distribution area and signs of neurological lesions and sensory dysfunction, reduced or altered from analgesia to allodynia (for definition see below).

Idiopathic pain is defined as pain that persists in the absence of an identifiable or suspected injury or illness.

Psychogenic pain. A genuine feeling of pain of purely mental origin. Physical phenomena such as paraesthesia or functional motor weakness may occur.

Acute pain is pain from an injury or illness that comes and goes, as opposed to being chronic which is persistent. Acute injuries come on quickly, have very definite symptoms which can be quite intense, and heal in a relatively brief time. Unfortunately, acute injuries can be the precursors of chronic pain.

Chronic pain is defined as a continuous or intermittent experience that lasts beyond the expected healing period, 3 or 6 months or more.

Persistent pain differs from acute pain and has to be understood in terms of a complex interplay of physiological and psychological features as shown in (Table I.). The narrow disease model has to be replaced with a broader illness model. One way that persistent pain begins is from an injury. Repeated pain from an acute injury can lead to central sensitisation. Even after the injury has healed, pain messages "replay" over and over again.

Table I. Physiological and psychological consequences of and differences in acute and persistent pain.

Acute Pain	Persistent Pain
Pulse ↑	Sleeping disorder
Blood pressure ↑	Irritability
Pupil dilatation	Appetite disorder
Sweating ↑	Constipation
Hyperventilation	Psychomotor inhibition
Motility ↑	Socially retiring behaviour
Flight	Divergent illness behaviour
Anxiety	Depression

In rehabilitation medicine the word "chronic" has a definite value. To encourage, motivate and inform patients we use the words "long-lasting", "long-standing", "prolonged" or as in this study, "persistent". These expressions are preferable as they are less definite, not life-threatening and a relation to cancer has been excluded. The intention is to inform patients that with the right approach they might even reduce their pain.

In 1990 the American College of Rheumatology defined **generalised or widespread pain** as pain present on both sides of the body, above and below the waist, and in the axial skeleton (cervical spine, anterior chest, thoracic spine or lower back). Pain not fulfilling this definition has been considered to be **regional pain**.
Patients with widespread long-term pain, for example fibromyalgia, have a reduced pain threshold (**allodynia**), an increased response to painful stimuli (**hyperalgesia**) and an increase in the duration of pain after nociceptor stimulation (**persistent pain**). These features are found in central pain-amplification states generally referred to as **"central sensitisation".** This has been defined as increased responsiveness of nociceptive neurons in the central nervous system (11).
Severe or persistent pain from any source (e.g. injuries, arthritis, surgery etc.) can potentially lead to pain centralisation and result in heightened sensitivity to pain itself. Thus, the perception of formerly non-painful stimuli can lead to pain and spread pain. In addition, innocuous inputs can lead to amplified responses in pain pathways (12).

1.1.1 Pain behaviour and coping with pain

Pain behaviour. Fordyce advocated the application of behavioural principles to the formal analysis and modification of dysfunctional behaviour in patients suffering from pain. Pain behaviour may be verbal, e.g. complaints of pain and suffering, groans or sighs. It can also be non-verbal e.g. bracing, guarding, rubbing, grimacing, excessive resting or reclining. Pain behaviour has to be understood in terms of its social context; it may be anything that a person

says, or does not say, that makes the hearer or observer assume that the person is suffering from a harmful stimulus. If a pain patient receives sympathetic attention when showing signs of pain, a pattern of pain behaviour may become established (13).

Coping is defined as: "ongoing cognitive and behavioural efforts to manage specific external and / or internal demands that are appraised as taxing or exceeding the resources of the person" (14). Coping is a person's active and conscious measures to counteract or overcome the negative effects of stress. Psychometric instruments focusing on different aspects have been developed for studying the styles and strategies demonstrated by patients coping with pain. Different coping styles there are: avoiding and coping (confronting), assimilative and accommodative. Different coping strategies can be active versus passive, adaptive versus non-adaptive, emotion-focused versus problem-focused, avoidant and attentional. There is considerable overlap amongst these categories: people may use combinations of coping strategies.

1.2. Assessment of persistent pain

Descriptions of pain should characterise its temporal features, intensity, topography, quality, and exacerbating and relieving factors. The information gathered through a detailed history, physical examination, and review of laboratory and imaging studies usually clarifies the relationship between the pain and the disease or trauma. This assessment determines the need for further evaluation and influences the selection of specific therapies.
To treat persistent pain it is crucial to know what quality or qualities of pain the patient is suffering from as some treatments are effective for just one type of pain. Using the Mechanism-Based Assessment model, pain can be divided into at least four main types; nociceptive, neuropathic, idiopathic and psychiatric. The assessment of persistent pain is shown in Fig 1.

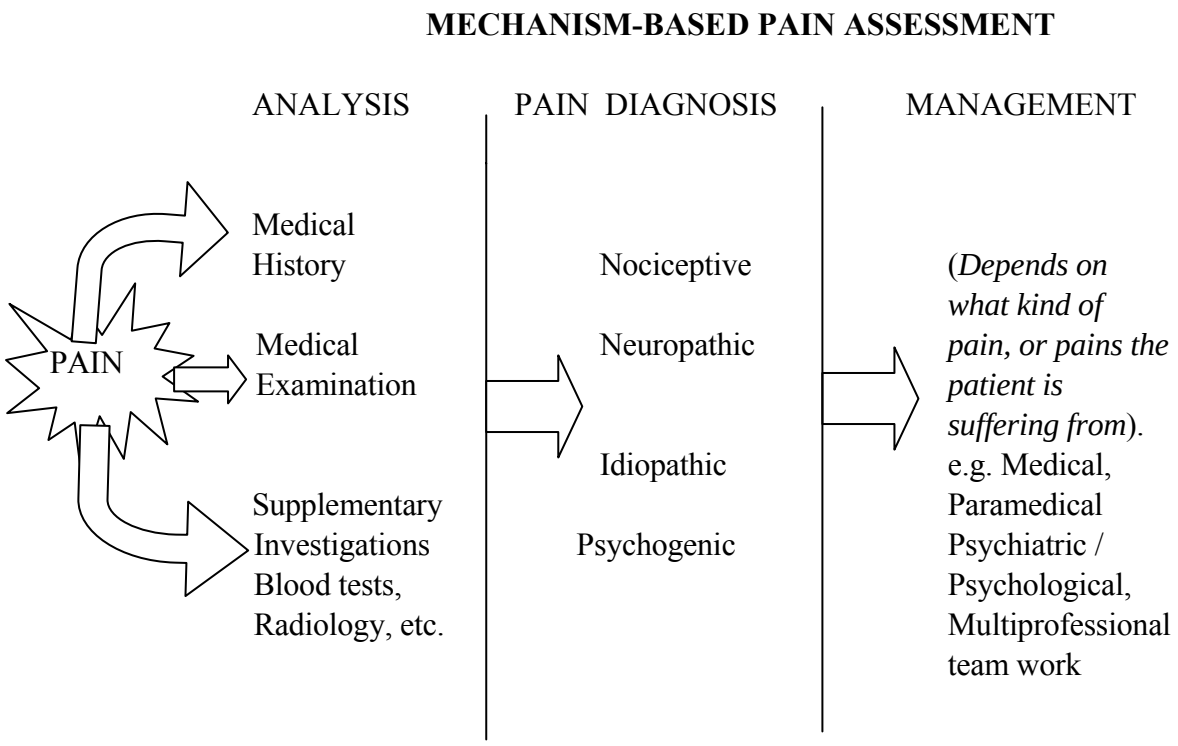

Fig 1. The mechanism-based Model for the assessment of persistent pain. (Modified after Brattberg G. 1995 (15).

1.3. Multiprofessional rehabilitation teams

Teamwork is one of the most fundamental factors in Rehabilitation Medicine. Different professions, assessments and evaluations are brought together to obtain a holistic view of the patient's problems. This allows realistic rehabilitation measures to be taken and realistic objectives to be set for the best possible outcome.

There is, however, national and international confusion in the vocabulary in the correspondence between clinics and departments. The use of different expressions to describe the rehabilitation teams, is no less confusing at rehabilitation conferences or in the literature (16). In the present work the expressions "**multiprofessional team or multiprofessional rehabilitation team**" are used. Such teams could consist of members from different professions working together with the aim of giving a certain patient the best possible outcome of the rehabilitation. Team composition nay be adjusted to individual needs and to the facilities and programmes offered at each rehabilitation centre or unit (16).

The work of a **"multidisciplinary team"** has been defined as: "activities that involve the efforts of individuals from a number of disciplines. These efforts are discipline-orientated and, although they may impinge upon clients or activities dealt with by other disciplines, they approach them primarily through each discipline relating to its own activities" (17).

On the above definition a "multidisciplinary team" could be a group of specialist (consultant) physicians from different medical specialties such as anaesthesiology, neurology, rheumatology, orthopaedics, psychiatry, oro-facial specialties, geriatrics, neurosurgery, oncology, paediatrics, pharmacology and rehabilitation medicine. This highly qualified group meets to discuss, for example, pain management for patients with severe pain problems. The members of each discipline tend to work towards their own individual goal for the patient and in general there is little overlap between team members.

