



UPPSALA
UNIVERSITET

*Digital Comprehensive Summaries of Uppsala Dissertations
from the Faculty of Social Sciences 55*

Behaviours, Beliefs and Back Pain

*Prognostic Factors for Disability in the General
Population and Implementation of Screening
in Primary Care Physiotherapy*

INGRID DEMMELMAIER



ACTA
UNIVERSITATIS
UPSALIENSIS
UPPSALA
2010

ISSN 1652-9030
ISBN 978-91-554-7758-5
urn:nbn:se:uu:diva-121424

Dissertation presented at Uppsala University to be publicly examined in Universitetshuset, sal IX, Övre Slottsgatan 2, Uppsala, Friday, May 7, 2010 at 09:15 for the degree of Doctor of Philosophy. The examination will be conducted in Swedish.

Abstract

Demmelmaier, I. 2010. Behaviours, Beliefs and Back Pain. Prognostic Factors for Disability in the General Population and Implementation of Screening in Primary Care Physiotherapy. Acta Universitatis Upsaliensis. *Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Social Sciences* 55. 87 pp. Uppsala. ISBN 978-91-554-7758-5.

Aim: The overall aim of this thesis was to study prognostic factors for prolonged disability in back pain in the general population and physiotherapists' screening for prolonged disability, applying a social cognitive learning perspective.

Methods and results: Studies I and II were based on a survey in the general population in Sweden. **Study I** included 1024 individuals aged 20-50 years, reporting non-specific back pain. Four groups (n = 100, 215, 172 and 537) based on duration and recurrence of back pain were formed and compared. After controlling for pain intensity, catastrophising and expectations of future pain were positively correlated to pain duration. Perceived social support was negatively correlated to pain duration. **Study II** was longitudinal over 12 months and analysed one group reporting first-episode back pain (n = 77), and one group reporting long-term back pain (n = 302). Future pain intensity and disability were predicted by initial levels of pain and disability and pain-related cognitions in both groups. **Study III** examined the inter-rater reliability of a research protocol for assessment of physiotherapists' telephone screening for prolonged disability. The results demonstrated sufficient inter-rater reliability. **Study IV** evaluated the effect of a tailored skills training intervention on physiotherapists' screening for prolonged disability in back pain. Four physiotherapists in primary care participated in four quasi-experimental single-subject studies. Effects were seen in all participants, with increased screening of prognostic factors and less time spent on detailed discussions about back pain.

Conclusions: The identification of mainly cognitive explanatory variables indicates the relevance of a social cognitive perspective of back pain-related disability (studies I and II). Physiotherapists' telephone screening for prolonged disability in back can be reliably assessed (study III). It is suggested that interventions based on social cognitive theory are effective in producing change in specified clinical behaviours in physiotherapists (study IV).

Keywords: Physical therapy, behavioural medicine, back pain, general population, caregiver, prognostic factors, implementation, screening

Ingrid Demmelmaier, Department of Public Health and Caring Sciences, Box 564, Uppsala University, SE-75122 Uppsala, Sweden

© Ingrid Demmelmaier 2010

ISSN 1652-9030

ISBN 978-91-554-7758-5

urn:nbn:se:uu:diva-121424 (<http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-121424>)

To my two families

List of papers

The present thesis is based on the following papers, referred to in the text by their Roman numerals.

- I Demmelmaier, I., Lindberg, P., Åsenlöf, P., & Denison, E. (2008). The associations between pain intensity, psychosocial variables, and pain duration/recurrence in a large sample of persons with non-specific spinal pain. *Clin J Pain* 24(7):611-619.
- II Demmelmaier, I., Åsenlöf, P., Lindberg, P., & Denison, E. (2009). Biopsychosocial predictors of pain, disability, health care consumption, and sick leave in first-episode and long-term back pain: a longitudinal study in the general population. *Int J Behav Med* DOI 10.1007/s12529-009-9055-3.
- III Demmelmaier, I., Denison, E., Lindberg, P., & Åsenlöf, P. (2009). Physiotherapists' telephone consultations regarding back pain. A method to analyse screening of risk factors. Accepted for publication in *Physiother Theory Pract*.
- IV Demmelmaier, I., Denison, E., Lindberg, P., & Åsenlöf, P. (2009). Learning to screen for yellow flags in back pain. A tailored skills training intervention in physiotherapy telephone consultations. Submitted.

Reprints of articles I-III were made with permission from the publishers.

Contents

Prologue	11
Introduction.....	13
Pain.....	13
Pain models in history	13
Back pain.....	14
Classifications.....	14
The size of the problem	15
Risk factors for back pain.....	16
Development of long-term disability	16
Management of back pain in primary health care.....	19
Implementation of guidelines	21
Theoretical perspectives	23
Respondent and operant learning.....	23
Social cognitive learning	24
Behavioural learning in pain-related disability.....	26
Behavioural change in caregivers.....	27
Rationale for this thesis	27
Aims.....	28
Study I.....	28
Study II.....	28
Study III.....	28
Study IV.....	28
Methods	29
Design	29
Participants and data collection.....	29
Study I.....	30
Study II.....	30
Study III.....	31
Study IV.....	31
Measures	33
Studies I and II.....	33
Study III.....	34
Study IV.....	35
The intervention in study IV	37

Data management and analyses.....	40
Studies I and II.....	40
Study III.....	40
Study IV.....	42
Ethical considerations	43
Studies I and II.....	43
Studies III and IV	43
Results.....	44
Study I.....	44
Description and comparison of groups	44
Comparisons of groups after controlling for pain intensity	46
Study II.....	46
Within-group comparisons at inclusion and 12 months later	46
Prediction of pain, disability, health care consumption and sick leave.....	47
Study III	48
Extent and nature of screening	48
Inter-rater reliability of the method	49
Division of consultation time.....	49
Study IV	50
Screening of yellow and red flags	50
Division of consultation time.....	51
Knowledge, attitudinal orientation and self-efficacy.....	52
Discussion.....	53
Summary of results.....	53
Behavioural learning in back pain and disability	54
Studies I and II.....	54
Behavioural change in caregivers.....	56
Studies III and IV	56
Methodological considerations.....	61
Studies I and II.....	61
Studies III and IV	62
Conclusions.....	64
Clinical implications and future research.....	65
Studies I and II	65
Studies III and IV	65
Svensk sammanfattning (Swedish summary)	67
Studie I och II.....	67
Studie III och IV.....	68
Tack	70
References.....	73

Appendix: Red and yellow flags in protocol study IV (in Swedish)86

Abbreviations

BMI	Body Mass Index
CI	Confidence Interval
CSQ	Coping Strategies Questionnaire
E-SES	Self-efficacy for Exercise
GCPS	Graded Chronic Pain Scale
HADS-A	Hospital Anxiety and Depression Scale (Anxiety subscale)
HADS-D	Hospital Anxiety and Depression Scale (Depression subscale)
ICF	International Classification of Functioning, Disability and Health
LBPQ	Leuven Back Pain Questionnaire
LIV 90	Lifestyle, Performance, Health Report
MANCOVA	Multivariate Analysis of Covariance
MANOVA	Multivariate Analysis of Variance
MPI-S	Multidimensional Pain Inventory (Social support scale)
OMPQ	Örebro Musculoskeletal Pain Questionnaire
PABS-PT	Pain Attitudes and Beliefs Scale for Physiotherapists
PHC	Primary Health Care
PVAQ	Pain Vigilance and Awareness Questionnaire
SCT	Social Cognitive Theory
SES	Self-efficacy Scale
TSK-2	Tampa Scale of Kinesiophobia (version 2)
WHO	World Health Organization

Prologue

When I started out as a physiotherapist in primary care in 1989, my understanding of back pain was basically biomedical and physiologic. I recognised the obvious fact that the patients I met were troubled by their pain, sometimes depressed and often hindered from living their lives as they wanted to. I also considered it important to have knowledge about these issues, to get an overall understanding of the patients' situation. However, I did not view the patients' pain-related cognitions, emotions and behaviours as valuable information that should be integrated in the treatment plan. Rather, the focus was on the pain itself and how to decrease pain levels measured by scales from 0 to 10.

In 1996 I was employed as a physiotherapist in a military occupational health care unit. I was fortunate to work in a well-functioning team including a psychologist with cognitive-behavioural therapy competence. Over the years, I adapted a wider perspective of pain. I noted that a lot of the patients I met held dysfunctional beliefs and cognitions about the cause and consequences of their pain. The cognitions were obstacles to recovery as they hindered the patients from believing in their own ability to cope with pain and participating in valued activities in spite of pain. I heard stories about slipping pelvises, vertebrae not being in the right place and beliefs that joints were worn out and nothing to count on anymore. In many cases, the patients told me this was the information they had been given by doctors, chiropractors or physiotherapists, i.e. health care professionals, with great impact on patients' understanding of their pain. Sometimes the information had made the patient more aware of his/her limitations and more afraid to take part in activities. I grew more and more attentive of patients' cognitive and behavioural learning in health care, and what messages caregivers give to patients with back pain. I realised there was room for professional improvement in this area. One prerequisite was to persist in challenging the biomedical view of back pain, still dominant in health care practice.

At the time of completing this thesis, a rehabilitation guarantee has been launched in Sweden. It was developed as a response to changes in the social insurance legislation, implying more restrictive usage of sick leave by physicians. The rehabilitation guarantee aims to decrease sick leave rates in two large diagnosis groups based on symptoms; musculoskeletal pain in the

back, neck or shoulders, and psychological problems such as depression, anxiety and stress. The counties receive financial stimulus for treating these groups according to evidence. Patients with back pain at risk of developing long-term sick leave should be managed in multimodal rehabilitation teams that embrace a biopsychosocial perspective of pain and offer cognitive-behavioural interventions including promotion of physical activity. Patients with psychological problems should be offered cognitive behavioural therapy. The money spent on the rehabilitation guarantee is 560 million SEK during 2009 and 960 million SEK during 2010. One distinct problem is that feasible tools for identifying individuals with poor prognoses have not been implemented in the clinic. Considering the high prevalence of back pain and the small proportion developing long-term limitations in function and working capacity, it is crucial to implement screening for early detection of individuals with risk profiles. And having identified them, through physical, cognitive, emotional and behavioural parameters, they should be treated accordingly with the focus on valued activities and participation.

This thesis includes studies of prognostic factors for prolonged disability in back pain in the general population, which constitutes the recruitment base for primary care. It also includes physiotherapists' early screening of prognostic factors for prolonged disability in telephone consultations in primary care.

Introduction

Pain

Pain models in history

Pain has been systematically studied since the 17th century, when the French philosopher René Descartes introduced a model of pain perception (1). The model describes how tissue damage stimulates ascending pathways and how pain is registered as the neural signals reach the brain:

“...just as by pulling at one end of a rope one makes to strike at the same instant a bell which hangs at the other end.” (1)

According to the model, pain intensity is proportional to the amount of tissue damage. Descartes' model is dualistic in the sense that it distinctly separates body processes from mind processes. It was developed within a biomedical, reductionist paradigm, explaining pain and disease through biochemical and neurophysiologic processes (2). Pain was conceptualised as an almost exclusively sensory phenomenon, a view that dominated the theoretical understanding of pain for almost 400 years. In 1965, the Gate Control Theory was advanced by Melzack and Wall (3). They described a gate control system at the spinal level modulating sensory stimulation before pain is perceived and responded to. The theory presents a perspective of pain that includes psychological processes regulating neural signals, offering an explanation of pain in the absence of injury and injuries in the absence of pain. The model also includes an “action system”, i.e. behavioural responses as reflexes. Later, Melzack integrated the Gate Control Theory with Selye's theory of stress (4) into a Neuromatrix Theory (5). This further developed the view of pain perception, suggesting a framework in which genetically determined templates are modulated by the stress system and cognitive functions of the brain, in addition to sensory signals. During the 1980s and 1990s, a biopsychosocial perspective of pain emerged. It incorporates the notion that physiological, psychological and behavioural factors all interact and are influenced by the individual's context (6, 7). Among others, Waddell (2004 and 2006) has emphasised the need for a biopsychosocial model to assess and prevent long-term disability in musculoskeletal pain (8, 9).

Back pain

Classifications

The literature on back pain commonly uses specific anatomic regions to classify the pain as low back pain, thoracic back pain, neck pain and sometimes neck/shoulder pain. Low back pain is usually defined as pain and discomfort localised between the lowest ribs and the gluteal folds (10). Thoracic back pain has been defined as pain experienced between the boundaries of the first and 12th thoracic vertebrae and across the posterior aspect of the trunk (11). Neck pain is often defined as located between the upper linea nuchae and the spines of the scapulae (12). The term “back pain” in this thesis includes pain located on the backside of the trunk: from the neck down to the glutei area and sideways to the shoulders.

At three months after onset, about 85 percent of patients with back pain have their pain classified as non-specific. This means that no tissue damage corresponding to the symptoms can be identified with available diagnostic medical devices, such as imaging and nerve blocks (13, 14). Thus, in most cases individuals suffering from back pain do not get a specific patho-anatomic diagnosis relating to the source of pain, e.g. nerve root compression, inflammatory disease and cancer (15). Back pain in this thesis refers to non-specific back pain, as reported by the individuals.

There is a long tradition of classifying back pain according to duration. Various time spans have been suggested: acute pain is often defined as lasting for less than four or six weeks, chronic pain for more than three, six or twelve months, and subacute pain for the intermediate interval (15-18) The recurrent character of back pain often makes these temporal definitions inadequate to use. This thesis uses a classification of pain based on both duration and recurrence, i.e. the duration of the present pain episode and if it was the first episode of back pain or not.

Paralleling the evolution of a biopsychosocial perspective of pain, multidimensional classification measures have been developed. In 1975, Melzack developed the McGill Pain Questionnaire to assess sensory, affective and evaluative dimensions of pain (19). Kerns et al introduced the West Haven-Yale Multidimensional Pain Inventory in 1985, including subjective, behavioural and psychophysiological dimensions (20). Von Korff et al (1992) have suggested a classification according to the severity of pain, based on duration, intensity and interference of pain on activity and participation (21). Accordingly, multidimensional prognostic risk scores have been developed, based on reports of pain intensity, disability, depression, number of pain

sites and pain days in order to identify individuals with future long-term pain and disability (22, 23).

The size of the problem

Prevalence

Depending on the definitions used and the populations studied, prevalence figures vary considerably. A recent review reports that activity-limiting back pain affects 54 to 80 percent of the population in industrialised countries during a lifetime (24) and 10 to 30 percent at any given time (14, 15). In a WHO study of 14 countries, reports of persistent pain in primary care varied from 6 percent in Nigeria to 33 percent in Chile. The most common site of persistent pain was the back region (25).