However, the term "multidisciplinary team" is also used to describe a team consisting of many different professions working in Rehabilitation Medicine. In addition to a specialist physician in rehabilitation medicine this kind of team can include paramedics e.g. physiotherapists, occupational therapists, psychologists, social counsellors (social workers), nurses and speech therapists.

Some groups of specialist physicians have seen the need for paramedic competence in their groups and have involved these disciplines in their meetings. These groups so far lack a specific definition.

Interdisciplinary teams. Some institutions have tried to solve the confusion in the vocabulary by calling rehabilitation teams "interdisciplinary". "Interdisciplinary team member individuals do not only require the skills of their own discipline but have the added responsibility of the group effort on behalf of the activity or client involved. This effort requires the additional skills necessary for effective group interaction and the ability to transfer integrated group activities to a result that is greater than the sum of the activities of each individual discipline. The group activity of an interdisciplinary team is synergistic, producing more than each individually and separately could accomplish" (17).

Driller (18) suggested that the interdisciplinary approach "involves timely and anticipatory communications, engaging in interactive problem-solving, and ability to translate technologic findings to people who are untrained in the techniques that are used."
In the co-operation in the interdisciplinary team Driller seeds two different patterns:

- In "coordinated interdisciplinary teams" mutual goals are set and the individuals from each profession attempt to work on these goals in their individual sessions.
- In "integrated interdisciplinary teams" mutual goals are worked on in joint treatment sessions with members of different professions (e.g. specialist physician in rehabilitation medicine with a paramedic team) participating.

Interdisciplinary team meetings are based on an exchange of ideas and on discussion, reporting and recording, and goals set for the patients to try and achieve by the next meeting. Team members have equal status and the decisions are made by the team. This is a common way to work in rehabilitation medicine, for example with patients suffering from long-term pain, and in neurological rehabilitation.

In a "**transdisciplinary team**" all frontiers by the disciplines are down. "In this approach, one member of the team acts as a primary therapist, with the other members feeding information and advice with regard to management through a single primary person" (19). This can be useful when the patient's condition preludes a change of therapists, e.g. severe head injury cases.

"Multidimensional team" is another expression used occasionally. No clear definition could be found to explain its significance.

"**Multimodal team**" is a commonly used expression. It refers usefully to a coordinated activity, including at least two modalities.

1.4. Multiprofessional rehabilitation programmes regarding return to work

Suffering from pain over a long period of time negatively affects a person's family life, spare time, economy, psychosocial well-being and ability to work. As summarised in the phase model (20),(fig 2) rehabilitation in a structured programme with a multiprofessional team has shown beneficial effects on sick-leave, disability pension and /or return to work (21-31) (Table II). The clinical effectiveness of such programmes has also been documented in systematic reviews (32-41) (Table III). The present multiprofessional rehabilitation team in the programme for patients suffering from persistent musculoskeletal-related pain is presented in Chapter 3.

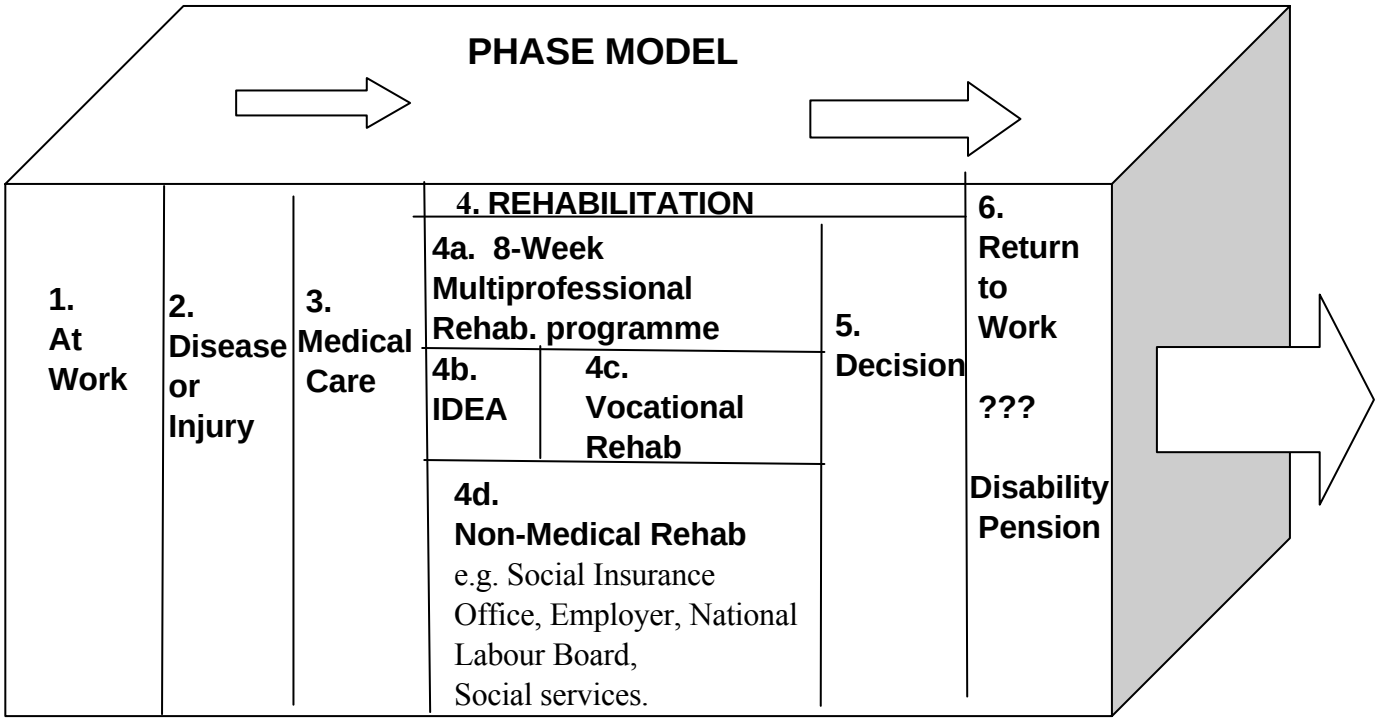

Figure 2. Phase model of an individual's progress from disease or injury toward return to work or disability pension. Stages towards return to work; medical care, impairment and disability evaluation analysis (IDEA), medical rehabilitation, vocational rehabilitation, decision and follow ups. (Modified after Berglind et al.1997 (20).

Table II. Outcomes of multiprofessional rehabilitation programmes regarding return-to-work.

Author (ref)	Study	Material	Result
Åberg (21) 1984	Randomised, prospective	Chronic back pain (n=164+189)	Neutral – 4- and 8-months follow up. No effect regarding return to work.
Mayer et al. (22) 1987	Non-randomised	Chronic low back pain (n=116+72)	Positive – 2-year follow-up, 86% vs. 45% returned to work.
Hazard et al. (23) 1989	Non-randomised	Chronic low back pain (n=59+17)	Positive – 1-year follow up, 81 % vs. 29% returned to work.
Linton et al. (24) 1989	Randomised, prospective	Back pain (n=36+30)	Positive – broke a trend of absenteeism.
Mitchell et al. (25) 1994	Randomised, prospective	Chronic pain (n=271+271)	Neutral – 1-year follow-up, 79 % vs. 78% returned to work.
Alaranta et al. (26) 1994	Randomised, prospective	Chronic low back pain (n=152+141)	Neutral – 1-year follow-up, no difference regarding sick-leave and retirement.

Bendix et al. (27) 1997	Randomised, prospective	Chronic low back pain (n=46+43+43)	Positive – 1-year follow-up, programme superior regarding work-ready rate.
Lindh et al. (28) 1997	Randomised, prospective	Musculoskeletal pain (n=238+226)	Positive – improved work stability after work return (for immigrants no effect).
Nordström-Björverud et al. (29) 1998	Non-randomised	Musculoskeletal pain (n=34+72)	Positive – 77% vs. 58 % returned to work at 2-4-years follow-up.
Strand et al. (30) 2001	Randomised controlled study prospective	Long-term sick-listed, back pain (n=81+36)	Positive - Improvement in physical performance related to return to work after 1 year.
Casso et al. (31) 2004	Questionnaire prospective	Low-back pain (n=125)	Positive - Intensive reconditioning programme positive effects on return to work after 1 year.

Table III. Clinical effect of multiprofessional rehabilitation programmes according to international reviews.

Author (ref)	**No of studies included**	**Material**	**Result**
Malone et al. (32) 1988	48	Persistent pain	Positive - indicating the importance of using a multidimensional framework for pain assessment.
Flor et al. (33) 1992	65	3089 patients Low back pain 1973-1989	Positive - multidisciplinary treatments are superior to no treatment, waiting list and single-discipline treatments regarding return-to-work.
Morley et al. (34) 1999	33	1672 patients Persistent pain excl. head ache	Positive - that active psychological treatments based on principle of cognitive behavioural therapy is effective.
Karjalainen et al. (35) 1999	7	1050 patients Fibromyalgia, generalised musculoskeletal pain 1966-1998	Negative - little scientific evidence for effectiveness of multidisciplinary rehabilitation for these musculoskeletal disorders.
Karjalainen et al. (36) 2001	2	Persistent neck and shoulder pain	Negative - little scientific evidence for effectiveness of biopsychosocial rehabilitation following repetitive-strain injuries.
Guzmán et al. (37) 2001	10	1964 patients Low back pain 1989-1997	Positive - intensive multidisciplinary biopsychosocial rehabilitation with functional restoration reduces pain, improves function in chronic low back pain.

Nielson et al. (38) 2001	21	Persistent pain	Positive - multimodal biopsychosocial treatment including cognitive-behavioural and/or behavioural components effective for chronic low-back pain and other musculoskeletal pain up to 12 months.
Schonstein et al. (39) 2002	18	Acute and persistent pain 1991-1999	Positive - physical conditioning programmes that include cognitive-behavioural approach plus intensive physical training given and supervised by multidisciplinary team, seem effective in reducing number of sick days for some workers with chronic back pain, when compared to usual care. But no evidence of efficacy for acute back pain.
Nachemson et al. (40) 2000 SBU	10	Chronic low back pain 1983-1998	Positive – strong evidence shows that multidisciplinary treatment is effective in pain relief and functional improvement for patients with long term and severe chronic low back pain, but not for acute back pain.
Lundberg et al. (41) 2006 SBU	46	6213 patients Persistent pain	Positive – multimodal rehabilitation including cognitive-behavioural approach and intensive physical training have positive effects on return-to-work rate, reduces pain and the number of sick days.

Research has so far focused on identifying patients who will, or will not benefit from such programmes. Assuming that many will, it would be helpful in the selection of patients to a work-related multiprofessional rehabilitation programme if the patients' return-to-work rate could be predicted.
There is so far little research on long-term (over three years) evaluation of programmes as to activity level, pain and return-to-work rate of patients with persistent musculoskeletal-related pain, after work-related rehabilitation. However the potential for successful rehabilitation decreases dramatically after three months on sick-leave for patients suffering from persistent pain as reflected in the return–to-work rate (42).

It is also commonly suggested that immigrants benefit less from a work-related rehabilitation programme than native patients with long-term pain (28, 43-46).

1.5 Socioeconomic considerations

According to a systematic review from SBU 2006, the Swedish council on technology assessment in health care, methods of treating chronic pain, the total estimated annual socioeconomic costs to Sweden were 87.5 billion Swedish crowns (SEK) (€ 8.2 billion) (41).
As the associated cost for the national social insurance systems, the health care systems and rehabilitation are strained, it would be most valuable if one could predict which patients with long periods off-work and long-term pain syndromes could find a way back to a structured life, including work, after completing a multiprofessional rehabilitation programme.

The cost effectiveness of a multiprofessional rehabilitation programme has been evaluated in comparison with conventional primary care treatment of patients with long-term musculoskeletal problems (47-50). Multiprofessional rehabilitation was more demanding on resources, but even so it was the most cost-effective regarding patients' health-related quality of life (47). Treatment at multidisciplinary pain centres might produce huge economic savings in terms of health care expenditure and indemnity costs (48). Such clinics generate direct health-service savings equal to twice their running cost (49). A recently published macroeconomic study showed a nine fold return on investment in comprehensive rehabilitation, account taken of all public sectors plus the employers' and individuals' economy (50).

2. AIMS

2.1 General aim

The overall objective was to evaluate the outcome of an 8-week, Multiprofessional, work-related rehabilitation programme for patients suffering from persistent musculoskeletal-related pain. The focus was on three main parameters:

- Return-to-work
- Increased level of activity and
- Reduced pain intensity.

2.2 Specific aims

Specific aims were to analyse:

I. the outcome of the rehabilitation programme at a one-year follow-up regarding the return-to-work rate and whether a given patient could benefit from the programme (Study I),

II. whether there was a difference between immigrants and native Swedes regarding the outcome of the programme (Study II),

III. the outcome six years after completing the rehabilitation programme (Study III), and

IV. whether there were socioeconomic benefits of the rehabilitation programme (Study IV).

3. PATIENTS AND METHODS

3.1. Patient selection, inclusion and exclusion criteria

The patients in the studies were selected groups referred to an 8-week multiprofessional rehabilitation programme at the Pain Unit at the Department of Rehabilitation Medicine, Huddinge University Hospital. All other treatment or rehabilitation had failed. One-third of the patients were referred from general practitioners, one third from hospitals and one third from the local social insurance office.

Inclusion criteria

Inclusion criteria were that the patient should:

- be of working age,
- have suffered from persistent musculoskeletal-related pain for more then three months,
- have been on sick-leave for more than three months,.
- have no ongoing drug or alcohol abuse or major cognitive deficit,
- understand Swedish sufficiently well to profit from the theoretical parts and the concluding meetings of the programme. Interpreters were used when needed.
- have relevant medical and surgical investigations and treatment completed prior to referral to the programme,
- have a rehabilitation plan drawn up by the local social insurance office,
- agree to reference being made to their earlier medical records.

Exclusion criteria

Patients were excluded from the programme if:

- they were at work or had a well-structured, continuing presence at work of more than two hours per day,
- there was no rehabilitation plan. The referring physician was asked to initiate production of such a plan together with the patient and the rehabilitation coordinator at the local social insurance office
- their Swedish was too poor to permit them to follow the theoretical parts of the programme,
- they had ongoing drug, narcotics or alcohol problems or major cognitive deficits.

Table IV. Demographic data of patients included in studies I-IV. (For comments on dropouts see chapter 3.3)

	Study I		Study II		Study III		Study IV	
	Study group	**Comparison group**	**Swedes**	**Immigrants**	**Study group**	**Comp. group**	**Study group**	**Comp. group**
No of patients	67	14	37	30	122	79	67	67
Women	54	8	30	24	93	46	54	55
Men	13	6	7	6	29	33	13	14
Age	40	45	40	40	39	46	40	40
Months on sick-leave	22	Unknown	22	21	20	19	22	19

According to data from the National Register of Pain, the patients referred to the 8-week rehabilitation programme in Studies I, II and IV had the highest proportions of immigrants and the lowest level of education. They also estimated higher pain intensity, poorer health and lower self-estimated ability than the average for patients on other work-related rehabilitation programmes in Sweden during the same period.

Table V. Primary diagnoses from referring physicians before programme start; occupation and return-to-work rate at 1 and 3-year follow-ups.

	Total	**Immigrants**	**Native Swedes**
	n (%)	**n (%)**	**n (%)**
Diagnosis	67	30	37
Generalised pain or fibromyalgia	23 (34)	12 (40)	11 (30)
Generalised neck and back pain	13 (19)	6 (20)	7 (19)
Cervicobrachialgia	13 (19)	7 (23)	6 (16)
Low-back pain	9 (13)	2 (7)	7 (19)
Status after whiplash (WAD)	4 (6)	2 (7)	2 (5)
Status after back surgery	3 (5)	1 (3)	2 (5)
Neuropathic pain	2 (3)	0 (0)	2 (5)
Profession	67	30	37
Healthcare workers	16 (24)	3 (10)	13 (35)
Cleaners	15 (22)	15 (50)	0 (0)
Office workers	14 (21)	3 (10)	11 (30)
Factory workers	9 (13)	7 (23)	2 (5)
Other occupations	6 (9)	0 (0)	6 (16)
Restaurant workers	5 (8)	2 (7)	3 (8)
Computer workers	2 (3)	0 (0)	2 (5)
Blue-collar work	43 (64)	25 (83)	18 (49)
White-collar work	24 (36)	5 (17)	19 (51)

3.1.1 Comparison groups

Study I. As a comparison group 14 patients rejected due to lack of space on the programme were used. These patients were followed-up with questionnaires. Their activity and work situations one year after they would have started the programme were registered.

Study II. The outcome of the 30 immigrants in the rehabilitation programme was compared with that of the 37 non-immigrants.

Study III. Seventy-nine patients who participated in a tertiary care evaluation programme at the National Swedish Insurance Board Rehabilitation Centre were considered adequate for use as controls. The selection criteria were that they had been evaluated at the same time as the study group concluded the rehabilitation programme. Further, they were also selected on the understanding that a long-term follow up regarding return-to-work rate would be run at the same time as for the study group. All controls were also on long-term sick-leave prior to the evaluation, were of working age and had persistent pain as their main diagnosis.

Study IV. The controls used in Study IV were 232 patients who completed a multidisciplinary evaluation at the Diagnostic Centre, Department of Clinical Neuroscience, Karolinska University Hospital during the same period as the study group. The controls were recruited by mail by the National Social Insurance Office. They were, like the study group, on long term sick-leave for persistent musculoskeletal-related pain and were followed-up after a year regarding return-to-work rate. However, they were not referred to any rehabilitation programme. Members of this group served as matched-pair controls regarding the variables age, gender, origin and time on sick-leave before intervention.

3.1.2 Study design

Studies I and III were prospective clinical cohort studies with comparison groups and 1- and 6-year follow-ups. Study II was a comparison between two subgroups of the intervention group with 1- and 3 years follow-ups. Study IV had a matched-pairs design with a 1-year follow-up and the matching procedure was blinded. The individuals in the comparison groups were estimated to have about the same difficulties to return to work as the study group.