Natural course

The natural course of non-specific back pain with recent onset is characterised by rapid improvements in pain and disability, but residual and/or recurrent symptoms of various severity within a year. Studies performed in the general population and in PHC settings demonstrate that only about 30 percent of pain sufferers recover completely within 12 months. However, most persons with back pain continue to work and do not consult health care for their pain. About 15 percent (range 3 to 40 percent) develop long-term disability with significant impact on working capacity and social life (26-31). The great majority of individuals sick-listed due to back pain return to work within one week while 90 percent go back within two months. Among persons still off work after six months, less than 50 percent go back, and after two years return to work is very unusual (32).

In the light of the recurrent and fluctuating course of non-specific back pain, it has been suggested that it should be viewed as a long-term condition characterised by variation and change, rather than separate acute, self-limiting episodes (33-35).

Societal costs

Apart from the individual suffering, back pain causes gigantic societal costs for health care, sick leave compensation and loss of production (14, 32, 36). The costs are mainly generated by the minor subgroup developing long-term disability and sick leave (37). Between 25 and 45 percent of individuals with back pain report seeking primary care during the previous month (38), the previous six months (39) and the previous year (40, 41). In the United States, back pain constitutes 15 percent of all outpatient visits (Lind, 2006). In Finland, musculoskeletal pain, mostly from the back, constitutes about 20 percent of visits in primary care (42). Productive time lost due to back pain

in the United States has been estimated to 19.8 billion USD per year (43), and the cost is increasing (24). In Sweden, back pain is the most common reason for both short- and long-term sick leave as well as disability pension (44). A Swedish study from 2004 estimated the annual costs for back pain in terms of health care and production loss to 3.3 billion Euros, or 1 percent of GNP (44).

Research has identified both risk factors and prognostic factors in back pain. Risk factors are associated with the occurrence of back pain, while prognostic factors are associated with development over time, such as the level of disability (45).

Risk factors for back pain

Occurrence of back pain is associated with physically demanding work, e.g. manual handling of heavy loads and enduring awkward working positions (14, 46-49). There is evidence for poor physical fitness as a risk factor (47, 49, 50) but no support for a sedentary lifestyle, measured by time in a sitting position (51). Perceived stress, anxiety and depressive mood have been identified as risk factors of back pain incidence (47, 52). Evidence is also accumulating that cognitive factors such as pain catastrophising and pain-related fear are involved in back pain occurrence (48, 53). Low co-worker support (54) and low work satisfaction (55) have also been found to be associated with the onset of back pain (49, 56).

Primary prevention

Studies on primary prevention of back pain have found support for some interventions. There is a moderate preventive effect of physical exercise (50, 57, 58). Information and education based on a biopsychosocial view of pain may promote health- and work-related outcomes in the general population (59). Work place interventions have so far not proven efficient in preventing the onset of back pain (49, 60).

Development of long-term disability

Disability

Based on the World Health Organization's (WHO) International Classification of Functioning, Disability and Health (ICF) disability is defined as "a difficulty in functioning at the body, person, or societal levels, in one or more life domains, as experienced by an individual with a health condition in interaction with contextual factors"(61). The ICF implies a dynamic, multi-factor perspective of health and disability, and a shift of focus from biomed-

cal cause to overall impact of a health condition. According to ICF, the degree of disability is defined in relation to an individual's performance of activities in a specific context. The term activity refers to the execution of a task, while participation describes the involvement of individuals in real-life situations (62).

Most individuals with back pain experience short-term limitations in activity and participation. Only a minor proportion of pain sufferers develop long-term disability, extensive health care utilisation and sick leave (26-31). Consistent research findings demonstrate the importance of a wide perspective in understanding the development of long-term disability (14, 63, 64). Multivariate models have been developed, revealing physical, psychological, behavioural and contextual modifiable predictors (65-71). In the transition from short-term pain to a long-term disabling condition, cognitive and emotional factors seem to be of significant importance (72-75).

Prognostic factors

Fear-avoidance beliefs, pain catastrophising, and low levels of functional self-efficacy are modifiable, cognitive factors that have demonstrated prognostic value for disability and sick leave (74-79). Inversely, high levels of self-efficacy and functional coping are predictive of better function and return to work (80, 81). Fear-avoidance beliefs are beliefs that pain and physical activity are harmful and potentially disabling (82). Pain catastrophising has been defined as a strong tendency to focus on pain and negatively evaluate one's ability to cope with it (83). Self-efficacy is defined as an individual's confidence in performing a specific behaviour in a specific situation related to a defined outcome (84)

Psychological distress, predominantly depression, has been found to predict poor outcome in back pain (52, 68, 74, 85, 86). Job satisfaction and co-worker support have also demonstrated prognostic value for long-term outcome in back pain (54, 55, 87, 88). Examples of physical prognostic factors are a heavy work load and monotonous tasks (69, 71, 89).

Studies of pain intensity's prognostic value have demonstrated contradictory results. Some studies report that pain intensity is a weak predictor of disability (76, 79, 90), whereas a recent overview points out that pain intensity contributes significantly in explaining disability both in acute and long-term pain (91). Turner et al (2004) suggested a non-linear correlation between pain and functioning. They found high ratings of pain intensity (5 or more on a 0-10 scale) to be strongly correlated to disability, whereas low ratings (0-4) showed weaker correlations (92).

To categorise and communicate evidence-based prognostic factors in research and clinical work, a terminology of “flags” with specific colours has been introduced (93). Yellow flags are psychological, behavioural and contextual prognostic factors that may impede one’s ability to recover from pain episodes. Examples of yellow flags are strong beliefs about back pain being harmful and potentially severely disabling (73, 91, 94), depressive mood (74, 85), fear-avoidance beliefs and substantial self-perceived dysfunction (74, 85, 95). Red flags are triage factors, i.e. history and physical symptoms of serious spinal pathology implying further diagnostic examination and/or urgent measures. Blue and black flags have also been identified, both referring to work-related obstacles to recovery. The flag system does not provide mutually exclusive categories for all prognostic factors, but is useful in describing this complex area with a great number of relevant factors. The terms yellow and red flags are frequently used in research, in the clinic and in evidence-based guidelines. For examples, see Table 1. In this thesis, the term “prognostic factors” is used interchangeably with “yellow and red flags”.

Table 1. *Examples of yellow and red flags in back pain (93)*

Prognostic factor	
Yellow flags	Negative beliefs about pain being harmful and potentially severely disabling Pain catastrophising Fear-avoidance beliefs Depressive mood Dysfunctional social support, e.g. overprotective or punishing High pain intensity High self-perceived disability Heavy work load History of extended sick leave
Red flags	Recent history of violent trauma History of cancer Widespread neurological symptoms, e.g. cauda equina syndrome Unexplained weight loss

Management of back pain in primary health care

Guidelines

International guidelines have been developed for the assessment and treatment of acute and chronic non-specific low back pain in primary health care (PHC) (96-98). Briefly, they state the following:

- Physicians should perform a triage based on a case history and physical examination to rule out signs and symptoms of serious spinal pathology, i.e. red flags. See Table 1 for examples.
- Diagnostic imaging tests should be used only in cases of severe neurological deficits or when serious underlying conditions are suspected.
- Once red flags have been ruled out, patients should be assessed regarding psychosocial barriers for recovery, i.e. yellow flags. See Table 1 for examples.
- Relevant information and assurance should be given, as well as advice to stay active and continue daily activities and work if possible.
- Medication for pain relief should be prescribed and taken at regular intervals.
- Spinal manipulation should be considered if patients fail to return to normal activities

Time spans for all the respective measures are not clearly stated. The European guidelines recommend awareness of yellow flags from the first visit in primary care (98). For patients already in a long-term state of pain only a few recommendations regarding diagnosis and treatment exist. Yellow flags should be assessed, and in cases of low impairment and disability, physical exercise and medication should be prescribed. If pain and sick leave persist more than 4-8 weeks, cognitive-behavioural interventions encouraging physical activity should be considered (96-98).

Dutch guidelines for physiotherapists conclude that assessment in low back pain should focus on disability and participation problems related to pain. They state that patients with normal recovery in activity and participation should be given reassurance and advice to stay active. Patients with a prolonged recovery should be offered exercise therapy with a behavioural approach (99). Moffett and McLean (2006) highlight the role of physiotherapists in primary care. As physiotherapists often constitute the first line of

contact for patients with back pain, they should perform an early assessment of red and yellow flags (100).

Specific guidelines for neck pain are less detailed, possibly due to the smaller amount of research performed compared to that for low back pain (101). American guidelines for physiotherapists state that non-specific neck pain should be assessed regarding physical and psychological prognostic factors (102) and recommend physical activity and exercise as the first option for treatment (103). It has been suggested that neck pain is generally less disabling than low back pain (104, 105). However, studies have identified similar risk factors for the occurrence of low back and neck/shoulder pain as well as prognostic factors for long-term outcome (14, 73, 86).

Screening and psychosocial interventions

Screening is a process of identifying individuals or groups who may be at increased risk of a disease or condition, through the assessment of detectable risk factors (106). Considering the minor proportion of individuals with back pain developing long-term disability and sick leave, it is crucial to identify individuals with “risk profiles” at an early stage (107, 108). It has been suggested that screening of sociodemographic “risk markers” such as age, educational level and work status should be performed within 3-4 weeks of disability or/and sick leave. From 4-12 weeks, the importance of psychosocial issues is more pronounced and screening for individual, modifiable prognostic factors is motivated (109, 110). Screening questionnaires for low back pain and neck pain have been developed, demonstrating sensitivity of 0.68 to 0.81 (111-114). Sensitivity in this context is the ability to correctly identify individuals with an unfavourable outcome, and should be compared to the 0.50 level expected by chance alone.

Intervention research on back pain indicates the importance of assessing and targeting a number of factors, predominantly psychological and contextual, to affect disability and sick leave (8, 108, 115-117). Treatment studies in PHC and work place settings have provided strong evidence for physical conditioning programs for individuals with back pain (108, 118-120).

An important aspect of interventions on individuals is the tailoring of treatment. It has been defined as change strategies intended to reach one specific person, based on an individual assessment and related to the outcome of interest (121). The application of tailoring and cognitive-behavioural principles in physical therapy settings has proven useful. Åsenlöf et al (2005) reported positive effects of interventions using functional behavioural analysis (122) to tailor treatment in musculoskeletal pain (123, 124).

Despite a few studies demonstrating successful integration of physical and psychological components in the management of back pain, overall negative findings have been reported regarding implementation of early psychosocial assessment and interventions in PHC. Workshop discussions and literature reviews have suggested development of easy-to-use screening tools (110, 125) and more research on determinants of caregivers' skills and behaviours (110).

Telephone consultations

When individuals consult physiotherapy clinics regarding back pain, the initial contact is often made by telephone. Evaluations of the efficacy of telephone consulting in physiotherapy have demonstrated promising results. One study of a telephone service in the United Kingdom reported that about 60 percent of patients consulting physiotherapists about musculoskeletal pain could manage with telephone advice only. The remaining 40 percent were referred to a clinic (126). Physiotherapy telephone advice given prior to face-to-face consultations regarding back pain has shown positive effects on reported symptoms and patient satisfaction (127). One randomised controlled trial in physiotherapy indicated advice only to be as effective as "standard treatment" including manual therapy and strengthening exercises (128, 129).

Based on the international guidelines for non-specific back pain, it has been suggested that physiotherapists should assess both the physical/pathological red flags and the psychosocial yellow flags for long-term disability and sick leave (99, 100). If assessment results in identification of psychosocial risk factors, appropriate measures should be taken (130). This could include referrals to other caregivers and individualised advice, and should also affect how urgently a face-to-face consultation is offered. As initial telephone consultations within physiotherapy constitute early health care contacts, it can be claimed that the guidelines should apply in this context (100). Little is known about assessment of yellow flags in telephone consultations regarding back pain.

Implementation of guidelines

The implementation of guidelines for back pain in PHC has been a great challenge so far. Several studies have demonstrated a gap between evidence-based recommendations and clinical practice when it comes to caregivers' behaviours. A recent review of physicians' management of low back pain reports low adherence to guidelines regarding physical and psychosocial assessment and contradictory results for referrals, medication and advice to remain physically active (131) Somerville et al (2008) also reported low adherence concerning opioid prescription and diagnostic imaging (132).

Research within physiotherapy has demonstrated considerable use of treatments where evidence of their efficiency is lacking (133-135). Studies of physiotherapists' self-reported behaviour indicate low adherence regarding assessment of psychosocial prognostic factors and recommendations of physical activity (136, 137). Green et al (2008) observed insufficient use of psychosocial questioning and goal-setting in physiotherapists' treatment of back pain (138).

A review by Fullen et al (2009) reports the impact of educational interventions, e.g. information and role playing, on physicians' clinical behaviour. The results are contradictory regarding effects on referrals, medication, sickness certification and advice about physical activity (131). Educational interventions targeting physiotherapists' treatment of low back pain have revealed difficulties in changing clinical behaviour (139, 140), even when there are positive changes in knowledge and attitudes (140). Sandborgh et al (2008) analysed treatment integrity in an intervention study where physiotherapists were to deliver a tailored treatment for musculoskeletal pain. They found low adherence to the treatment protocol, and suggested that one obstacle was the physiotherapists' insufficient theoretical understanding of tailoring (141). Van der Wees et al (2008) performed a review of educational interventions to influence physiotherapists' back pain treatment. They concluded interventions should contain problem solving, role playing and applied skills training to be effective (142).

Implementation of evidence-based guidelines in clinical practice generally requires changes at different levels: individual caregivers, teams, health care units and organisations. Implementation strategies should be adapted to barriers and facilitators for change on all levels (143-148). Important barriers for behavioural change have been identified as lack of agreement with guideline recommendations, organisational constraints and conflicting patient expectations (147, 149-153). In 2005, the Cochrane Collaboration performed a review evaluating tailored interventions to overcome behavioural barriers. Disappointingly, they found methodological deficits impeding any clear-cut conclusions (154). To affect individual caregivers' behaviours in relation to clinical guidelines, it has been concluded that educational interventions should be theory-based. Implementation researchers have pointed out that social cognitive theories should guide the development of interventions on behavioural change (155-157).

Theoretical perspectives

This thesis embraces a biopsychosocial perspective, implying that human behaviour is complex and should be understood from physiological, psychological, behavioural and contextual aspects. This perspective applies both to pain-related disability and caregivers' behaviours in assessment and treatment of patients with pain. Theories of respondent and operant learning are considered, as well as social cognitive theories emphasising individuals' expectations as behavioural determinants. Behavioural learning is an individual process and should be understood from an individual perspective. Nevertheless, some theoretical principles are described below to elucidate the general mechanisms. In this thesis, the term "behavioural learning" is used as a comprehensive concept including respondent, operant and social cognitive learning.