3.1.3 Outcome measures

In **Studies I** and **II** the patients completed two questionnaires before entering the programme: the Modified Somatic Perception Questionnaire (MSPQ) and the Disability Rating Index (DRI). The MSPQ consists of 13 questions aimed at identifying whether the pain has somatic value, from no symptoms (0), to slight symptoms (1), to several symptoms (2) to very many/cannot be worse (3). The answers give a possible score from 0 to a maximum of 39 (51, 52).
The DRI consists of 12 questions concerning daily activities and how easily they are performed. For each of the 12 items a visual analogue scale (VAS) was used ranging from ‘without difficulty’ (0) to ‘not possible’ (100). The answers give a possible total score from 0 to a maximum of 1200 (53).
Present pain intensity was measured on a VAS anchored with ‘no pain’ (0) to ‘worst possible pain’ (100). The patient assessed his/her future difficulty in returning to work after the rehabilitation programme, before entering the programme, on a VAS anchored from ‘no difficulty’ (0) to ‘not possible’ (100). These data together with the results of the IDEA were compared to actual return- to-work rates at the 1- and 3-year follow-ups.

In **Study III** all patients completed questionnaires and estimated their pain intensity, filled out a pain drawing and answered questions about their level of activity and sleeping habits, before entering the programme. The consumption of analgesics was also recorded.
After six years the patients were followed-up in a structured telephone interview answering the same questions as before entering the programme. They were also asked about their present work situation.

Regarding function, sleeping habits and activity level, the patients answered "yes" or "no" to the following three statements:

- I lie down to rest several times a day.
- I wake up several times a night.
- I do my necessary activities (post office, bank, shopping etc.)

The patients estimated their pain intensity on a scale from 0 to 5:

0 = No pain.
1 = Some pain that can be ignored.
2 = Some pain that cannot be ignored but does not obstruct daily activities.
3 = Pain that makes concentration on some activities difficult.
4 = Pain that makes all activities difficult, except activities like eating or going to the toilet.
5 = Pain that requires rest such as sitting or lying down.

The consumption of analgesics was recorded on a 0-3 scale:

0 = No use of analgesics.
1 = Occasional use of analgesics.
2 = Recommended doses of analgesics.
3 = Overuse of analgesics.

In **Study IV**, the total extra cost of the 8-week rehabilitation programme for the study group was calculated. The comparison group had no such extra cost, as they participated in no multidisciplinary rehabilitation programme of any length. The health-care cost for the comparison group was assumed to be about equal to the non-rehabilitation health-care cost of the study group. The cost of the rehabilitation programme was the actual cost for university hospital staff, including salaries, overheads, rental of office space/therapy rooms and working expenses. These costs were related to the economic benefits of the 8-week rehabilitation programme, measured in terms of increased production stemming from an increase in time used for work, i.e. decrease in sick-leave.

In this study where the proportions of blue-collar and white-collar workers were recorded, the cost of employment was calculated from national averages for these subpopulations. These estimated values were multiplied by 1.42 in order to take account of payroll taxes, approximately 42 %.

3.2 The 8-week multiprofessional, work-related rehabilitation programme, for patients on long-term sick-leave for persistent musculoskeletal-related pain

The 8-week programme was based on a combination of information, social training, physical exercise, ergonomics and psychological interventions inspired by behavioural medicine.
Each group consisted of eight patients. Every fourth week a new group of eight patients entered the programme.
The 8-week programme consisted of two parts. The first three weeks was evaluation and the last five work-related rehabilitation. Each participant received an individual plan preparing for return to work after the 8-week programme. The plan was drawn up during the first three weeks and the programme for the following weeks was adapted individually to achieve the objectives.
The multiprofessional team was headed by a physician who was a specialist in rehabilitation medicine, pain management and occupational health. There were one or two physicians in specialist training, three physiotherapists, three occupational therapists, one psychologist, one social counsellor, one enrolled nurse and one medical secretary. The active involvement of the different team members appears in Table VI.
The objectives were return-to-work, increased level of activity, and pain reduction.

Table VI. Rehabilitation hours given by each profession per week (h/w). The 32 hours under "other" included information, dietetic consultation, walks, contact with employer, patients' forum, visits to the Labour Market Institute and workplace visits.

Profession	**h/w 1**	**h/w 2**	**h/w 3**	**h/w 4**	**h/w 5**	**h/w 6**	**h/w 7**	**h/w 8**	**Total**
Physician	6	6	9		3			5	29
Physiotherapist	6	8	10	13	10	11	11	10	79
Occupational Therapist	6	7	5	10	5	6	6	3	49
Social Counsellor	3	3	3	2	4	2	6	5	28
Psychologist	2	3	3	2	3	2	2	1	18
Other	3	1	1	2	5	9	3	9	32
Team Conference	3	3	3	3	3	3	3	3	24
Total	29	31	34	32	33	33	31	36	**259**

All the patients in the programme met a rehabilitation medicine specialist physician or a physician under specialist training for a 1.5 hour session. The patients had previously completed mailed questionnaires. As routine in clinical work the Multidimensional Pain Inventory (MPI, MPI-S) (54, 55), The National Register of Pain (NRS), questionnaires including a pain drawing and a pain diary had to be completed. The outcome of these measures is not presented in the study. During the session the patient's pain history was recorded and an extended bodily examination and information on the 8-week programme were included.

The patients were well-informed about the objectives before entering the programme. Written information was sent and one week before programme start all patients were invited to the Department of Rehabilitation Medicine for more information, an opportunity to ask questions about the programme and discussion of practical arrangements. They were all aware that they would get an active plan for returning to work after the programme. They were also made aware that they could not count on pain relief during the programme and were also prepared for possible extra stress-related pain during the initial team evaluation or the final review.

The patient's presence was required from 8.00 a.m. to 3.30 p.m., 5 days a week over the eight weeks, for medical examination, pain analysis, information, functional tests, pain school, psychological pain management, group counselling, physical, functional and ergonomic training, relaxation groups and family meetings; and for individual contact with the team members. A visit to the Labour Market Institute was part of the programme. For patients in work, a visit to the workplace was also part of the schedule. This was to get a picture of the patient's working conditions and to evaluate whether these were suitable.

During the weekly group counselling session with the social counsellor and psychologist, the patients were taught about how catastrophic thoughts, anxiety and lack of coping strategies negatively affect pain. The consequences of pain were discussed: it could affect not just the patient but also the family, workplace, economy and social life. Sleeping disturbance, sex, and the patient's vision of the future were discussed using cognitive behavioural methods (56). Structured team conferences were also held weekly. The patient did not take part but was informed individually afterwards. In the first week, every patient was given a contact person in the team. During the team conference only the team members directly involved in a patient were present.

The patients met at least one team member for a minimum of 143 hours during the 8-week programme, individually or in group sessions.

3.2.1. The Impairment and Disability Evaluation and Analysis (IDEA) instrument

In the first three weeks of the programme, the evaluation part, the impairment and disability evaluation and analysis (IDEA) instrument developed at the Department of Rehabilitation Medicine Pain Unit at Huddinge University Hospital, was used by the multiprofessional team members to assess programme members' possible work ability. The IDEA did not actually focus on disability but sought rather to measure, observe and evaluate the patient's medical, physical, psychological and social functions, and ability to work in view of remaining pain (Table VII).

Table VII. The idea of the IDEA

Profession	IDEA
Physician	Gather earlier medical records, information, carry out clinical examination, clinical pain analysis and pain school. Try to minimise and optimise patient's use of medication.
Physiotherapy	Test patient's actual function and physical resources and design exercise programmes to increase physical function including pain analysis focusing on pain influence on physical activity, status, muscle tension and respiration. Test of actual status of muscles and joints. Six-minute bicycle ergometer test. Test of muscle endurance, balance and coordination. Observation in group activities to evaluate patient's physical resources and problems regarding their impact on function and work capacity. Exercise programme consisting of pool exercise, sequence training, ergo-metric cycling, walking, mobility exercises, stretching, body-awareness and relaxation techniques. Individual training programme and home exercise programme. Instructions on continuing training after the programme. Classes to give opportunity to practice new active coping strategies for reducing pain. Hot packs, cold packs, TENS and acupuncture also used, but few individual

	treatment sessions, so as to guide patients in finding out what active strategies and less expensive treatments give best results. All inputs aimed to reduce patients' anxiety, catastrophising thoughts, dependence on therapists and cost. Visits to employed patients' workplaces together with occupational therapist and patient.
Occupational Therapy	Occupational therapist used interviews, checklists, tests, a video recorder and observation to analyse and evaluate patient's ability during activity. Educated patient in ergonomic principles. Observed and recorded patient's physical, psychological, intellectual and social functions in different activities of daily living and in work-related situations. Aspects evaluated were: patient's mood, level of motivation and concentration, understanding of instructions, written and oral, and practical and intellectual skills. The patterns of the patient's movements and body positions during work were recorded. Manual dexterity was observed but also strength, precision, static and dynamic work. Endurance, work pace, tiredness, pauses, pain behaviour, stress, quality, quantity and result were also evaluated, as were the ability to communicate and ask for help, work independently and interact with other patients and team members. The patient's ability to take and act on new advice was also included. A video recorder was used during special activities. The recordings were shown to the patient as a basis for ergonomic training to achieve a change of the patient's passive pain strategies in behavioural therapy, and for discussion, both individually and in group sessions. During the activities the patients could use their new strategies in more work-related situations.
Social counsellor	Interviews to assess work-related issues and coordinate return-to-work plans. Individual sessions with patient discussing obstacles to return to work after the programme. Problems such as no employer, no contact with work for months or years, unsolved insurance matters, family and pain situation were some of the reasons given by the patient.
Psychologist	Gathered psychological examinations and interviewed patients to establish emotional and cognitive factors. Tests and questionnaires were used depending on patient's individual problems. Psychotherapy.
Enrolled Nurse	Coordinating functions.
Medical Secretary	Administrative functions.
Team Conference	Held weekly with team members involved in a patient's rehabilitation. Followed a structured model where the patient did not take part but was informed individually afterwards. After the three-week evaluation period, the team's forecast of the patient's likely work-level after completion of programme was recorded. Multiprofessional team members' assessment of patient together with earlier medical records by different specialists assembled and integrated in team's evaluation.