Respondent and operant learning

Respondent learning can be described as learning by association. An unconditioned stimulus, e.g. an intensely painful movement is likely to elicit fear and sympathetic arousal as an automatic, unconditioned response. Contextual factors that are perceived to be connected in time to the movement can be associated with pain, elicit fear and may become a conditioned stimulus. Thus, respondent learning can result in perceiving situations as threatening by being associated with a previous painful experience (158). The mechanism can explain fear of movement and excessive avoidance of activity, as merely the thought of performing a movement can become a conditioned stimulus and elicit fear (6).

Operant learning is basically governed by the consequences of behaviour. Analysing behaviour using operant learning principles includes the identification of antecedent cues (A) for a specific behaviour (B) and the consequences of that behaviour (C). The consequences can act as reinforcing stimuli that increase the likelihood of the behaviour occurring in the future, for example attention from others. Avoidance of negative consequences, such as pain, is also reinforcing and may result in dysfunctional pain behaviour including persistent avoidance of activity. Inversely, the consequences can act as punishing stimuli that suppress the behaviour, such as criticism. Withdrawal of positive stimuli such as attention is also suppressive of behaviour. When behaviour is repeatedly preceded by an antecedent stimulus that has been shown to predict reinforcing consequences, this stimulus takes on a special quality and becomes a discriminative stimulus, i.e. it sets the occasion for repeating that specific behaviour (158). One example is a caregiver asking a patient detailed questions about pain symptoms. If the patient has experienced reinforcing attention in a previous contact, the patient may have

learned to give very detailed descriptions of symptoms at the very sight of the caregiver. Fordyce et al claimed that pain-related behaviour is subject to the same operant learning principles as all other behaviour (159). He pointed out that long-term pain ensures the need for behaviour change in both pain sufferers and their families. Accordingly, health care providers need skills to promote behaviour change (160).

The mechanisms of respondent and operant learning operate simultaneously and interchangeably (158). Automatic responses elicited by conditioned stimuli may be perceived as reinforcing or punishing consequences and thereby produce operant learning. For example, a physical activity that has gradually become a conditioned stimulus elicits fear and automatic physiological arousal (respondent learning). The arousal may be interpreted as a negative consequence of the activity, subsequently decrease the frequency of the behaviour (operant learning) and result in fear-avoidant behaviour. Avoiding the activity will be reinforced by short-term reduction in fear, hindering confrontation and behavioural relearning.

Social cognitive learning

Social cognitive theory (SCT) (161) is derived from social cognitive learning (162) and presents a model that further expands the understanding of behavioural learning. It adds an agentic perspective to the principles of respondent and operant conditioning, emphasising individuals' possibilities to exercise personal influence on their lives. Central concepts referring to expectations indicate the importance of intention and forethought in analysing and changing human behaviour (163). Behaviour is viewed as dynamic and in constant interaction with the individual and the environment, conceptualised as triadic reciprocal causation (see Figure 1). Crucial *personal* individual characteristics include the individual's beliefs of personal efficacy (self-efficacy) and outcome expectations about positive and negative consequences of a specific behaviour. An individual's self-control includes components of self-monitoring and goal-setting in relation to performing a specific behaviour. *Behavioural* patterns are influenced by e.g. behavioural capability, relying on knowledge about a specific behaviour and having the skills to perform it. *Environmental* determinants are external to the individual, e.g. family and caregivers, but are also specific situations defined by place, time and physical features. Reactions from the environment can be reinforcing - or punishing - in three modes: direct (as in operant learning), vicarious (as in observational learning) and by self-reinforcement (as in self-control). According to SCT, a dynamic, interactive perspective is needed to assess and affect pain-related behaviour, just like any other behaviour.

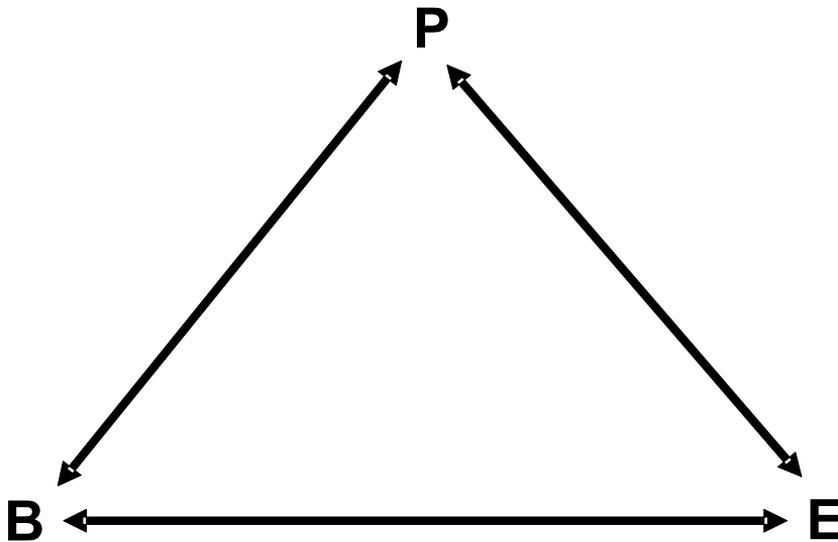


Figure 1. The relationships between the three major classes of determinants in reciprocal determinism. P represents the individual personal factors, such as cognitive, affective and biological events. B stands for behavioural patterns and E is the external environment, such as family and physical features (162)

Self-efficacy

Self-efficacy is a key feature of SCT, and is regarded as a strong determinant of behaviour. It is defined as an individual's confidence in performing behaviour to achieve a specific goal, and confidence in overcoming barriers to that behaviour. Bandura (1997) describes four principal sources of self-efficacy beliefs: enactive mastery experiences, vicarious experiences, verbal persuasion from others, and physiological and affective states within the individual. Enactive mastery experiences are the most powerful sources of information, as they are the result of direct performance. Vicarious experiences are mediated through observational learning, i.e. other persons' performance of behaviour and evaluated as successful or not. This source of self-efficacy beliefs may be more important when there is obvious uncertainty of one's capabilities. Verbal persuasion can be used to sustain self-efficacy, especially if expressed by significant others. Physiological and affective states affect self-efficacy beliefs, especially in tasks involving physical accomplishment and coping with stressors. Arousal that is too high or too low can debilitate performance and affect an individual's expectation of success (84).

Goal-setting

According to SCT, goal-setting is important in the personal regulation of performance, i.e. self-control. Goals should be modified continuously with increasing difficulty to promote self-efficacy beliefs for the target behaviour. Locke and Latham (2002) describe goals to affect performance through four mechanisms: a directive function in directing attention and effort toward goal-relevant activities; an energising function through high goals leading to greater effort than low goals; a persisting function; and an activating function by leading to discovery and use of task-relevant knowledge and strategies (164). To be efficient in behavioural change, goals should be specific, measureable, activity-related, realistic and time-specified (165).

Behavioural learning in pain-related disability

The frequently used definition of pain, as formulated by the International Association of Pain (IASP), is:

“An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (166)

The IASP definition of pain includes sensory, emotional and cognitive aspects of pain, but leaves out behavioural and contextual aspects. From a social-cognitive learning perspective this is a weakness that limits the usefulness of the definition. The importance of including pain-related behaviour and context in research and the clinic has been pointed out e.g. by Waddell et al (7) and by a recent review, which advocates a biopsychomotor view of pain (167). According to SCT, the recurrent character of spinal pain offers repeated occasions for learning and re-learning pain-related cognitions and behaviours resulting in various degrees of disability (168). Long-term disability should be viewed as the result of a dynamic process that has evolved over time. Previous research has demonstrated that psychological factors such as beliefs and expectations about pain and its consequences are crucial in the development of long-term disability (6, 169). In this perspective, caregivers are important aspects of the environment that can reinforce functional and/or dysfunctional cognitions and behaviours in the patients (160). Considering the potential of early, preventive measures, the initial health care contact regarding e.g. spinal pain has been pointed out as especially important (10, 168)

Behavioural change in caregivers

Cognitive and behavioural learning principles should also be applied in assessing, analysing and changing caregivers' behaviours. Research on behavioural change in caregivers suggests interventions should be based on social cognitive theories (155-157). It has been concluded that active approaches including skills training and ongoing feedback are effective in changing clinical behaviour and that passive approaches such as receiving educational materials are generally ineffective (144). It has also been pointed out that no intervention is effective under all circumstances, implying a general need to tailor interventions to perceived barriers to change (144) and also specifically in the implementation of clinical guidelines for treatment of musculoskeletal pain (170). According to SCT, educational efforts aiming at behavioural change in caregivers should promote self-efficacy by using individual goal-setting with increasing difficulty.

Rationale for this thesis

In summary, the fluctuating course of non-specific back pain provides pain sufferers with numerous occasions to learn various pain-related cognitions and behaviours. Modifiable prognostic factors of long-term disability have been found to be mainly psychological, e.g. depression and strong negative beliefs about pain and its consequences. Most studies of the functional relationships between predictors and unfavourable outcome in back pain have been performed in patient populations. General population studies are needed to include individuals with pain not consulting health care and to study predictors of disability in early stages as well as later stages of a presumptive pain-related cognitive and behavioural learning process. Moreover, the knowledge on behavioural change in caregivers has to be expanded. Interventions should be theory-based and tailored to identified barriers for change. To be concordant with guidelines, assessment of prognostic factors for disability should be performed. In order to improve management of back pain in PHC, evidence-based prognostic factors for prolonged disability have to be assessed early and systematically. Telephone consultations given by physiotherapists to patients with back pain are usually early health care contacts, where identification of prognostic factors should be made according to guidelines. It was hypothesised that physiotherapists can improve their skills in the screening of prognostic factors in telephone consultations regarding back pain.

Aims

The overall aim of this thesis was to study prognostic factors for prolonged disability in back pain in the general population and physiotherapists' screening for prolonged disability, applying a social cognitive learning perspective.

Specific aims of the studies included in this thesis were:

Study I

To describe and compare pain intensity, disability and biopsychosocial variables in four pre-defined groups from the general population, based on duration and recurrence of back pain.

Study II

To investigate the course and the biopsychosocial predictors of pain, disability, health care consumption and sick leave in two groups from the general population, with either first-episode or long-term back pain.

Study III

To assess the reliability of a research protocol for physiotherapists' screening of prognostic factors for prolonged disability, and to examine the extent and nature of screening in telephone consultations regarding back pain in a convenience sample in primary care.

Study IV

To study the effect of a tailored skills training intervention in primary care on four physiotherapists' screening of prognostic factors for prolonged disability in initial telephone consultations regarding back pain.

Methods

Design

Four studies are included in this thesis. Studies I and II were based on a survey in the Swedish general population and used a cross-sectional and longitudinal design, respectively. Study III was primarily psychometric, using a correlative and explorative design. Study IV consisted of four quasi-experimental single-subject studies. It included a tailored skills training intervention with repeated measurements during baseline, two intervention phases and post-intervention. An overview of the studies is shown in Table 2.

Table 2. *Overview of studies I-IV*

Study	Design	Sample	Data collection	Assessment
I	Cross-sectional survey	1024 individuals with back pain from the general population	Questionnaires	Feb 2005
II	Longitudinal survey	397 individuals with back pain from the general population	Questionnaires	Feb 2005 and Feb 2006
III	Correlative and explorative	17 telephone consultations	Audio recordings	2007-2008
IV	Quasi-experimental single-subject	Four physiotherapists in PHC	Audio recordings Questionnaires	Repeated measurements Feb-Oct 2009

Participants and data collection

Studies I and II were based on the same survey in the general population. In February 2005, postal questionnaires were sent to 5000 individuals aged 20-50 in Sweden, randomly selected from a national person and address registry (SPAR). Two postal reminders were sent within five weeks of distribution, if necessary. Exclusion criteria were recognised specific back pain and pregnancy. For specification of exclusions, see papers I and II. The response rate was 39% among the 4694 eligible individuals.

Study I

Study I included 1024 individuals aged 20-50, reporting non-specific back pain. Participants were divided into four categories according to duration and recurrence of back pain: 1) pain duration less than 3 months and first-episode (n = 100), 2) pain duration less than 3 months but not first-episode (n = 215), 3) pain duration 3-12 months (n = 172) and 4) pain duration more than 12 months (n = 537). For description of the study group, see Table 3.

Table 3. *Description of the study group in study I.*

		Total study group (n = 1024)
		%
Age	20-30	31.6
	31-40	33.6
	41-50	34.8
Gender	Men	41.8
	Women	58.2
Ethnicity	Non-Swedish origin	8.6
Family situation	1 adult-household	24.0
Education	9-year compulsory school	11.0
	11-12 years, upper secondary school	52.4
	University studies	36.5
Work status	Working	75.0
	Studying	10.0
	Sick leave or disability pension	6.3
	Other	8.7
Health care consumption	Contact with primary care previous 3 months	33.5

To estimate representativeness, the study group was compared with a Swedish population with musculoskeletal pain (n = 3208) (171). The study group was comparable to the pain population regarding age, gender and proportion of 1 adult-households. The study group had smaller proportions of participants of non-Swedish origin, and with PHC contacts during the previous three months.

Study II

Two groups from the sample in study I responded twice to the questionnaire, in February 2005 and in February 2006. One group reported first-episode non-specific back pain with duration less than 3 months (n = 77), and one group reported long-term (>12 months) non-specific back pain (n = 302). The first group was included to represent an early stage of a presumptive learning process related to pain, and the second group was included to repre-

sent a later stage of this presumptive process. For description of the groups, see Table 4. Participants reporting pain at both assessments (n = 42 out of 77 and 265 out of 302 in the respective groups) were included in the analyses of changes over time.

Table 4. *Description of the groups in study II.*

		First-episode pain group (n = 77) %	Long-term pain group (n = 302) %
Age	20-30	39.0	24.5
	31-40	26.0	32.5
	41-50	35.1	43.0
Gender	Men	41.6	37.7
	Women	58.4	62.3
Ethnicity	Non-Swedish origin	7.8	4.6
Family situation	1 adult-household	29.0	27.0
Education	9-year compulsory school	9.2	12.0
	11-12 years, upper secondary school	47.4	52.0
	University studies	43.4	36.0
Work status	Working	75.3	75.2
	Studying	13.0	7.9
	Sick leave or disability pension	5.2	7.6
	Other	6.5	9.3
Health care consumption	Contact with primary care previous 3 months	18.2	39.4

Study III

Study III aimed primarily to assess inter-rater reliability of a research protocol and included 17 recordings of telephone consultations regarding back pain. The consultations were performed by five physiotherapists at two PHC clinics in mid Sweden during 2007-2008. To be included, the consultations had to be the initial contact between the physiotherapist and the patient. The patients had to be between 20 and 60 years of age and understand and speak Swedish. Furthermore, they should report back pain with no recognised diagnosis, such as rheumatic disease or malignancy. Data were collected by audio recordings made by the physiotherapists.

Study IV

Study IV was an intervention study and included four physiotherapists at one PHC clinic in mid-Sweden. Every individual constituted her/his own control in four single-subject studies. The participants were self-selected and ex-

pressed positive attitudes towards evidence-based practice. Their respective ages were 40, 35, 27 and 44: three women and one man. Their experience working as physiotherapists ranged between 4 and 20 years. Data collection methods were audio recordings and questionnaires. The participants audio-recorded 63 consultations in all, fulfilling the same criteria as in study III, except for the patients' upper age limit, which was removed. All participants performed telephone consultations as part of their ordinary work. They used the telephone in their own office, either alone or in the presence of one of the other participants. Apart from physiotherapists, the PHC clinic was manned with physicians, nurses, laboratory personnel and welfare officers, a total of 50 persons.

Measures

Studies I and II

The questionnaire used for data collection in studies I and II included background data on pain duration, age, gender, education, work and family situation, and 23 additional study variables. For an overview of measures, see Table 5. Psychometric properties of the instruments are reported in paper I.

Table 5. *Measures used in studies I and II*

Variable and measure	Items	Response scale
Pain severity		
GCPS (21)	8 items	Grade 0-IV
Pain intensity		
Characteristic pain intensity from GCPS (21)	3 items	0-10 rating scale
Disability		
Disability score from GCPS (21)	3 items	0-10 rating scale
Cognitive/affective variables		
Fear of movement/(re)injury TSK-2 (172)	13 items	4-point Likert scale
Functional self-efficacy SES (173)	8 items	8-point Likert scale
Self-efficacy for exercise E-SES (174)	6 items	10-point numerical scale
Anxiety HADS-A (175)	7 items	4-point Likert scale
Depression HADS-D (175)	7 items	4-point Likert scale
Catastrophising Subscale from CSQ (176)	6 items	7-point rating scale
Pain vigilance Part of PVAQ (177)	4 items	7-point rating scale
Pain expectations OMPQ (112)/study-specific	2 items	7-point rating scale
Work expectations OMPQ (112)	1 item	7-point rating scale
Ability to prevent and decrease pain Modified from CSQ (176)	2 items	7-point rating scale
Stress (178)	1 item	5-point Likert scale
Physical variable		
Body Mass Index (179)	Weight/height ²	
Self-reported behaviour		
Pain confrontation Part of LBPQ (180)	3 items	7-point rating scale
Physical exercise LIV 90 (181)	2 items	5-point Likert scale
Everyday physical exercise LIV 90 (181)	2 items	5-point and 4-point Likert scale

Table 5 cont.

Environmental variables

Perceived social support; punishing, solicitous and distracting responses Subscale from MPI-S (182)	11 items	7-point rating scale
Physically demanding work LIV 90 (181)/study specific	2 items	7-point and 4-point rating scale
Work satisfaction Modified from OMPQ (112)	5 items	7-point rating scale

TSK-2 = Tampa Scale of Kinesiophobia version 2, SES = Self-efficacy Scale, E-SES = Self-efficacy for Exercise, HADS-A = Hospital Anxiety and Depression Scale (Anxiety subscale), HADS-D = Hospital Anxiety and Depression Scale (Depression subscale), CSQ = Coping Strategies Questionnaire, PVAQ = Pain Vigilance and Awareness Questionnaire, OMPQ = Örebro Musculoskeletal Pain Questionnaire, MPI-S = Multidimensional Pain Inventory (Social support scale), LIV 90 = Lifestyle, Performance, Health Report, LBPQ = Leuven Back Pain Questionnaire.

Study III

A research protocol was developed, based on guidelines for the management of low back pain in PHC (10, 96, 130) and evidence-based prognostic factors for disability in back and neck pain (73). The protocol was used as a manual to assess two separate outcomes: first, *how many and which prognostic factors were screened* and second, *how consultation time was divided* among six predefined item categories.

The protocol included operationalisations of seven psychosocial factors, i.e. yellow flags, and one physical factor, i.e. red flags and radiating pain. For examples of possible questions and statements that were to be referred to specific factors, see Table 6. Criteria for active screening by the physiotherapists were also set: see under “Data management and analyses”. Time usage during the consultations was measured in relation to six items: pain problem, patient expectations, general health behaviour, screening, actions and administration. The items were informed by Pendleton’s map for patient-physician face-to-face consultations (183).

Table 6. *Possible questions and statements to be referred to specific psychosocial and physical prognostic factors*

Prognostic factor	Possible questions from physiotherapists	Possible statements from patients
<i>Psychosocial (yellow flags)</i>		
Pain intensity	"On a 0-10 scale, how bad was your average pain during the past week?"	"If I would rate my pain on a scale, it would be 8 out of 10"
Disability (work, home, leisure activities)	"Which activities can you manage at work?"	"I cannot go horse riding because of the pain"
Sick leave	"Have you had time off work because of your back pain?"	"I have been sick-listed for three weeks"
Coping	"What can you do to alleviate your pain?"	"I go for long walks and then I feel better"
Negative beliefs	"Are you afraid to make movements because of the pain?"	"If I keep on working, I think my back could be really damaged"
Expectations of duration of pain	"Do you think that your back pain will be long-term?"	"I guess this pain will be long-lasting"
Depressive mood	"What about your mood? Has it been affected by your back pain?"	"This pain wears me down psychologically"
<i>Physical</i>		
<i>Spinal pathology (red flags) and radiating pain</i>		
	"Have you got any problems emptying your bladder?"	"I sense some kind of numbness around my genitals"
	"Do you have radiating pain in your leg/s?"	"I have pain that radiates from my back all the way to my left foot"

Study IV

Study IV used repeated measurements during four phases: baseline (phase A, five weeks), knowledge acquisition (phase B₁, four weeks), skills training (phase B₂, 20 weeks) and post-intervention (phase C, seven weeks).

Primary outcome measures

1) To assess *the number of screened prognostic factors*, the research protocol developed in study III was extended to a total of eleven factors (see Appendix). The extended protocol included operationalisations of ten psychosocial factors, i.e. yellow flags, and one physical factor, i.e. red flags. "Cop-

ing with pain” in study III was divided into “Cognitive coping” and “Behavioural coping”. “Fear of movement” was added as a specification of “Negative beliefs” and “Reactions from family/friends” was added as a contextual yellow flag. An overview of the three added factors and examples of questions and statements referring to specific factors are shown in Table 7.

Table 7. *Added prognostic factors in study IV. Possible questions and statements to be referred to specific factors.*

Prognostic factor	Possible questions from physiotherapists	Possible statements from patients
Behavioural coping	“What can you do to alleviate your pain?”	“I go for long walks and then I feel better”
Cognitive coping	“Can you manage your pain by thinking in a particular way?”	“I say to myself that despite the pain, my life is really good. It makes me feel better”
Reactions from family and friends	“How does your family react to your pain?”	“My parents are worried. They think I have not been assessed thoroughly enough”

Inter-rater agreement for the 11-factor protocol was assessed by examination of nine (15%) of the consultations. The author (ID) and one external rater examined the consultations independently. For details of the procedure, see paper IV. Inter-rater agreement regarding how many yellow and red flags were screened demonstrated intraclass correlation of 0.97 (single measure, two-way random effects model, absolute agreement). Kappa value of inter-rater agreement on which specific factors were screened in the consultations was 0.84 ($p < .001$, 95% CI 0.72-0.96).

2) *Division of consultation time* was categorised into a) screening of yellow and red flags; b) detailed discussions about pain symptoms; c) other items. It was measured by listening to the recordings and registering the time in five-second intervals. “Other items” included: discussions about general health behaviour and patient expectations, actions such as giving information/advice and administrative matters such as finding a suitable time for a visit to the clinic.

Secondary outcome measures

1) *Knowledge* about red and yellow flags in back pain was measured using three items, modified from Overmeer et al (140).

2) *Biomedical and biopsychosocial orientation* towards back pain was measured using the Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-

PT) (184). A previous examination of factor structure has demonstrated one biomedical factor (ten items, 0-60 scale) and one biopsychosocial factor (nine items, 0-54 scale). Both factors have shown predictive validity for caregivers' judgements regarding the harmfulness of physical activities and regarding recommendations about physical activity and return to work (184).

3) The participants' *self-efficacy for screening* of the specific yellow and red flags was assessed using a study-specific measure constructed by the author (ID) and the main supervisor (PÅ). It consisted of eleven items corresponding to the eleven factors defined in the main outcome measure "Number of screened yellow and red flags". The instructions and items were formulated according to Albert Bandura's "Guide for constructing self-efficacy scales" (185).

The primary outcomes were assessed continually in all phases of the study. Knowledge, attitudinal orientation and self-efficacy were assessed at the end of baseline, in the middle of the knowledge acquisition phase, three times during the skills training phase and immediately after finishing the intervention. An overview of time points for the assessments by questionnaire is shown in Table 8.

Table 8. *Study phases and time points for assessments (=X)*

	BASELINE	INTERVENTION			POST-INTERVENTION	
	A (5 w)	Knowledge acquisition B₁ (4 w)	Skills training B₂ (20 w)			C (7 w)
Knowledge	X	X		X	X	
Orientation	X	X		X	X	
Self-efficacy	X	X	X	X	X	

The intervention in study IV

The intervention was designed to correspond to key features of Social Cognitive Theory (162). The rationale was to promote *behavioural capability* in the participants by knowledge acquisition, development of feasible screening questions and skills training in authentic telephone consultations. Individual goal-setting and self-monitoring were used to enhance *self-control*. *Self-efficacy* was promoted by setting individual, realistic goals to provide successful experiences of performing a new behaviour, i.e. screening for yellow and red flags. The intervention comprised two phases: knowledge acquisition and skills training. It was framed by a short introduction (session 1) and five group sessions during 20 weeks (sessions 2-6). The sessions took place

in a meeting room at the clinic, and were led by ID with assistance from PÅ. The intervention included a challenge of professional roles and clinical behaviour. Being aware of the emotional stress this may involve, both researchers were present to enable even smaller discussion groups if needed.

To promote knowledge acquisition, the participants were given relevant sections of guidelines (130), one scientific article on yellow and red flags (93) and five written questions to guide their reading. Two weeks after receiving the written material, the second group session was held where central concepts and attitudes towards screening were discussed. No instructions regarding screening in the subsequent telephone consultations were given at this time.

Barriers for screening in telephone consultations were identified at sessions 2-6. They included unclear aims of the initial telephone consultation, the participants' negative expectations of the outcome of screening such as negative reactions from the patients and fear of not managing the patients' answers in a professional way. The perceived barriers were discussed in the group sessions and corresponding actions to overcome them were included in the individual goals.

To enable skills training, a check list for telephone screening was developed by the participants. They formulated specific questions to be used in screening for each factor. The participants formulated individual specific goals: which factors they were going to screen for, how often they intended to do it and what specific questions they were going to use. Between group sessions 2-6, skills were trained in authentic telephone consultations according to the individually set goals. Recordings of consultations were e-mailed to ID, normally during the day of the consultation. Individual feedback on the recorded consultations was given in two modes: first, by discussing recordings of consultations at sessions 3-6. ID chose examples of effective screening of specific yellow flags in the consultations, providing positive reinforcement to the recorded participant and opportunities of observational learning for the other participants. Second, feedback related to specific consultations was given by ID by e-mail and telephone. This feedback concerned which factors were screened and how time was used on screening and detailed discussions of pain symptoms. The e-mail and telephone feedback was given between three and eight times to each participant, corresponding to 52 percent of the recorded consultations during the intervention. An overview of the structure and content of the intervention is presented in Table 9.

Table 9. *Structure and content of the intervention*

Session	Session length	Phase	Content	Activities between sessions
1	20 min	Knowledge acquisition	Introduction	Reading guidelines guided by questions on knowledge and perceived barriers for screening
2	3 h	Knowledge acquisition	Literature seminar with discussions Identification of barriers Comprehensive feedback on screening in recorded consultations	Reflection on perceived barriers for screening
3	3 h	Skills training	Development of check list for screening Feedback by listening to recordings Individual goal-setting	Screening of prognostic factors in authentic consultations, according to individually set goals
4	3 h	Skills training	Follow-up and adjustment of individual goal-setting Feedback by listening to recordings Individual feedback by e-mail/telephone	Screening of prognostic factors in authentic consultations, according to individually set goals
5	3 h	Skills training	Follow-up and adjustment of individual goal-setting Feedback by listening to recordings Individual feedback by e-mail/telephone	Screening of prognostic factors in authentic consultations, according to individually set goals
6	3 h	Skills training and relapse prevention	Follow-up and adjustment of individual goal-setting Feedback by listening to recordings Individual feedback by e-mail/telephone Individual plan for relapse prevention	Continuous application of screening skills according to individual relapse prevention plan

Data management and analyses

Studies I and II

The questionnaire used in studies I and II consisted to a minor extent of subscales of instruments and study-specific items. In order to reduce and congregate data, a principal component analysis was performed (see paper I). To capture the variance in pain intensity and disability, it was decided to use the subscales “Characteristic pain intensity” and “Disability score” from The Graded Chronic Pain Scale (GCPS) (21), instead of the total GCPS. For management of non-normally distributed variables, missing data and outliers, see the respective study.

Multivariate analyses of variance (MANOVA) were performed to examine between-group differences. In order to compare groups after controlling for pain intensity, three separate multivariate analyses of covariance (MANCOVA) were performed, using pain intensity as a covariate. Bonferroni corrections were used to protect against error in inference owing to multiple comparisons.

In study II, two of the outcome measures were dichotomised, as data were substantially skewed regarding health care consumption and sick leave. Health care consumption was dichotomised to reflect both organisational level of health care and number of visits. Sick leave was dichotomised into “Yes” (one day or more) or “No”. Both study groups were described at inclusion and 12 months later. The McNemar test was performed within each group to investigate changes in the dichotomised variables. Paired samples t-test was used within each group to assess changes in pain intensity and disability. A significance level of 0.05 was set, and Bonferroni corrections were applied. Point biserial and bivariate analyses (Pearson’s r) between potential predictors and outcome measures were calculated. Based on the results from the bivariate analyses, simple linear regressions were performed and multiple regression analyses were executed. A significance level of 0.05 was used for the linear regression analyses.