The patient's performance, participation, activity, functioning, coping with pain and pain behaviour were observed and tested during the programme in line with the World Health Organisation (WHO) classifications. The term 'disability' was used in IDEA as it was part of the WHO classification used at the time data were collected. It will be remembered that in 1980 the WHO published a first version of guidelines for the International Classification of Impairment Disability and Handicap (ICIDH). The Classification was revised in 1999 (ICIDH-

2) and in 2001 was changed to International Classification of Functioning, Disability and Health with the abbreviation (ICFH), known as the International Classification of Functioning (ICF) (57). This clinical and scientific tool facilitates surveys of the consequences of illness and /or injury. It provides a global medical framework for clinical work, quality, research and policy. It focuses on body functions, body structure, activities, participation and environmental factors. There is a Swedish version (58). Core sets of ICF categories have been presented for chronic conditions, e.g. chronic widespread pain (59). Its use is now recommended but at the time of the present studies it had not been finally published.

A crucial part of the evaluation was the team's unique opportunity to observe the patients in different activities 7.5 hours a day throughout the programme. As pain behaviour can change dramatically between two activities, before or after a meeting, or in different situations, the patients' levels of activity and participation were observed and recorded. Strategies for coping with pain and other biological, physiological and social problems were recorded and discussed with the patients to give every patient a tailored, individual programme.
Each patient received an individual return-to-work plan together with the result of his/her IDEA and the team's prediction of future work capacity. The patient also got a structured schedule for the following weeks of the programme. Patients who did not accept the evaluation, the plan and the given individual objectives had the opportunity to leave the programme (See 3.1.1).
In Sweden the following four possibilities for working hours established by the Swedish social insurance office system were used by the team for the prediction of each patient's work capacity: full time = 8 hours/day, 75% = 6 hours/day, 50% = 4 hours/day or 25% = 2 hours/day. Using these levels the IDEA was enabled to assess a patient's work capacity.

The IDEA was also the basis for the more individual rehabilitation for the following weeks in the programme. These were more work-related and educational.

3.2.2 The work-related part of the programme

During the work-related part of the programme (weeks 4 – 8) all the patients, despite being in a group, got individually tailored, work-related and ergonomic training.
Patients in work were asked to contact their employers This could be difficult as some had been away from work for a very long time: they might not even have been recognised at their old jobs because of possible reorganisation, or a new employer. The team's social counsellor had taken the first step and had contacted the employer with information about the plan for getting the patient back to work.
A visit to the Labour Market Institute (AMI) was scheduled for week 5. The aim was to inform the patients about the labour market and the fact that some of those in the programme would be able to continue at the Labour Market Institute after their rehabilitation. The AMI was mainly for the unemployed patients and those for whom no suitable jobs could be found.
In the programme, a close relative or friend was invited to a family counselling meeting to discuss day-to-day problems and how much the patient's pain had affected the family or their social life. The patient, the doctor and either the social counsellor or the psychologist was present.
During week 6, workplaces were visited. The patient accompanied by the team's physiotherapist and occupational therapist went to the patient's former workplace. The employer and a trade union representative or a colleague met them to discuss how to overcome any obstacles to the patient's return to work. Ergonomic analyses were made by the occupational therapist and physiotherapist to facilitate this, for example suggesting changes at the workplace so that the patient's pain was not provoked.

A concluding meeting was held at the end of the programme. The patient, the physician, the social counsellor and a social insurance official were present. Other participants involved in the patient's rehabilitation also invited to be represented at the meeting were the employer or the AMI, the trade union and the general practitioner or the employer's occupational health service. The patient's medical history, the result of the IDEA with the team's decision on the patient's ability to work, and the effect of the 8-week programme, were presented. The weeks and months to follow were planned in detail. Minutes were taken during the meeting and distributed to the participants so that all decisions made could be followed up.
After the meeting the patients could meet the doctor and the social counsellor to ensure that they had understood the plan in detail. An extensive statement written by the physician also included the results from the other team members, the IDEA and the concluding meeting.
At the one-month follow-up, the patient had an appointment with the team physician at the Pain Unit at the Department of Rehabilitation Medicine. The aim of this meeting was to ensure whether the plan drawn up at the concluding rehabilitation meeting was working. The patient was also given a copy of the medical statement. After the one-month follow-up the patient was referred back to the physician responsible for him/her.

3.3 Dropouts

In Studies I, II and IV seventy-two patients were enrolled. Five left the programme before the fourth week for medical reasons. Despite supposedly complete previous medical and surgical investigations they were found to have severe neurological or rheumatological conditions and were referred to specialists. This left 67 patients, a dropout rate of 7 %. They were all reached for the follow-up one year later. None of the 67 patients left the programme even though the opportunity was given when the IDEA was presented to them in the third week. In study II, 59 patients were followed up after three years (drop out rate 12 %). In study III, 149 patients completed the programme. Six years later, 122 were reached for a follow-up (drop out rate 18 %).

3.4. Statistical analysis (Studies I-IV)

The statistical analyses are described in the respective studies and summarised in Table VIII.

Table VIII. Statistical methods used in the four studies.

Study	Intra-group comparisons	Inter-group comparisons	
I	Spearman's correlation coefficient	Mann–Whitney U test	
II	Wilcoxon's test	Mann-Whitney U test, χ^2 test	A logistic regression analysis with a description of odds ratios and confidence intervals for unadjusted and adjusted values.
III	McNemar test Sign test	Mann-Whitney U test, χ^2 test	
IV	McNemar test Student's *t*-test Wilcoxon's test	χ^2 test	

3.5 Ethical considerations

The Hippocratic Oath, which focuses primarily on physicians' behaviour, has provided the foundational principles of medical ethics. In pain management five bioethical principles are commonly encountered; beneficence, non-maleficence, autonomy, justice and double effect. Human rights prescribe that medical treatment should be given independently of race and nationality. This requires information, discussion, coaching, structured methodology and a well-educated team always treating patients with all the respect their situation requires. The present patients, in addition to their persistent musculoskeletal-related pain, often had psychological and social complications and were disadvantaged in their contacts with health care, employers, social insurance office and other authorities. Relations between such patients and the authorities can be strained.
These patients are often considered a difficult group since their health is not improving, they are irritated, resigned and care-seeking. As a group they risk being discriminated against and treated with low priority. For these and other reasons it is extremely important that they be treated with all the respect, autonomy and justice that is required. The programme's multiprofessional rehabilitation team members were at great pains to treat the patients equally regarding age, sex, ethnicity educational and social background, religion and mother tongue.

The studies were conducted in accordance with the Helsinki Declaration and approved by the Ethics Committee at the Karolinska Institute (KI dnr: 138/01, 68/01 and 95/149).

4. RESULTS

4.1 Study I

None of the patients were at work at the start of the eight-week programme. At the 1-year follow up, 63 % had returned to work, or were in work-related activities, for at least four hours a day. There was a statistically significant correlation ($p < 0.01$) between the multiprofessional rehabilitation team IDEA and the actual outcome of the return-to-work rate 1 year after completing the programme (Table IX).

Table IX. The team's IDEA of return-to-work capacity and the actual outcome after 1 year.

	IDEA of return-to-work capacity		**Actual return-to-work rate after 1 year**	
	n	%	n	%
Full time (8h/day)	32	48	11	17
75% (6h/day)	15	23	2	3
50% (4h/day)	20	30	17	25
25% (2h/day or less)	0		0	
In work-related activities	0		11	17
Studies			1	1
Still on sick-leave			25	37

Table X Correlations of the return-to-work rate at the 1-year follow-up. (Spearman's correlation coefficient).

Variable	**Correlation (r-value)**
IDEA	0.5135
Patients own prediction	0.12
Time out of work before rehabilitation	- 0.18
Age	- 0.43
Pain intensity (VAS)	- 0.008
MSPQ	- 0.10
DRI	- 0.03

To find out how good the agreement of the team's IDEA was after three weeks in predicting the patient's actual return-to-work rate at the 1-year follow-up the agreement is shown Table XI.

Table XI. Agreement of IDEA and the actual return-to-work rate at the 1-year follow-up in percent of full time.