Study III

The examinations of the consultations were performed by three persons: ID (rater 1) and two external raters (raters 2 and 3). Rater 2 was a physiotherapist and PhD student within behavioural medicine/physical activity and rater 3 was a clinically practising physiotherapist with further education in cognitive-behavioural therapy. Before the examinations started, both external raters were trained in two consultations each and any differences in judgements were discussed in relation to the protocol. All three raters examined the transcribed consultations concerning screened prognostic factors, and rater 1 examined how consultation time was divided among six predefined items.

Screening

All raters read through the transcriptions and marked sections in the text judged to correspond to either psychosocial or physical prognostic factors according to the protocol. Judgements were made with a focus on the verbal behaviour of the physiotherapist, i.e. posing questions or discussing specific factors with the patients. When prognostic factors were brought up by the patients, the response from the physiotherapist had to be more than saying “Yes” or giving non-verbal feedback, e.g. “humming”, to be judged as screening. This procedure resulted in a score out of eight factors in each consultation, and a record of which specific factors were judged to be screened in each consultation. The text location for each factor was also registered. The records of factors and corresponding text sections were analysed descriptively.

Three aspects of inter-rater reliability were investigated: first, *how many factors* were screened; second, *which specific factors* were screened; and third, *which sections in the text* were judged to correspond to specific factors.

1) Intraclass correlation (single measure, two-way random effects model, absolute agreement) for the three raters was used to estimate agreement regarding how many factors were screened. 2) Kappa values were calculated pair-wise between raters to estimate agreement on which specific factors were screened in the consultations. When one rater in a pair judged a factor as being screened, and the other rater did not, this “zero” factor was registered and included in data as non-agreement. Consultations where the raters agreed pair-wise that no factor was screened by the physiotherapists were excluded from the analyses. 3) The analyses of agreement on which sections in the text corresponded to specific factors were only performed on the cases where the raters had agreed on which specific factors were screened. Each screened factor had to correspond to at least one identical section in the text to be classified as agreement. Pair-wise agreement between raters was estimated in percent.

Division of consultation time

Markings were made by rater 1 for the sections in the transcriptions corresponding to each of the six items: pain symptoms, patient expectations, health behaviour, screening, actions and administration. The categorisation covered the entire consultations, i.e. each part of the consultations was assigned to one of the six items. The recordings were reanalysed by rater 1 in order to assess the time spent on each separate item, rounded off to the nearest five-second interval. The mean time for each item was calculated and illustrated in a graph, and the proportion of time used on each item was analysed by visual inspection.

Study IV

ID transcribed the recorded consultations (n = 63) verbatim and analysed them continuously during all phases of the study. Text sections judged to correspond to specific yellow and red flags were marked and coded for each flag. The criteria for active screening by the physiotherapists were the same as in study III.

Yellow flag screening (10 items) was separated from red flag screening (1 item) in the analyses of the number of screened flags and self-efficacy. For division of consultation time and knowledge, the yellow and red flags were analysed together.

Primary outcome

The *screening of yellow flags* for each participant was analysed in two ways: first, by summing the raw scores for each factor and calculating the proportion of maximum possible screening during baseline and post-intervention. Secondly, data were plotted in graphs corresponding to all phases of the study. The graphs were visually inspected to assess changes in trend, level and latency. For assessment of inter-rater reliability of the visual inspection, see paper IV. *Red flag screening* was described at baseline and post-intervention.

For *division of consultation time*, markings were made by ID for the sections in the transcriptions corresponding to three item categories: a) screening of yellow and red flags; b) detailed discussions about pain symptoms; and c) other items. The recordings were clocked according to the procedure in study III. The mean proportion of the total consultation time spent on each item was calculated in percent for each participant.

Secondary outcome

Knowledge about yellow and red flags was reported in percent, and estimated by relating all correct answers according to guidelines to the total number of answers given by each participant. Two separate sum scores for *biomedical and bio-psychosocial orientations* towards back pain were calculated for each participant, according to the instructions for PABS-PT (184). *Self-efficacy for screening* of yellow flags was calculated in two ways. To evaluate changes from baseline to post-intervention, sum scores for all prognostic factors were computed for each participant and changes were estimated in percent. To describe development over time, median self-efficacy was calculated at baseline, four times during the intervention and post-intervention.

The participants' goal-setting was quantified by counting the number of yellow flags they aimed to screen for in the subsequent telephone consultations, from 0 to 10 factors. Setting the goal to "sometimes screening for factor X" was counted as 0.5. Data on median self-efficacy and goal-setting were plotted in the same graphs as the number of screened yellow flags.

Ethical considerations

Studies I and II

The participants were informed about the aim of the studies, how data would be handled and that participation was voluntary, all in accordance with the Ethical Review Act (2003:460). Non-responders received two reminders by mail. They were not approached to do an attrition analysis, as no response was regarded as a decision not to participate. The Regional Ethical Board in Uppsala decided no ethical approval was needed for studies I and II, as no intervention was performed.

Studies III and IV

In studies III and IV, both physiotherapists and patients were informed about the overall aim of the study before they decided to participate. They received oral and written information as prescribed in the Ethical Review Act (2003:460). Possible negative effects on the physiotherapists from exposing own behaviour to external judgement were recognised in both studies. In study IV, emotional reactions from challenging one's professional role and own clinical behaviour were considered. To identify and minimise any adverse effects, the results in study III were presented and discussed at a seminar with the participating physiotherapists. The discussions were led by ID. In study IV, the participating physiotherapists were specifically informed that the intervention included listening to and discussing recordings of their own consultations with colleagues. To provide a positive context in line with behavioural learning principles, only examples of effective screening were chosen in the feedback situations during the first sessions. Over time, examples of screening that could be further developed were also used. The presence of both ID and PÅ in all group sessions enabled discussions with individual participants when needed. Studies III and IV were approved of by the Regional Ethical Board in Uppsala: nos. 2008/257 and 2008/396, respectively.

Results

Study I

Study I was based on cross-sectional data from a general population sample reporting back pain, and investigated differences between four groups based on subjects' pain duration/recurrence. The groups were formed to capture 1) first-episode pain with duration less than 3 months, 2) recurrent pain with duration less than 3 months, 3) pain with duration between 3 and 12 months, and 4) pain with duration more than 12 months.

Description and comparison of groups

Means and standard deviations for all study variables are presented in Table 10. Three separate MANOVAs were performed, owing to different sizes of subsets, and resulted in statistically significant models. The first MANOVA included all variables except social support and work-related variables. The overall analysis was significant, $F(48, 2997) = 6.8, p < .0005$, partial $\eta^2 = 0.1$. The second MANOVA included three social support scales, and resulted in an overall significant model, $F(9, 2466) = 2.3, p = .015$, partial $\eta^2 = .01$. The third MANOVA included two work-related variables, and also indicated overall significance, $F(6, 1692) = 2.2, p = .044$, partial $\eta^2 = .01$. The results indicate that the groups with first-episode pain and recurrent short-term pain reported lower levels of pain intensity, fear of movement/(re)injury, pain catastrophising and pain expectations, and higher levels of functional self-efficacy, compared to the groups with pain duration longer than 3 months.

Table 10. Means (M) and standard deviations (SD) in all study variables in the four pain duration/recurrence groups. Rows including significant mean differences (MANOVA $p < .05$) are in bold type. Among these, means with a common letter (a, b, c) do not differ, while means without a common letter differ.

		Group 1 <3m first episode (n = 100)	Group 2 <3 m recurrent (n = 215)	Group 3 3-12 m (n = 172)	Group 4 >12 m (n = 537)
		M (SD)	M (SD)	M (SD)	M (SD)
Cognitive/affective					
Fear of movement	TSK 13-52 scale	19.5^{ab}(5.2)	20^a(6.4)	22.9^b(7.9)	22.6^b(7.3)
Functional self-efficacy	SES 8-64 scale	56.7^a(6.0)	55.1^a(7.3)	51.8^b(9.6)	51.9^b(9.6)
Self-efficacy for exercise	E-SES 6-60 scale	32.4 (11.6)	32.4 (13.1)	29.6 (13.3)	30.0 (13.0)
Anxiety	HADS-A 0-21 scale	6^a	6.1^a	7.4^b	7.6^b
Depression	HADS-D 0-21 scale	4.3^{ab}(3.2)	3.9^a(3.1)	5.3^b(3.9)	5.5^b(3.7)
Catastrophising	CSQ 0-36 scale	4.2^a(4.8)	5.4^a(6.4)	8.8^b(7.6)	9.6^b(7.7)
Pain vigilance	0-24 scale	12.2 (4.8)	12.8 (4.7)	13.6 (4.4)	12.9 (4.5)
Pain expectations#	0-12 scale	3.7^a(2.6)	4.7^a(3.1)	6.2^b(2.8)	8.0^c(2.9)
Ability to prevent and decrease pain	0-12 scale	7.6^{abc}(3.0)	8.0^b(2.8)	7.0^{abc}(3.0)	6.8^c(2.8)
Stress	1 item 1-5 scale	2.5^a(1.3)	2.7^{ab}(1.2)	2.9^{ab}(1.3)	2.9^b(1.3)
Physical					
Body Mass Index (BMI)	Continuous scale	24.1 (3.5)	25.1 (4.0)	25.4 (4.7)	24.6 (3.8)
Environmental					
Social support	MPI				
- punishing responses	0-6	0.7 (1.0)	0.7 (1.1)	0.8 (1.2)	0.9 (1.2)
- solicitous responses	0-6	3.0 (1.5)	2.8 (1.4)	3.0 (1.6)	2.5 (1.5)
- distracting responses	0-6	2.9 (1.7)	3.1 (1.8)	3.2 (1.9)	2.7 (1.8)
Physically demanding work	1-10 scale	5.2 (2.4)	4.8 (2.4)	5.5 (2.5)	5.4 (2.5)
Work satisfaction	0-30 scale	19.3 (6.2)	20.1 (5.0)	19.3 (5.4)	18.9 (5.9)
Behavioural					
Pain confrontation	0-18 scale	10.1 (3.3)	9.8 (3.6)	10.0 (3.9)	10.3 (3.6)
Physical exercise	2-10 scale	5.3 (2.1)	5.6 (2.2)	5.5 (2.2)	5.5 (2.2)
Everyday physical exercise	2-9 scale	5.8^{ab}(1.7)	6.0^a(1.8)	5.6^b(1.8)	6.0^{ab}(1.8)

Note: High scores indicate high levels of the variable

#A high score indicates a high perceived risk of having future pain/long-term pain

Comparisons of groups after controlling for pain intensity

In order to compare groups after controlling for pain intensity, three MANCOVAs were performed with pain intensity as a covariate. The first analysis included all variables except social support and work-related variables. The overall model was significant, $F(45, 2997) = 5.7, p < .0005$. The second analysis included three social support scales, and the overall model was significant, $F(9, 2463) = 3.1, p = .001$. The third analysis included work-related variables, resulting in a non-significant overall model, $F(6, 1690) = 1.0, p = .397$, partial $\eta^2 = .004$. The results demonstrate that the groups differed modestly in three cognitive factors and perceived social support. Catastrophising, pain expectations and perceived social support were positively correlated to duration of pain, but this was not true for depression. For details of between-group differences as a result of the MANCOVAs, see paper I.

Study II

Study II was longitudinal and investigated changes in and predictors of pain, disability, health care consumption and sick leave in two groups from a general population sample. One group represented an early stage (first-episode pain, less than 3 months) of a back pain problem and the other one represented a later stage (pain more than 12 months).

Within-group comparisons at inclusion and 12 months later

The analyses of change over time show a reduction in reported pain (Yes/No) from inclusion to 12 months: in the first-episode group from 100 percent ($n = 77$) to 54.5 percent ($n = 42$), and in the long-term group from 100 percent ($n = 302$) to 89.7 percent ($n = 271$). No other changes in the outcome variables were seen in either of the two groups. Data on health care consumption, sick leave, pain intensity and disability in the subgroups reporting pain at both assessments are presented in Table 11.

Table 11. *Health care consumption, sick leave, pain intensity, and disability at inclusion and 12 months later for participants reporting back pain at both assessments.*

	First-episode group Pain < 3 months		Long-term group Pain > 12 months	
	Inclusion (n = 41-42) ^a	12 months later (n=41-42) ^a	Inclusion (n = 253-265) ^a	12 months later (n =253-265) ^a
Health care consumption				
<i>High %</i>	12.2	19.5	37.9	38.6
<i>Low %</i>	87.8	80.5	62.1	61.4
Sick leave				
<i>Yes %</i>	7.1	4.8	15.3	13.8
<i>No %</i>	92.9	95.2	84.7	86.2
Pain intensity				
M (SD) <i>0-100</i>	38.0 (15.8)	39.4 (12.8)	48.1 (16.0)	47.8 (16.7)
Disability				
M (SD) <i>0-100</i>	15.4 (19.7)	14.3 (16.3)	23.1 (22.7)	22.4 (21.3)

^a n varies within groups owing to internal attrition

Prediction of pain, disability, health care consumption and sick leave

The point biserial and the bivariate analyses (Pearson's *r*) demonstrated correlations between 1) single predictors and outcome, and 2) multiple predictors and outcome. Correlations stronger than 0.3 (range 0.305 to 0.603) and significant on a $p < .05$ level were considered meaningful and were kept for the subsequent analyses. The identified multiple predictors in both study groups were pain intensity and disability at inclusion but also beliefs and expectations about pain and its consequences. For details of the bivariate correlations, see paper II.

First-episode group

In the first-episode group, simple linear regression analysis identified physically demanding work at inclusion as a single predictor of reported pain 12 months later ($r^2 = .106$, $N = 77$, $p = .006$). Pain expectations at inclusion was identified as a single predictor of sick leave 12 months later ($r^2 = .104$, $N = 41$, $p = .043$). Depression at inclusion was identified as a single predictor of health care consumption 12 months later ($r^2 = .093$, $N = 42$, $p = .05$). Overall multiple regression models significantly predicted pain intensity ($F(2, 34) =$

4.7, $p = .016$, adjusted $R^2 = .17$) and disability ($F(4, 32) = 4.1, p = .009$, adjusted $R^2 = .256$). The cognitive predictors were fear of movement/(re)injury and pain catastrophising.

Long-term group

In the long-term group, simple linear regression analysis identified disability at inclusion as a single predictor of sick leave 12 months later ($r^2 = .124, N = 261, p < .0005$). Overall multiple regression models significantly predicted pain intensity ($F(4, 251) = 30.4, p < .0005$, adjusted $R^2 = .316$) and disability ($F(6, 250) = 30.9, p < .0005$, adjusted $R^2 = .412$). The cognitive predictors were fear of movement/(re)injury, functional self-efficacy, pain catastrophising and expectations of duration of pain.