	The team's IDEA after three weeks				
Actual return-to-work rate	**0**	**50**	**75**	**100**	**Total**
0	**0**	14	7	4	25
50	0	**14**	4	4	22
75	0	0	**2**	0	2
100	0	1	1	**16**	18
Total	0	29	14	24	67

The statistical calculations gives a kappa rate of K = 0.308 and a weighted kappa rate of K = 0.385. The strength of agreement (adapted from Landis and Koch (1977) (60) and the proportional agreement P(A), in the continuance table was 48 %. This means that there was an absolute agreement of the IDEA and the patients' actual return-to-work rate in 48% of the cases. In other cases the proportion of agreement was not exact or differed considerable. Still, it was the best predictor of the variables studied.

It was not possible to predict the return-to work rate at individual level, only at group level. In the comparison group, three of 14 had returned to work but far more were on full disability pension. No statistically significant difference in pain intensity was found between the two groups. The results on MSPQ or DRI, the patient's own perceptions about returning to work and pain intensity, their ages or their period out of work did not predict return-to-work following the structured multiprofessional rehabilitation programme.
The IDEA developed by the rehabilitation team was shown to be the best predictor of the return-to-work rate, of the instruments compared in this group of patients.

4.2 Study II

At the one-year follow up, 57 % of the immigrants and 68 % of the natives had returned to work for at least four hours a day (Table XII). At the three-year follow-up, 48 % of the immigrants and 50 % of the native Swedes were still at work or in work-related activities. The difference was not statistically significant.

Table XII. Return-to-work rate among immigrants and native-born Swedes at the 1- and 3-year follow-ups

	Total	**Immigrants**	**Native Swedes**
	n (%)	**n (%)**	**n (%)**
1-year follow-up	67	30	37
Returned to work or in work-related activities	42 (63)	17 (57)	25 (68)
3-year follow-up	59	27	32
Returned to work or in work-related activities	29 (49)	13 (48)	16 (50)

A statistically significant difference (p = 0.023) between the groups was found regarding their own estimation of their ability to go back to work. Twenty eight (93 %) of the immigrants estimated it

"hard" or "very hard" to go back to work after the rehabilitation programme compared to twenty five (68 %) of the non-immigrant patients.
The activity level was lower (p = 0.011), and pain intensity and analgesics use were higher, among the immigrants than among the non-immigrants at the 3-year follow-up (p = 0.016, and p = 0.034).

Logistic regression analysis was performed for the 1- and 3-year follow-up data, seeking prognostic factors for the dependent variable return-to-work, with a description of odds ratios and confidence intervals for unadjusted and adjusted values of different independent factors. Variables controlled were; age, sex, white-collar / blue-collar work, immigrants/ non-immigrants, time out of work, VAS outcomes and use of analgesics. None of these variables showed statistical significance and none could be used in this study as predictors for return-to-work (Table XIII).

Table XIII. Logistic regression analysis for the one-and three-year follow-up data, with the intention of finding prognostic factors for the dependent variable return-to-work, with a description of odds ratios and confidence intervals for unadjusted and adjusted values of different independent factors. The third column shows the reference category chosen. (=odds ratio 1.0). GCD= Generalized coefficient of determination. (Model summary, Nagelkerke R square)

			UNADJUSTED			ADJUSTED		
			Odds ratio	**95% CI**	**GCD %**	**Odds ratio**	**95% CI**	**GCD %**
1-year follow up		Reference						7.3
Sick-leave	0-6 mo	vs. >24 mo	2.074	0.397-10.845		2.841	0.497-16.246	
before rehabil.	7-12 mo	vs. >24 mo	1.778	0.477-6.624	2.2	2.072	0.526-8.158	
	13-24 mo	vs. >24 mo	1.397	0.364-5.353		1.658	0.404-6.806	
Nationality	natives	vs. immi-grants	1.593	0.587-4.320	1.7	1.768	0.566-5.525	
Occupation	BCW	vs. WCW	1.012	0.361-2.842	0.0	1.120	0.332-3.776	
Gender	male	vs. female	2.292	0.565-9.291	3.0	2.490	0.562–11.026	
3-year follow up								8.8
Sick-leave	0-6 mo	vs. >24 mo	1.600	0.293-8.735		2.072	0.339-12.673	
before rehabil.	7-12 mo	vs. >24 mo	2.750	0.673-11.239	6.5	2.854	0.672-12.122	
	13-24 mo	vs. >24 mo	3.000	0.676-13.309		3.857	0.778-19.126	
Nationality	natives	vs. immi-grants	1.077	0.387-3.001	0.0	1.636	0.476-5.619	
Occupation	BCW	vs. WCW	1.267	0.440-3.650	0.4	1.798	0.499-6.476	
Gender	male	vs. female	0.833	0.224-3.103	0.2	1.084	0.258-4.548	

4.3 Study III

At the 6-year follow up 52% of the 122 patients were back at work compared to 13 % in the control group (p < 0.001). Further, compared with before entering the programme there was a statistically significant difference in the return-to-work rate within the study group (p <0.001). None of the present patients who returned to work was working less than 4 hours a day.

Concerning the actual change in working hours, there was a difference regarding age: older patients in the study group had decreased their working hours or were not working at all compared to the rest of the group (p = 0.008). Compared to before entering the programme, the patients had a statistically significant higher level of activity (p = 0.037). Pain reduction was experienced by 51% of the patients (p <0.001), 15 % reporting no pain at all (Fig 3).

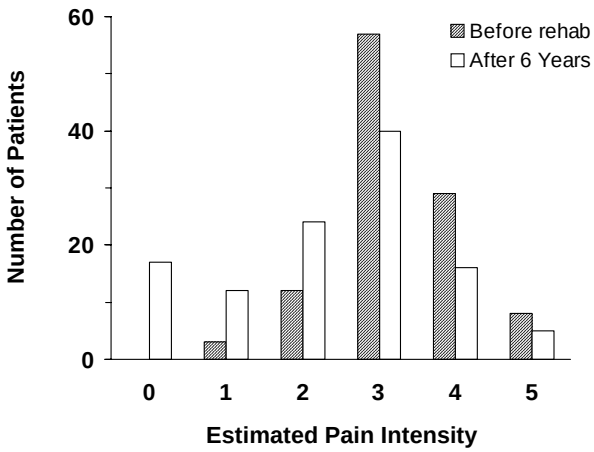

Fig 3. Estimated pain intensity before the start of the rehabilitation programme and at the 6-year follow-up. 0 = No pain. 1 = Some pain that can be ignored. 2 = Some pain that cannot be ignored but does not obstruct daily activities. 3 = Pain that makes concentration on some activities difficult. 4 = Pain that makes all activities difficult, except e.g. eating or going to the toilet. 5 = Pain that demands rest such as sitting or lying down.

Forty-seven percent of the patients had decreased their consumption of analgesics (p <0.001). Nineteen percent of the patients took no analgesics before programme start compared to 41% at the follow-up. No statistically significant difference in pain intensity was found between the working patients and those not working at the long-term follow-up. There was a statistically significant gender difference (p = 0.029) among patients that had not returned to work at the 6-year follow up: all patients still on full sick-leave were women. The men had either full temporary disability allowance or full disability pension, none in the study group being still on sick-leave. No other difference were found between the patients in the study group who returned to work and those who did not, regarding level of activity, pain intensity, consumption of analgesics, gender origin, diagnosis or duration of work absence. Those variables had no value for predicting the return-to-work rate.

4.4 Study IV

None of the patients in either group were at work at the start of the programme. At the one-year follow up, 42 (63 %) of the study group had returned to work or were in work-related activities. In the control group the corresponding figure was 16 (24 %), (p < 0.001). Taking the number of working hours per day into account, the corresponding return-to-work rate measured in full-time jobs was 30.5 in the study group and 16 in the control group, a difference of 14.5 in *(?)* the 67 pairs included in this study (p < 0.001).
To calculate the economic benefit of the rehabilitation programme, the total cost per patient was estimated to be € 3,723 (34,248 SEK). This included running costs, consultancy costs, cost of facilities used, overheads and miscellaneous.
The difference in the reduction of production losses between the study group and the control group was € 185,873 (1,710,072 SEK) for white-collar workers and € 317,628 (2,922,120 SEK) for blue-collar workers, with a total of € 503,499 (4,632,192 SEK) per year.

To calculate the economic benefit of the rehabilitation programme the € 503,501 (4,632,192 SEK) was divided by 67, the number of participants. This gave a total saving of € 7,515 (69,137 SEK) per patient and per year.

Given the above cost of € 3,723 (34,248 SEK) per patient, the programme was estimated to be economically beneficial within a year of the successfully rehabilitated patient's return to work. This included the costs for the patients who did not return to work. The successful patients had to work for between six and eight months for the benefits to just outweigh the costs. After having six to eight months in work, their contribution in terms of increased production had paid not only for their own rehabilitation but also for that of those who did not return to work. Assuming that the patients observed to be working after three years had been doing so all the time, the economic benefits were more than five times the running costs. On the same assumption, after six years they were least ten times the running costs.