Study III

Extent and nature of screening

Five specific prognostic factors were judged to be screened during the consultations: spinal pathology/radiating pain, disability, sick leave, coping and negative beliefs. Three prognostic factors were judged not to be screened during the consultations: pain intensity, expectations of duration of pain and depressive mood. For a more detailed description, see Table 12. The median number of screened factors in each consultation was 2, as judged by all three raters. The range was 4 (0-4), as judged by raters 1 and 3, and 3 (0-3), as judged by rater 2.

Table 12. *Specific prognostic factors that were screened/not screened in the consultations (n = 17), as judged by the three raters.*

	Rater 1	Rater 2	Rater 3
Spinal pathology/ radiating pain	12	12	10
Pain intensity	0	0	0
Disability	5	7	4
Sick leave	4	5	4
Coping with pain	8	7	9
Negative beliefs	1	1	2
Expectations of long duration of pain	0	0	0
Depressive mood	0	0	0

Inter-rater reliability of the method

The analysis of agreement on the number of screened prognostic factors demonstrated an intra-class correlation between the three raters of 0.82 ($p < .001$, 95% CI 0.65-0.93). The pair-wise kappa measures of agreement on which prognostic factors were screened was 0.77 ($p < .001$, 95% CI 0.61-0.93) between raters 1 and 2, 0.66 ($p < .001$, 95% CI 0.48-0.84) between raters 1 and 3 and 0.62 ($p < .001$, 95% CI 0.44-0.8) between raters 2 and 3. In the cases where the raters agreed on which factors were screened, the proportion of agreement on corresponding text sections was 93% (26/28) between raters 1 and 2, 88% (22/25) between raters 1 and 3, and 100% (25/25) between raters 2 and 3.

Division of consultation time

The average time spent on each of the six items is illustrated in Figure 2. The length of the consultations varied between 3 and 21 minutes; the median was 8 minutes and the mean was 8.5 minutes. The major part of the consultation time was devoted to discussions about pain symptoms, administrative issues and actions such as booking an appointment time and giving advice about physical activity.

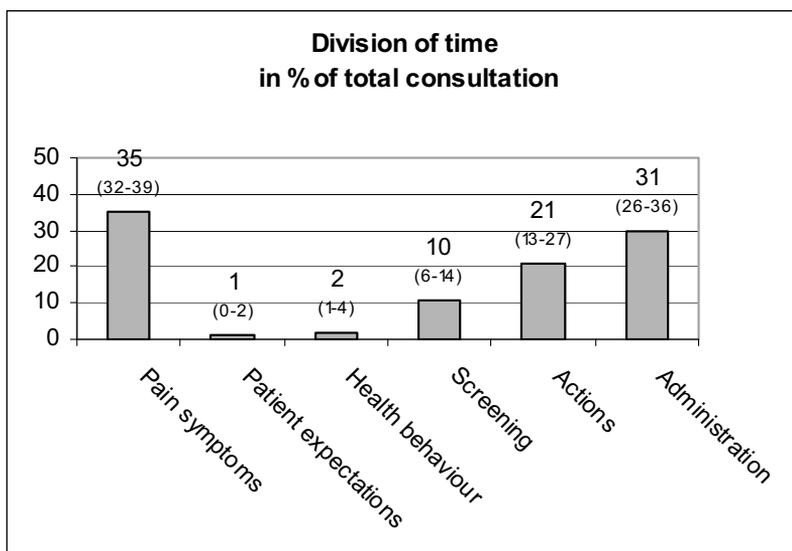


Figure 2. Mean proportion of consultation time in % (95% CI) spent on six items during telephone consultations (n = 17).

Study IV

Screening of yellow and red flags

The number of screened yellow flags for each participant at baseline and post-intervention is presented in Table 13. All participants increased their screening, from 2-13 percent of maximum possible screening at baseline to 80-90 percent at post-intervention.

Table 13. *Screening of yellow flags. Raw scores and % of maximum possible screening at baseline (BL) and post-intervention (Post).*

	Participant 1		Participant 2		Participant 3		Participant 4	
	BL n = 3	Post n = 4	BL n = 2	Post n = 4	BL n = 4	Post n = 4	BL n = 4	Post n = 4
Pain intensity		4	1	4		4	2	4
Disability	2	4	1	4		4		4
Sick leave	2	4	2	3	1	4		4
Negative beliefs		4		4		3		4
Behavioural coping		4		4		4		4
Cognitive coping				1		3		1
Fear of movement		4		4		4		3
Reactions from family and friends		4		4		1		4
Depressive mood		4		4		2		3
Expectations of long duration of pain		4		4		2		4
Possible score	30	40	20	40	40	40	40	40
Actual score	4	36	4	36	1	32	2	35
% of maximum possible screening	13	90	20	90	2	80	5	88

Screening for red flags increased from baseline to post-intervention for three participants. Two participants screened for red flags in all consultations at post-intervention. They all reported high self-efficacy for red flag screening. For details, see paper IV. For graphs summarising yellow flag screening, median self-efficacy for screening and goal-setting for each participant, see paper IV.

Division of consultation time

For proportion of consultation time spent on the screening of yellow and red flags, discussions about pain symptoms and discussions about other items, see Table 14. Time devoted to screening increased in all participants, most markedly from the knowledge acquisition phase to the skills training phase. Inversely, time spent on pain symptoms and other items decreased through the study phases.

Table 14. *Consultation time (% of total consultation) spent on screening, pain symptoms and other items during the four study phases.*

		Baseline	Knowledge acq.	Skills training	Post-intervention
		A	B ₁	B ₂	C
Participant 1	Screening	6	2	35	47
	Pain symptoms	51	48	31	24
	Other items^a	43	50	34	29
		100 (n = 3)	100 (n = 2)	100 (n = 6)	100 (n = 4)
Participant 2	Screening	8	-	36	48
	Pain symptoms	56	-	40	20
	Other items	36	-	24	32
		100 (n = 2)	- (n = 0)	100 (n = 4)	100 (n = 4)
Participant 3	Screening	1	12	35	48
	Pain symptoms	56	44	33	25
	Other items	43	44	32	27
		100 (n = 4)	100 (n = 1)	100 (n = 13)	100 (n = 4)
Participant 4	Screening	3	8	22	34
	Pain symptoms	56	62	37	33
	Other	41	30	41	33
		100 (n = 4)	100 (n = 1)	100 (n = 7)	100 (n = 4)

^a Other = actions, administrative matters, discussions about general health behaviour and patient expectations

Knowledge, attitudinal orientation and self-efficacy

Knowledge about yellow and red flags in back pain was on a high level at baseline in all participants and increased slightly during the study. Biomedical orientation decreased and biopsychosocial orientation increased to some extent. For details, see paper IV.

Self-efficacy for screening of yellow flags at baseline and post-intervention is shown in Table 15. Participants 1 and 3 increased their overall self-efficacy to a similar extent, whereas participant 2 improved slightly and participant 4 reported a decreased overall self-efficacy for screening. All participants scored lowest self-efficacy for screening of cognitive and contextual factors both at baseline and post-intervention.

Table 15. *Self-efficacy for screening. Raw scores and % change from baseline (BL) to post-intervention (Post).*

	Participant 1		Participant 2		Participant 3		Participant 4	
	BL	Post	BL	Post	BL	Post	BL	Post
Pain intensity (0-10)	3	10	10	10	6	10	10	7
Disability (0-10)	10	9	10	10	9	8	10	7
Sick leave (0-10)	10	10	10	10	9	9	10	5
Negative beliefs (0-10)	6	8	10	10	7	8	10	6
Behavioural coping (0-10)	9	8	10	10	3	8	10	7
Cognitive coping (0-10)	2	8	7	7	0	7	2	4
Fear of movement (0-10)	5	10	10	9	9	6	10	7
Reactions from family and friends (0-10)	0	7	5	7	0	5	2	4
Depressive mood (0-10)	7	10	9	9	0	4	2	5
Expectations of long duration of pain (0-10)	0	7	5	7	0	5	2	5
Total score (0-100)	52	87	86	89	43	70	68	57
Change	67%		3%		63%		-16%	

Discussion

Summary of results

Studies I and II were based on a survey in the general population. The results in study I demonstrated that after controlling for pain intensity, four subgroups based on back pain duration/recurrence differed modestly in three cognitive/emotional variables and perceived social support. Catastrophising cognitions and expectations of future pain were positively correlated to pain duration and perceived social support was negatively correlated to pain duration. The differences between groups were small and suggested that pain duration/recurrence was not an important explanatory variable. In study II, future pain intensity and disability were predicted by initial levels of pain and disability and pain-related cognitions in two groups with first-episode and long-term back pain, respectively. The models also revealed some differences regarding the number of predictors and relations between them, with a greater complexity in the long-term group. Levels of prognostic risk factors for disability were generally low in all subgroups in both studies.

Studies III and IV concerned physiotherapists' screening for prognostic factors for back pain disability in PHC telephone consultations. The results in study III demonstrated sufficient inter-rater reliability for a research protocol used to analyse screening. The extent of screening was low in a convenience sample of 17 consultations: only a median of two out of eight prognostic factors were assessed in each consultation. One third of the consultation time was devoted to detailed discussions about pain symptoms. Study IV evaluated the effect of an intervention on physiotherapists' screening for prognostic factors in four single-subject studies. The intervention was based on SCT, emphasising skills training, individually set goals for behavioural change and individual feedback on screening behaviour. Effects were seen in all four participants, with increased screening and less time spent on detailed discussions about pain symptoms.

Behavioural learning in back pain and disability

Studies I and II

To reflect a social cognitive perspective of back pain and disability, both studies included a large number of physical, psychological, behavioural and contextual variables. The study groups were based on duration and recurrence of pain, and were formed to represent various stages of a back pain condition. The results do not provide strong evidence of a behavioural learning process in this general population sample, mildly affected by back pain. Differences between duration/recurrence groups were small and levels of prognostic risk factors for disability were low. Nevertheless, there were patterns of mainly cognitive variables that were related to longer duration of pain. These patterns are in accordance with previous research on patient samples, and may be seen as indicators of pain-related behavioural learning.

Most research on prognostic factors for disability in back pain has been performed on patients with long-term pain and sick-listed workers. The current two studies, performed on a general population sample with back pain, revealed both similar and different findings compared to previous research. One similarity refers to the mainly cognitive variables being related to longer duration of back pain in study I. More catastrophising, more expectations of future pain and perceptions of low social support were related to longer pain duration. These results are supported in a study by Boersma and Linton (2005), reporting pain duration to moderate psychological outcomes, pain and function in musculoskeletal pain samples (186). Individuals' expectations of outcome have proved to be strong predictors of return to work in samples with low back pain (187-190) and disability in sick-listed workers (78). A similar pattern of cognitive variables was seen in study II. Cognitions, together with initial levels of pain intensity and disability were predictive of future pain and disability. This was valid for both study groups, representing either an early or a later stage of a back pain condition. The importance of cognitive variables in the development of long-term disability in back pain is well established in previous studies (72-74, 94, 191-194).

One difference in the results compared to research on patient samples concerns the variables not varying between the pain duration/recurrence categories in study I and not predicting outcome in study II. A multifactor approach to back pain and disability is widely recognised in research, and it has been concluded that interventions should target both individual and contextual factors to be effective (195). In study I, a great number of cognitive, physical, behavioural and environmental variables did not differ between the pain duration/recurrence categories. The results in study II demonstrated small variations in the predictive models for future pain and disability. These re-

results contradict previous studies, which have suggested that longer pain duration is associated with psychological distress (193, 196-198). One plausible explanation is that the current sample originated from a general population and was as a whole not severely affected by back pain. Our sample reported low levels of disability, care seeking and sick leave compared to samples from e.g. pain clinics.

Previous research has demonstrated conflicting evidence regarding the role of pain duration as a predictor of disability (197, 198). In a behavioural learning perspective, longer pain duration per se does not mean more negative cognitions leading to pronounced disability. According to behavioural learning principles, the development of persistent, disabling pain should be seen as an individual process. It includes a great number of individual, behavioural and contextual determinants as well as critical events affecting the course of pain (63, 168). Depending on every individual's behavioural learning history, the back pain experience can take any course, from only minor effects on activity to persisting limitations in activity in important life domains.

Study II revealed a greater complexity in the predictive models for the group with long-term back pain, compared to the group with first-episode pain. The models for the long-term group included more predictors and explained a larger amount of variance of future pain and disability. This could be indicative of a behavioural learning process taking place. Nevertheless, the small differences between the groups in study I and the modest amount of variance explained by the models in study II raise questions: to what extent are pain-related cognitions and behaviours already present at the time of first back pain presentation? It is plausible that previous behavioural learning related to other pain experiences as well as other challenging situations is generalised to individuals' management of a first episode of back pain.

Previous longitudinal studies of first-episode pain have shown that it is possible to identify individuals risking long-term disability shortly after the onset of pain (107, 194, 199, 200). In the current study, there were individuals in the first-episode group reporting high levels of pain catastrophising and depression. For statistical reasons, they were treated as outliers in the analyses and the group design did not allow their profiles to stand out. To specifically study behavioural learning in individuals, other research designs than group studies have to be used.

Studies I and II included mostly individuals managing their pain with self-care, but also individuals consulting health care. Adopting a social cognitive perspective of back pain, caregivers should be viewed as important contextual factors influencing pain-related behaviour and disability. Caregivers'

clinical behaviours are likely to affect beliefs and expectations in patients, leading to more or less functional pain-related behaviour. Considering the small proportion of back pain sufferers developing long-term disability, screening of prognostic factors at an early stage is motivated. The challenge of increasing PHC caregivers' screening in back pain remains, and will be discussed in a behavioural learning perspective.

Behavioural change in caregivers

Studies III and IV

Caregivers in clinical work are subject to the same basic behavioural learning principles as all other individuals. Their individual learning history includes learning by association in e.g. stressful situations, learning from consequences such as reactions from patients and observational learning by e.g. studying colleagues (158). Depending on their beliefs regarding outcomes of a specific behaviour in the clinic, they will be more or less prone to perform that behaviour. Physiotherapists' screening in initial telephone consultations should be interpreted according to these principles.

The research protocol assessed in study III was developed to measure physiotherapists' screening in study IV. The kappa values ranged from 0.61 to 0.77 and suggested "substantial agreement" according to Landis and Koch (201). The protocol included one physical and seven psychosocial prognostic factors for disability. Clear-cut, mutually exclusive definitions of the prognostic factors do not exist, not even in the international guidelines (96, 98, 130). Taking this conceptual complexity into account, the inter-rater reliability of the research protocol must be regarded as good. The level of agreement indicated that the method could be used to assess physiotherapists' screening in telephone consultations.