5 DISCUSSION

5.1 Outcome of the rehabilitation programme

In the work presented in this thesis the outcome of an 8-week, work-related, multiprofessional rehabilitation programme for patients suffering from persistent musculoskeletal-related pain was analysed. The return-to-work rate is a common measure for multiprofessional rehabilitation programmes. However, the return-to-work rate varies a great deal in different studies. Chapman et al. (61) reported 6% while Roberts and Reinhardt (62) as well as Mayer et al. (22) reported a successful return-to-work rate of slightly above 80%. Other studies show a rate somewhere in between these extreme figures. This can partly be explained by the huge differences in the randomisation, methodology, input effort and length of the programmes. Another explanation is the differing national insurance systems and laws in different countries. Hence the present programme showed good results at national and international levels regarding the return-to-work rate. However, the circumstances of the present patients regarding origins, education, activity levels, pain problems and time out of work were not ideal for return to work. Surprisingly, at the 6-year follow up, more than half the patients had in fact returned to work.
It was not possible to identify individual parts of the programme responsible for the outcome, nor to isolate individual outcomes so as to characterise the patients who returned to work as opposed to the ones who did not.
Several circumstances could have contributed to the relatively good results. The programme was well structured and run by an experienced, multiprofessional team actively engaged in the patients' pain situation. The length of the programme and the fact that it required active attendance for 7½ hours, 5 days a week, over eight weeks, corresponded to at least a half-time job. A change in patients' pain behaviour, coping strategies and social behaviour was seen by the end of the programme, if not before. The patients were not left alone with their anxiety, catastrophising thoughts or failures to cope with their pain. They could discuss the results of the IDEA and, helped by the team, get used to a life that included work. The active cooperation and involvement of other people and organisations such as family, employers and the social insurance office were important in the rehabilitation. Lastly, their long sick-leave and the fact that they had exhausted the medical possibilities before entering the programme could have played an important role. After being excluded from the labour market, with restricted social contacts, they had got a chance to return to normal life often including work.

5.2 Selection bias and influence of other interventions

There might have been a bias in the selection of patients for the study. There are often long waiting lists for multiprofessional rehabilitation pain treatment and programmes. This may influence referral policy so that only the most severely affected patients will be referred. The circumstances during the studies did not allow to use randomized designs which means that there may be some uncertainty as regards some of the results, but that has been taken
into account when conclusions have been formulated.
Other interventions than the rehabilitation programme may have affected the results followed up one, three and six years later. The outcome in the control group with a return-to-work rate of 13% indicates a long-term effect of the 8-week multiprofessional rehabilitation programme, but further studies may show whether the present results reflect a natural course of events.
Other explanations such as socioeconomic changes might be found. However, the low return-to-work rate in the control group accords with that in other studies, showing a low rehabilitation potential among people sick-listed for more than three months (63).

Our patients were also requested to avoid other commitments during the programme and to arrange so that they could attend full time. The team members pointed out the importance to them of seeing how the patients were coping with their pain in all kind of situations so that they could guide them, especially when the pain was at its worst. The patients were told that this was a programme especially for people with pain: if they were not in pain they were in the wrong programme! The patients were also warned that the pain would probably get worse at the beginning of the programme, because of the new situation with new group members, the multiprofessional team, the programme, expectations, having to be on time – all stress factors that could increase the pain. Increased pain was indeed noted after the IDEA had been presented to the patients, at the end of the programme and just before they returned to work (Fig 4).

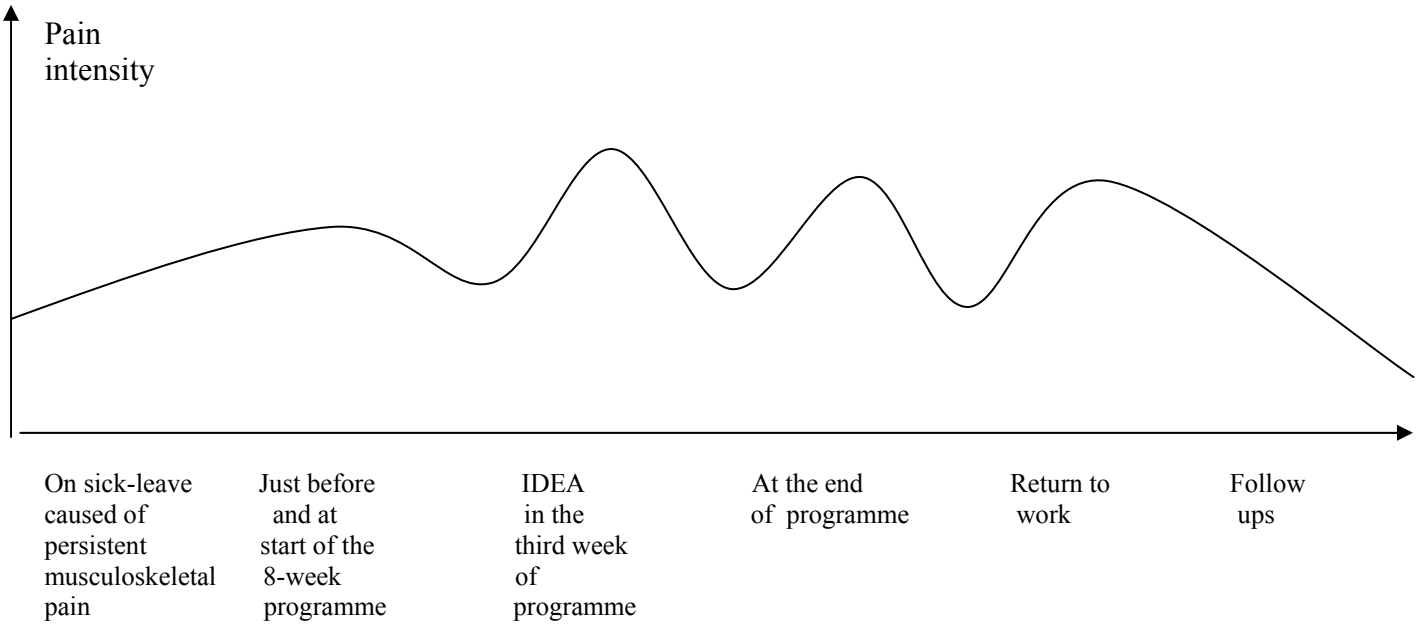

Fig 4. A model of the patient's estimated change in experienced pain intensity and pain behaviour during the rehabilitation phase to the follow-ups. The curve is based on the multiprofessional rehabilitation teams' estimation through observations, not on data.

Most of the patients had been investigated and treated by other specialists and were at high risk of over-treatment (analgesics, physiotherapy, blood samples, X-ray, magnetic resonance tomography, etc.). They were socially and physically inactive and had bad sleeping habits. They had undergone numerous treatments without lasting improvement. They had exhausted the medical possibilities before entering the rehabilitation programme. Numerous treatments are available to patients with persistent musculoskeletal-related pain. This can lead to ''treatment hunting'' and years of ongoing ineffective, patient-passive and expensive treatment including physiotherapy, alternative medicine, healing, massage; treatments based on often weak scientific evidence (40). This was the case for many of our patients.

5.3 IDEA and prediction of return-to-work rate

The IDEA was shown to be the best predictor of the return-to-work rate of the instruments compared (with a Spearman correlation coefficient r = 0.5135). Pain intensity, level of activity, age, time of absence from work and the patient's own prediction of returning to work, as well as

the MSPQ and the DRI, blue-collar/white-collar work or the use of analgesics were not crucial factors and had less or no value in predicting return to work. Other factors such as motivation and economic benefits may play a more important role. Restricting factors for return to work were unsolved insurance matters with the national social insurance office, occupational injury insurance, private insurance companies and the unemployment benefit office, among others. Risk factors for not returning to work include high age, low income, poor education (64), earlier sick-leave, spouse with disability pension, experience of bad working environment (65), low social group affiliation, alcohol abuse (66), return to work after neck, back and shoulder problems (67) low levels of self-estimated health and low belief in return to work (68). All these reduce the probability of return to the labour market: they might also be more important factors than pain. Further, several factors such as employer policies and disability compensation systems can affect absence from work (69).

5.4 Pain quality and intensity as a predictor of the return-to-work rate

Persistent non-cancer related musculoskeletal pain is not life-threatening and should not be considered as such. Such pain is said to be a symptom, not a diagnosis; but it has an extensive negative effect on life quality. However, there is little evidence that the pain intensity of patients suffering from long-term pain is a predictor of their ability to return to work. This is further supported by the fact that there were no differences in the use of analgesics between the working and not-working patients in the present study group. Other mechanisms and interventions play a larger role regarding work capacity in this patient category.
Almost 60% of our patients reported decreased pain intensity and about 50% decreased consumption of analgesics at the long-term follow-up. This indicates that musculoskeletal pain can change for the better. The use of the terms “long-term pain”, “persistent” or ”long-lasting pain” instead of “chronic pain” may well have a positive effect in rehabilitation. These patients have been in pain for a long time and are probably going to have to live with it for a long time to come. Improvement *is* possible, however, as shown in this study. “Chronic pain” on the other hand is a more definite expression and does not encourage patients in their effort to step up their activity and return to work.
This notwithstanding, the study shows that it is still possible after years of persistent pain and long-term sick-leave to rehabilitate patients back to a social life including work.

5.5 Comments on the programme and its objectives

For educational reasons the objectives of the programme were presented to the patients in the following order:

- increased level of activity,
- reduced pain intensity and
- return-to work.

The intention was to inform participants that active participation would hopefully lead to:

- improved physical conditioning, strength, flexibility, activity and psychological well-being,
- education of the patient in human anatomy, physiology and pain management,
- better control of inappropriate treatments, medication and pain behaviour.
- identification of reasonable vocational goals and a start on the process of return to gainful employment.

The first two objectives were often well accepted, but before or at the start of the programme it was not always easy to convince participants of the positive effect of returning to work. Since this was a *work-related* programme it was made clear that every patient would have an active plan for work

return at programme end. In some cases this could appear very frightening to patients who had not been at work for months or years.
Each patient received an individual plan to facilitate their return to work. It gave a structured schedule for the later, more work-related, part of the programme. The patient was asked if he/she would accept the evaluation, plan and individual objectives. If not, patients had the opportunity to leave the programme. In the fourth week, individual work-related training started and the patients were trying cope with the IDEA result.
An unusual part of the programme was that return-to-work potential was evaluated after three weeks, with five more weeks to go. Some of our patients needed and got individual appointments with different team members to discuss the IDEA result and to get used to the thought of returning to work despite their pain. It was pointed out that it was important, even if the IDEA indicated that a certain patient would be able to work full time, to start working only a few hours a day and to gradually extend this. A few patients found it difficult to return to a life including work. They had been on sick-leave for months or years and had found other values in life such as taking care of grandchildren, taking care of their house, moving to their summer home, or had a dog or a horse to take care of. Other patients changed their pain behaviour dramatically, but most started to implement their work-return plan.
It was important to point out that the programme was *not* a "hands on" treatment programme although many patients had been promised one by the referring physician. Rather, the point was to learn how to cope with long-lasting pain. Efforts were centred on increasing the patient's level of activity and capacity as close to normal as possible, despite the pain.
Since the rehabilitation programme was based on help to self-help, it required an active approach by the patients. The rehabilitation was performed mainly in group sessions but with individualised programmes including physical, practical, psychological and social training. The approach was medical-behavioural with a multiprofessional view aiming to develop and integrate bio-psychosocial knowledge regarding health and illness and to implement this knowledge for prevention, diagnosis, treatment and rehabilitation.
Further, some patients in the programme were in effect compelled by their local social insurance office, their insurance company or their employer to participate. Many had long-term pain syndromes with the pain as a minor problem compared to its consequences. The motivation and ability to change coping strategies from inactive to more active and to take full responsibility for pain behaviour were often limited. Patients often needed to be gently pushed through the programme by the team members to achieve the objectives.
It was quite common in the sixth week of the programme that patients with an earlier negative attitude, or with little motivation, suddenly changed their minds and became more positive. They suddenly started to take advantage of the possibilities offered in the programme.

The present outcome may reflect the result of programme interventions that could have played a significant role in participants' ways of coping with their pain and their activity limitations to increase their quality of life – even for those that did not return to work.

5.6 The immigrants versus the non-immigrants

The structured rehabilitation programme made it possible to assist immigrant patients as well as native patients to return to work, even if the former suffered from restricting factors such as language and education. A limitation of this study is the question of whether one may compare patients, as was in fact done in this study. The immigrant group was heterogeneous. However, this also applied to the non-immigrant group, homogenous only regarding culture and language. Another bias might have been that half of the immigrants were employed or had been employed as cleaners, but had other occupations impossible to practice in Sweden because of language or

other problems. On the other hand, the participants here had new opportunities to seek other occupations. One of our immigrants was working as an interpreter, others started small businesses, or worked in family businesses. There is a slight difference in the presentation of the patient's occupation in Study I compared with the same patients in Study II. This is due to the fact that when investigating the patient's actual occupation some of the patients had two employers. In Study II the main occupation is presented.

Recording the number of years in full-time education, which we did not do, would have given an idea of potential, as the immigrants were probably overqualified but did subsequently find more qualified jobs.

The fact that more native Swedes than immigrants were not taking any analgesics at the 3-year follow-up might be explained by the team's failure to indicate when and why analgesics could be of use. Pain is reconceptualised in learning-based behavioural terms. Methods of assessing behavioural elements of pain, and of discussing non-medical influences on pain with patients are important, as are behaviourally-based tactics for long-term management and reactivation (70). However, the immigrants may have had more difficulties in accepting and making use of this information. Differences in attitudes towards pain and in qualities of pain anxiety, focusing either on the meaning of pain and its consequences or on the immediate experience of pain, might influence rehabilitation (44).

Differences that could influence the possibilities of work ability, such as ethnic background, upbringing, religion, education, segregation, alienation, language, pain experience and pain behaviour, among others, could have been further obstacles. Despite all this, at the follow ups the immigrants had found jobs to the same extent as the native Swedes had.

Marhold et al. (71) suggested that patients' perceptions and beliefs about work and returning to work may be a significant hindrance to actual recovery. This seems not to have been the case in the present study, since the immigrant group had a lower estimation of the ability to return to work but a higher actual rate.

Using a different approach to ours, a study by Lindh et al. (28) evaluated the effectiveness of a multidisciplinary rehabilitation programme offered to a general population with 90 days of sick-leave due to non-specific musculoskeletal pain. The results concerning return to work and re-sick-listing during a follow-up period of five years were evaluated for Swedes and immigrants separately. Compared with a control group, the rehabilitation resulted in improved work stability after work return among the Swedes. The immigrants as a group, however, did not benefit from the programme compared with controls in primary care. The more positive outcome of our study in contrast to others' might be explained by the fact that the 8-week programme studied was, to my knowledge, more intensive than that in programmes described previously.

5.7 Prognosis and early rehabilitation interventions

The importance of early intervention to minimise the risk of central sensitisation phenomena and thus prevent the development of chronic pain has been indicated from a theoretical standpoint (72, 73). However, the long-term results of the present study suggest the opposite. The fact that 15% did not report any pain at all and that 41% were not taking any analgesics at the 6-year follow up raises questions as to whether a well-structured rehabilitation programme might affect central sensitisation positively in the long run. If patients can benefit from the programme and learn how to cope with their pain, it might reduce the overflow of afferent pain signals to the central nervous system. Is there a possibility that persistent pain can fade away with time, or did our patients have the wrong diagnosis? It might have been the patients with no sign of central sensitisation who experienced decreased pain or total pain relief? Further studies have to deal with these matters.

5.8 Return-to-work and gender perspective

At the 6-year follow up none of the men were still on sick-leave in the group of patients that had not returned to work at the follow up. This may be because men can put more effort into getting their files closed and being granted a disability pension. Ahlgren (74) states that the rehabilitation process favours men's return to work. On the other hand, in the Swedish social welfare system, women with low education who stay at home to bring up their children and have been out of the labour market for years achieve better economic compensation on sick-leave than on disability pension.

5.9 Return-to-work and economic perspectives

Outcome measures relating to areas of economic importance are lacking in the clinical, multiprofessional pain management and rehabilitation of patients suffering from persistent musculoskeletal-related pain (75, 76).
Multidisciplinary pain management is often perceived as an expensive option for patients with chronic pain and is often introduced when all other treatments have failed. Third-party payers appear more convinced of the efficacy of surgery for pain than of multidisciplinary pain treatment, seemingly more amenable to paying for surgery than for rehabilitation (77).
However, when comparing costs, the present rehabilitation programme paid off within a year after the successfully rehabilitated returned to work. The successfully treated would have had to work between 6 and 8 months in order for the benefits to just outweigh the costs. After having worked for 6-8 months, the contribution of the successful patients in terms of increased production would have paid for not only their own rehabilitation, but for the rehabilitation of those patients who did *not* return to work. Thus, this programme is cost-effective and will most likely generate substantial net economic gains for the community.

6 SUMMARY OF CONCLUSIONS

The results of the work presented in this thesis support the hypothesis that within a structured, multiprofessional, rehabilitation programme a majority of patients on long term sick-leave and suffering from persistent musculoskeletal-related pain can gain much and return to work – and remain at work – despite their pain. In addition, a higher level of activity and pain reduction were experienced by half the patients. Half of the patients had decreased their consumption of analgesics. The results also demonstrate that it is not too late to achieve good results even for patients who have been on sick-leave for long periods, i.e. months or years.

It was not possible to predict the return-to work rate at individual level, only at group level. A correlation was found between the IDEA of the multiprofessional rehabilitation team and the actual return-to-work outcome. The patient's own perception of returning to work, the pain intensity or the period of time out of work, or the MSPQ and DRI questionnaires, did not predict return-to-work ability. As reflected by the return-to-work rate, immigrants and non-immigrants benefited equally from the programme.
In economic terms, the rehabilitation programme paid off within a year after the successfully rehabilitated returned to work. The successfully rehabilitated patients would have had to work for 7½ months in order for the benefits to just outweigh the costs. After having worked for 6-8 months, the contribution of the successfully treated patients in terms of increased production would have paid for not only their own rehabilitation, but for the rehabilitation of those patients who did not return to work. After that the economic benefits would generate a net surplus. The estimated economic benefits for society are estimated to be more than five times the running cost after three years and at least ten times the running cost after six years.

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