The analysis of the overall content of the consultations in study III demonstrated that discussions about the pain dominated: about one third of the total consultation time was spent on pain symptoms not related to work, home or leisure activities. A minor part of the time was devoted to questions and discussions about prognostic factors for disability. Pain-related cognitions and emotional aspects of pain were discussed briefly in a few cases. The findings in study IV were similar at baseline: all participants used more than half of the consultation time on detailed discussions about pain symptoms. The physiotherapists used the patients' description of the problem as a starting point for the discussion and focused on the physiological aspects of pain. These results are in concordance with previous studies of physiotherapists,

which report predominantly physiological perspectives on pain (136, 139, 202, 203).

In a social cognitive learning perspective, the attention given to pain symptoms by caregivers reinforces further cognitions and discussions about pain. Increased attention to pain symptoms leads to increased pain perception, especially if discussions about coping with pain are excluded (204). It is important that the individual patient is encouraged to describe his or her problem carefully, but the focus of the assessment should not be on pain symptoms only (205). In the context of physiotherapists' screening of yellow and red flags, the physiotherapist should find the appropriate time to switch over to more functional issues, e.g. what works in spite of back pain and which specific ways of managing pain have proven efficient (204). Reinforcement of caregivers' behaviours must also be considered. Talking about pain symptoms is usually appreciated by patients as they are given attention and met by empathic responses. The physiotherapists are likely to perceive this appreciation and are hereby reinforced to continue discussions about pain symptoms. In this way, the patient and caregiver will act in a reciprocal relationship, reinforcing each others' pain-attentive behaviours. The physiotherapists' detailed questioning about pain location, pain character and aggravating movements are likely to affect the patients' expectations of finding a specific, identifiable cause of the pain. Given the fact that most patients will not be given a specific diagnosis explaining the anatomic/physiologic cause of their back pain (206), caregivers should be cautious about contributing to such beliefs. The expectations of a specific diagnosis may lead to dysfunctional beliefs that there is a "quick fix" or that back pain is caused by serious, potentially disabling pathology (130). According to research, guidelines and social cognitive learning principles, caregivers should assess prognostic factors briefly at an early stage and adapt management accordingly. Appropriate management varies from reassuring information and self-care advice only for the majority of patients to urgent referrals to emergency departments for a small minority.

Study IV evaluated the effect of a tailored skills training intervention on physiotherapists' screening of prognostic factors in back pain. The intervention emphasised skills training, individually set goals for behavioural change and individual feedback on screening in telephone consultations. All four participating physiotherapists increased their screening of yellow flags, from screening of none or a few at baseline to most of the included yellow flags at the end of the intervention. The results support previous implementation research, which has suggested that interventions on behavioural change should be based on social cognitive learning principles (155-157). A recent study, specifically reviewing intervention research on physiotherapists, also emphasised the use of skills training to affect clinical behaviour (142).

Obstacles to behaviour change in the context of adherence to clinical guidelines have been explored to some extent. A qualitative study found that physiotherapists' incomplete understanding of guidelines and also low levels of agreement with them were barriers (151). Jette et al performed a study on a physiotherapist sample in 2003. They found overall positive attitudes but low adherence to evidence-based practice. The main obstacle for implementation and behavioural change was reported as lack of time (152).

In study IV, barriers to performing screening in telephone consultations were assessed at the beginning of the intervention and in the relapse prevention plan after finishing the intervention. It was clear that knowledge about prognostic factors was not an obstacle. The participants were well-informed from the start and improved only slightly during the intervention. This finding is in line with other studies, raising questions about knowledge being the prime target of intervention studies on behaviour change in caregivers (139, 207, 208). The attitudinal orientations of the participants were predominantly biopsychosocial, which is congruent with clinical guidelines. Compared to other physiotherapy samples, our participants were more biopsychosocially oriented (136, 140, 209).

Identified barriers included unclear aims of the initial telephone consultation and the physiotherapists feeling uncomfortable to ask questions about pain-related cognitions and emotions. They expressed beliefs about appearing unprofessional and expectations that the patients might lose confidence in them. They had negative expectations of the outcome of screening: maybe they would not manage to deal with the information? High own expectations of managing all possible yellow flags were also identified as barriers.

The aims for initial telephone consultations in Swedish PHC physiotherapy are not expressed in a clear-cut way and may consequently vary between individuals, clinics and organisations. It is plausible that this ambiguity affects the extent of screening – if the aims are not clearly expressed, the content and structure of the consultations cannot be expected to follow a straight line. According to guidelines, prognostic yellow flags should be assessed early in PHC (210). Depending on waiting time before face-to-face consultation, it can be of varying urgency to assess them by telephone. If the waiting time is negligible, it could be argued that assessment of prognostic factors can wait. However, if the waiting time is of some length, and the intention is to give individualised care including referrals, advice, time booking and multiprofessional coordinated efforts, screening of prognostic factors is required. In addition, previous research on telephone advisory services suggests that a considerable number of patients manage and are satisfied with telephone advice only (126). However, this decision should be made after screening of prognostic factors.

In a social cognitive perspective, the physiotherapists' negative expectations of performing screening in telephone consultations reduce the likelihood of actual screening. Being educated and trained in predominantly biomedical traditions (136, 139, 202, 203), it is not surprising if physiotherapists feel uncomfortable and insecure about asking questions about pain-related cognitions and emotions in patients. It is also understandable if they perceive uncertainty about what to do with the information; they question if the patient will approve and if the information is relevant. Apart from sufficient knowledge and favourable attitudes, screening of yellow flags requires an assumption that this is one explicit aim of the telephone contact. It also requires own individual beliefs of efficacy in performing screening and handling the information given by patients. If physiotherapists' own expectations include managing all possible yellow flags, the expectations have to be adjusted. It is not reasonable to address all issues, fears and beliefs held by the patients in the initial telephone contact. The aim should be screening, not comprehensive assessment and taking action on all findings.

The results in study IV are somewhat ambiguous regarding self-efficacy as a determinant of behaviour. Overall self-efficacy did not appear to be a strong predictor of screening, which was not surprising as self-efficacy should be assessed in relation to specific behaviours (84). However, the cognitive and contextual factors receiving the lowest self-efficacy ratings at baseline increased correspondingly with increased screening in all participants through the intervention. Interestingly, one participant reported a decrease in self-efficacy for six out of ten other factors from 10 at baseline to 5-7 at post-intervention. One explanation could be that perception of own behaviour, screening of specific factors, did not correspond to the operationalisations in the study. It is plausible that the participant perceived herself as performing specific screening, but it was not done as explicitly as was defined in the study protocol. This case illustrates the importance of feedback on performed behaviour, in turn affecting awareness of own behaviour (211). It also demonstrates the power of using direct observations compared to self-report measures of behaviour.

Studies III and IV used two versions of a research protocol, covering seven and ten yellow flags, respectively. Research has identified a great number of prognostic factors for disability and sick leave. Psychological distress and depression, fear-avoidance cognitions and low self-perceived function are among the most salient predictors (74, 85, 94, 95, 212). Screening instruments of various lengths for psychosocial factors in back pain have been developed (111-114), but the implementation in clinical practice is still a challenge. It has been suggested that the development of brief, easy-to-use screening tools facilitates implementation (110, 125). Iles et al (2009) reviewed prognostic studies of low back pain and individuals' recovery expect-

tations. They found brief screening of recovery expectations to be useful when specific, time-based measures were used within the first three weeks of back pain (213). In a social cognitive learning perspective, the general “self-efficacy to recover” affects outcome; negative outcome expectations affect behaviours, presumably producing a worse outcome. The relationship can also be interpreted as individuals being able to make adequate judgements of their own capability. However, the prognostic value remains.

The implementation of a biopsychosocial perspective of health, including screening of yellow flags in back pain, requires sufficient communication skills in caregivers. The current studies did not focus specifically on communication skills, but the topic deserves attention as increased demands on caregivers can be expected. A review by Jeffels and Foster (2003) found that physiotherapists’ communication skills influence patients’ perceptions of their pain, both in positive and negative ways (204). Increased attention to pain, such as asking for detailed descriptions of the pain quality and location increased the pain perception, whilst discussion of coping increased pain tolerance. The findings are highly relevant for communication in assessment as well as treatment in physiotherapy. Maguire and Pitceathly (2002) described key tasks in communication with patients (205). These included identification of patients’ main problems and the patients’ perceptions about the physical, emotional and social impact of the problems. Adapting information to the patients’ needs and checking the patients’ understanding was also emphasised. As opposed to the described skills, they delineated the tactic of “blocking” as an inefficient way of communicating in health care. It is demonstrated by the clinician avoiding to deal with the “real” problem by giving premature advice, ignoring emotional problems and concentrating on the patient’s physical symptoms only. Routine screening for yellow flags in back pain would decrease the risk of “blocking” communication. Caregivers’ use of words and labels has been shown to influence patients’ perceptions of e.g. pain. There is a problematic lack of consensus on diagnostic terms to describe patients with non-specific back pain (206). Apart from the confusion this brings in itself, commonly used terms such as “wear and tear”, “slipped disc” or “trapped nerve” can be expected to cause distress in patients (214). The diagnostic and conceptual difficulties challenge the communication skills of caregivers; they have to choose their words carefully and pay close attention to patients’ understanding of their back pain condition.

One intention of the rehabilitation guarantee in Sweden is to increase the access to multiprofessional teams in PHC (215). Expectations of a negative outcome from screening, such as not being able to deal with the cognitive and emotional information, are likely to inhibit screening. Hopefully, the increased access to multiprofessional teams will facilitate physiotherapists’

and other caregivers' early screening of yellow flags in back pain, whether in telephone or face-to-face consultations.

Methodological considerations

Studies I and II

The response rate in the survey was 39 percent, introducing a threat to the external validity of the results. To examine the representativeness of the sample, comparisons were made with a large reference group reporting musculoskeletal pain (171). Our sample was representative regarding age and gender distribution as well as proportion of one-adult households. There were some differences, with less health care consumption and fewer individuals of non-Swedish origin in our sample. The study groups in study II, reporting first-episode and long term back pain, respectively, reported similar pain intensity to comparable back pain samples in previous studies (34, 216). Compared to other population-based samples with back pain, our long-term group reported similar sick leave rates and our first-episode group less sick leave (78, 217, 218). The total sample of 1024 individuals represents a general population mildly affected by back pain, with low levels of disability, sick leave and health care consumption.

Future studies using survey data should consider the large number of variables found to affect the response rate to questionnaires. The Cochrane Collaboration performed a systematic review of randomised controlled studies in 2003, identifying 22 variables affecting response rate (219). The most salient factors were monetary incentives, length of the questionnaire, perceived importance of the content and personalised letters.

A few statistical issues should also be discussed. The analyses in the performed studies in this thesis are mainly parametric. In study I, multivariate parametric analyses were used to describe and compare groups with varying duration and recurrence of back pain. The decision was made as we wanted to control for pain intensity and the non-parametric alternatives were considered too complex. Study II included multiple regression analyses, testing models explaining different amounts of the variance in outcome. Within epidemiology, it is more common to use binary logistic regression analyses resulting in estimates of relative risk for a condition (220). One advantage is that the results are easy to interpret, with relative risk above 1.0 (increased risk) or below 1.0 (lowered risk). One challenge is to make a valid dichotomisation, optimally reflecting a qualitative difference between the two levels in outcome, such as high/low disability. In study II, it was decided to use parametric analyses to be congruent with the analyses in study I, and dichotomisation would have involved a major change in the outcome measures.

The design used in studies I and II allowed conclusions about groups with back pain from the general population, but no clear answers about behavioural learning in pain-related disability. To study behavioural learning in individuals, research designs assessing individual processes should be used.

Studies III and IV

One consideration in study III is the number of prognostic factors being screened in the consultations. As three out of eight factors did not occur in any of the consultations, they have not been part of the data and thus not included in the test of inter-rater agreement. To include all factors, it would have been optimal to study physiotherapists that screened a wide range of prognostic factors. However, previous research indicates that most physiotherapists in PHC do not assess prognostic factors for disability systematically (136, 137, 139, 221) and it was difficult to find an ideal study group in this respect.

The explorative design in study III does not permit generalisation of the results. Screening was performed to a low extent and consultation time was spent predominantly on discussions about detailed pain symptoms. These results raise hypotheses about areas for improvement in future interventions on physiotherapists' screening.

One central methodological aspect in study IV is to what extent intervention integrity was achieved: was the intervention delivered as intended? The education and feedback were provided by the author (ID) and the main supervisor (PÅ) The content was documented in writing before and after each session. PÅ monitored and took notes during the sessions. Written minutes were e-mailed to the participants the day after each session. Two of the participants were present at all six sessions, one was absent at one session and one was absent at two sessions. Absence was compensated by telephone and e-mail information from ID as well as assessment of knowledge, attitudinal orientation, self-efficacy and goal-setting. Assessments were made within a few days after the missed session.

One feature of single-subject designs is that each participant is used as his/her own control, i.e. behavioural change is studied within the individual. The ideal is to establish a stable baseline, making it possible to draw conclusions about changes in the subsequent phases (222). In this study, the number of observations during baseline and the first intervention phase was small, particularly for one participant. The reason for this was that the number of relevant calls to the clinic was smaller than expected. However, the data patterns were similar in all four participants and indicate effects of the intervention. It is also important to reflect upon other plausible explanations

of the results, such as other ongoing education or organisational changes. None of these potentially competing explanations occurred during the study.

Another methodological aspect concerns the assessment of knowledge and attitudinal orientation. The three items used to measure knowledge indicated ceiling effects and may have been too easy. They have not been tested for psychometric properties, but as knowledge was not the main focus of this study, they were considered as relevant and comprehensive enough. The results in PABS-PT may have been affected by perceived expectancies. Knowing the content of clinical guidelines and the design of the intervention, it is plausible the participants gave more biopsychosocially oriented answers than if they e.g. had attended a course in manual therapy. As PABS-PT is developed specifically for physiotherapists managing back pain, it was still regarded as the best option to measure attitudes.

The external validity should also be reflected upon. When performing single-subject experimental studies, it is desirable to study “typical cases” (223). As it is not clear what a “typical physiotherapist” is, the participants were described in terms of gender, age, years working as a physiotherapist, attitudes and overall expectations regarding participation. Study IV included four participants, three female and one male. They were 27, 35, 40 and 44 years of age respectively, and had varying experience of working as a physiotherapist, between 4 and 20 years. They expressed positive attitudes towards evidence-based practice and had positive expectations of participating in the study. They were employed at a clinic with an overall interest in research projects. Taking attitudes and expectations into account, the participants were probably more “ready to change” (224) and more biopsychosocially oriented than many physiotherapists. For self-efficacy, they reported relatively low values for screening of cognitive and contextual prognostic factors, which is likely to be valid for most physiotherapists in PHC (136, 139, 202, 203).

Conclusions

This thesis investigated prognostic factors for prolonged disability in back pain and physiotherapists' screening for prolonged disability, applying a social cognitive learning perspective.

The conclusions are;

- The identification of mainly cognitive explanatory variables indicates the relevance of a social cognitive perspective of back pain-related disability. However, if and how behavioural learning in disability occurs in a general population sample, mildly affected by back pain, cannot be determined by the results (studies I and II).
- Physiotherapists' screening for prolonged disability in back pain can be reliably assessed by using a protocol for behavioural observations in telephone consultations (study III).
- It is suggested that interventions based on social cognitive theory are effective in producing change in specified clinical behaviours in physiotherapists (study IV).

Clinical implications and future research

Studies I and II

The results demonstrated low levels of prognostic risk factors for long-term disabling conditions in a non-clinical sample with back pain. Therefore, high levels of e.g. pain catastrophising in individuals consulting primary care should be regarded as a “warning sign”. One implication for PHC is the importance of assessing and managing not only pain intensity and disability, but also patients’ beliefs and expectations regarding back pain. This seems to be valid both in early and later stages of a back pain condition. Consequently, caregivers in PHC need further education and training in managing cognitive, emotional and contextual aspects of back pain.

Future studies should study the development of disability in individuals with first-episode back pain in longitudinal designs. As a complement to cohort studies, a smaller number of individuals could be identified and interviewed repeatedly over a longer period of time. The individual contact between participants and researchers would increase the chance to keep participants in the study. It would also enable a more sensitive, individualised measurement of e.g. beliefs and expectations related to back pain than what is possible by standardised questionnaires. The individual approach would correspond to the well-founded perspective of long-term pain-related disability as an individual, behavioural learning process.

Studies III and IV

The results in studies III and IV are in line with previous research, suggesting that systematic assessment and management of prognostic factors for prolonged disability in back pain have not been fully implemented in PHC physiotherapy. For successful implementation, it is crucial to consider measures at different levels: individual caregivers, teams, health care units and organisations. Explicit aims of telephone and face-to-face consultations have to be formulated, and barriers at all levels should be addressed. On the individual caregiver level, the long biomedical tradition in health care and physiotherapy should be considered. It is a great challenge to change fundamental perspectives and integrate new clinical behaviours. Implementation

of new routines requires commitment in terms of time, energy and leadership. Strategies have to be long-term and systematic to produce permanent change.

Assessment and management of cognitive, emotional and contextual prognostic factors in back pain require sufficient communication skills in caregivers. Physiotherapists with a traditional biomedical orientation towards back pain may find it difficult and unnecessary to discuss psychological matters. Education and training should be provided on basic levels in higher education and in the clinic. Key components, as in all behavioural change interventions, are skills training and systematic feedback on performance (205, 225, 226).

Future research should focus on the question: what is optimal screening in back pain? Feasible, easy-to-use tools with only the most important prognostic screening questions have to be developed and tested for their ability to identify patients with poor prognosis in back pain. Pain self-efficacy and self-control should be further investigated regarding their prognostic clinical value (227). Future studies of screening in PHC should also study clinical behaviour in caregivers with varying motivation and readiness to change behaviour (224), with corresponding tailoring of interventions. One concept that should be included in future studies is “awareness of behaviour”. This refers to holding realistic perceptions of own behaviour, and has been found to moderate physiotherapists’ adherence to back pain guidelines (211).

Svensk sammanfattning (Swedish summary)

Denna avhandling innehåller fyra delstudier. Studie I och II handlar om prognostiska faktorer för långvarig aktivitetsbegränsning vid ryggsmärta i allmänbefolkningen. Studie III och IV handlar om sjukgymnasters undersökning av prognostiska faktorer vid telefonrådgivning angående ryggsmärta i primärvård. Avhandlingsarbetet utgår från social kognitiv teori, vilket innebär att samspelet mellan individuella faktorer (fysiologi, tankar och känslor), kontextuella faktorer (t.ex. fysisk miljö och andra människors reaktioner) och individuella beteendemönster ska beaktas när man vill studera och påverka människors beteenden. Detta synsätt gäller både utveckling av långvarig aktivitetsbegränsning vid ryggsmärta och sjukgymnasters telefonrådgivning till patienter med ryggsmärta.

Studie I och II

Aktivitetsbegränsande ryggsmärta är mycket vanligt; ca 80 procent drabbas någon gång i livet. De flesta som får ont i ryggen fortsätter att arbeta och klarar sig utan sjukvård. En liten andel, cirka 10 procent, utvecklar påtagliga besvär med långvarig aktivitetsbegränsning och sjukskrivning. Utifrån tidigare forskning vet man att individens egna föreställningar och beteenden kring ryggbesvären har stor betydelse för hur utvecklingen blir på sikt. Det finns många studier av patientgrupper med ryggsmärta, och hur deras besvär utvecklas över tid. Däremot finns få undersökningar gjorda i allmänbefolkningen, och mycket få med ett socialt kognitivt inlärningsperspektiv.

Studie I och II baserar sig på samma enkätundersökning i allmänbefolkningen i Sverige, genomförd mellan februari 2005 och februari 2006. Syftet i studie I var att beskriva och jämföra fyra grupper (totalt 1024 personer) med olika duration av ryggsmärta utifrån ett antal fysiska, psykologiska och kontextuella faktorer. Resultatet visade att grupperna med längre duration hade lite mer katastroftankar, lite mer förväntningar om framtida smärta och upplevde lite mindre stöd från närstående. Syftet i studie II var att undersöka hur ett antal fysiska, psykologiska och kontextuella faktorer förändrades under tolv månader och vilka prognostiska faktorer för aktivitetsbegränsning som kunde identifieras. Två grupper studerades; en med förstagsångsbesvär sedan maximalt tre månader, och en med ryggbesvär sedan mer än ett år.

Resultatet visade en stabilitet över tid i båda grupperna, med en liten ökning av katastroftankar och förväntningar om framtida smärta i ”förstagångsgruppen”. I båda grupperna identifierades framför allt kognitiva prognostiska faktorer för framtida aktivitetsbegränsning.

Studie III och IV

De som söker vård för ryggbesvär hänvisas i första hand till primärvården, till exempel läkare och sjukgymnast. Det finns internationella riktlinjer för hantering av ryggsmärta i primärvården. Riktlinjerna innebär bland annat att man tidigt ska undersöka om det finns något i patientens sjukdomshistoria eller symtom som tyder på allvarlig sjukdom eller skada. Även psykosociala hinder för återhämtning hos och omkring patienten ska undersökas, till exempel katastroftankar, överdrivet undvikande av aktivitet och depressiva tillstånd. Om inga misstankar om allvarlig sjukdom eller skada finns, ska man generellt ge råd om att bibehålla normala aktiviteter så långt det går, samt att ta smärtlindrande medicin regelbundet. Åtgärderna ska anpassas även till eventuella psykosociala hinder.

I många fall tar personer med ryggsmärta kontakt med sjukgymnast via telefon, för att få råd och eventuellt boka en tid för ett besök på mottagningen. Dessa telefonsamtal utgör tidiga vårdkontakter och riktlinjerna för hantering av ryggsmärta bör gälla även dessa. Ett antal studier har visat att riktlinjerna inte följs fullt ut i primärvården, bland annat när det gäller sjukgymnasters undersökning av psykosociala hinder för återhämtning vid ryggsmärta. För att studera detta område inom telefonrådgivning genomfördes studie III och IV.

I studie III prövades en metod för att bedöma i vilken utsträckning sjukgymnaster undersöker prognostiska psykosociala faktorer vid telefonrådgivning angående ryggsmärta. Materialet bestod av 17 inspelade telefonsamtal med fem olika sjukgymnaster. Bedömningarna av sjukgymnasternas agerande i samtalen gjordes utifrån ett forskningsprotokoll, med definitioner och exempel på frågor om åtta olika prognostiska faktorer. Bedömningar från tre fristående personer jämfördes och resultatet visade att metoden var tillförlitlig.

I studie IV utvärderades en utbildningsmodell för beteendeförändring på sjukgymnaster i primärvård. Fyra sjukgymnaster deltog i en s.k. single-subject design, där varje deltagare jämfördes med sig själv över tid. Utbildningen syftade till att öka sjukgymnasternas undersökning av prognostiska psykosociala faktorer vid telefonrådgivning angående ryggsmärta. Utbildningen innehöll kunskapsmoment och strategier för att åstadkomma beteendeförändring såsom individuell målsättning, hinderanalys och feedback indi-

viduellt och i grupp. Sjukgymnasterna spelade in sina telefonsamtal angående ryggsmärta under totalt 36 veckor. Studie-designen innehöll fyra faser; baslinje, två utbildningsfaser och en fas efter utbildningen. Analysmetoden från studie III användes för att bedöma i vilken utsträckning prognostiska psykosociala faktorer undersöktes. Resultaten visade att utbildningen hade effekt på sjukgymnasternas beteende; de undersökte fler prognostiska faktorer och lade mindre tid på detaljerade diskussioner om smärtsymtom. Deras kunskaper om riktlinjerna och deras attityder till ryggsmärta var relevanta redan vid studiens början och påverkades inte nämnvärt av utbildningen.

De slutsatser som dras av resultaten är att

- De huvudsakligen kognitiva variabler som var signifikanta i studie I och II tyder på att det är relevant med ett socialt kognitivt perspektiv på aktivitetsbegränsning vid ryggsmärta. Det gick dock inte att utläsa om och i så fall på vilket sätt beteendelinäring sker vid ryggsmärta i allmänbefolkningen.
- Genom att använda ett protokoll för beteendeobservationer i telefonrådgivning går det att bedöma sjukgymnasters undersökning av psykosociala prognostiska faktorer för långvarig aktivitetsbegränsning vid ryggsmärta. Tillförlitligheten hos ett protokoll för detta ändamål var god (studie III).
- Resultaten i studie IV tyder på att utbildning som utgår från social kognitiv inläringsteori är effektiv för att förändra specifika beteenden hos sjukgymnaster.

Tack

Arbetet med avhandlingen är en lång resa som man lyckligtvis inte gör på egen hand. Nu är det dags att knyta ihop säcken och tacka alla som bidragit på olika sätt!

Ett stort tack till **alla deltagare** i studierna; individerna i ”the general population” som tog sig tid att besvara frågeformulären, patienterna som lät oss spela in telefonsamtal samt de engagerade och prestigelösa sjukgymnaster som släppte in mig och Pernilla i telefonrådgivningen. Vilken öppenhet och nyfikenhet ni har visat!

Min fantastiska ”happy triade” av handledare: **Eva Denison, Pelle Lindberg** och **Pernilla Åsenlöf**. Ni har följt mig genom både väntade och oväntade händelser och hjälpt mig att få perspektiv när olika problem har dykt upp. Eva som huvudhandledare i början, Pelle som min närmaste rådgivare i mitten av arbetet och Pernilla som huvudhandledare i slutet. Tack **Eva**, för att du delat med dig av ditt vetenskapliga kunnande, dina klara tankar och ditt absoluta lugn (även när du egentligen inte är lugn!) **Pelle** – jag uppskattar verkligen ditt eftertänksamma sätt, ditt analytiska tänkande och att du aldrig prutar på den teoretiska förankringen...! Tack till **Pernilla** för att du, förutom vänskap under alla år har delat med dig av så många intelligenta, innovativa forskningsidéer till mig!! Jag har alltid sett fram emot våra handledningstillfällen som trevliga, kreativa möten. Det har känts oerhört tryggt att ”ha er i ryggen” hela vägen.

Institutionen för folkhälso- och vårdvetenskap, som har utgjort en stimulerande omgivning för mig som doktorand. Jag kom in i den fina forskarmiljö som till stor del skapats av den nu bortgångne professorn i vårdvetenskap, **Per-Olow Sjärdén**. Jag har fått en gedigen forskarutbildning och dessutom dagligen varit i en trivsamt arbetsmiljö med underbara arbetskamrater! Tack till **Marianne Carlsson**, prefekt vid institutionen, som skapar sammanhållning i den breda verksamheten. Du signalerar ett icke-hierarkiskt tänkande som är hälsosamt bl.a. för doktorander. **Pelle Lindberg** och **Inger Holmström**, min före detta respektive nuvarande studierektor vid forskarutbildningen. Tack för allt ert engagemang genom åren och för att ni har skapat en stimulerande doktorandseminarieserie som utgör en viktig ryggrad i utbildningen.

Forskargruppen i beteendemedicin, som började med *Pelle Lindberg* och *Eva Denison* och nu har vuxit till att omfatta ytterligare 13 medlemmar. Förutom givande vetenskapliga diskussioner har era individuella karaktäristika format en dynamisk och generös grupp: *Anne Söderlund*, fylld av kreativitet och färgstark sisu, *Annika Nilsson*, stödjande och intresserad, *Maria Sandborgh*, generös med sig själv och kloka idéer, *Cecilia Rastad*, som visar både ödmjukhet och ryggrad i forskningen, *Birgitta Jönsson*, nyligen disputerad på föredömligt genomförda studier, *Magnus Lindberg*, som alltid kommer med genomtänkta synpunkter, *Catharina Gustavsson*, oförtröttligt forskande och stadigt förankrad i det kliniska arbetet, *Annika Bring*, klartänkt och positiv, *Helena Igelström*, *Sara Holm* och *Åsa Revenäs* som alla bidrar med kvalificerade synpunkter utifrån sina områden. Och så *Pernilla Åsenlöf*, ledare för forskargruppen. Ditt ledarskap skapar struktur och inbjuder till dynamisk forskningsaktivitet - du förvaltar och utvecklar verkligen den fina kultur som *Pelle* och *Eva* lade grunden för under 90-talet!

Till alla nuvarande och före detta arbetskamrater på institutionen, för praktiskt stöd, trevligt sällskap och intressanta diskussioner om allt mellan himmel och jord. Speciellt vill jag tacka *Åsa Muntlin Athlin* och *Josefin Westerberg Jacobson*, som varit jämsides med mig under slutfasen av avhandlingsarbetet. Ni har gjort allt enklare! *Annika Lundquist*, som funnits där i vått och torrt, *Sören Jonasson*, tack för all praktisk hjälp jag fått av dig! Doktoranderna på institutionen: jag har haft mycket utbyte på seminarier och vid fikabordet med *Gunn Engvall*, *Mio Fredriksson*, *Afsaneh Roshanai*, *Stina Isaksson*, *Elenor Kaminsky*, *Per Lytsy*, *Martin Cernvall*, *Ritva Rissanen*, *Annica Ernesäter*, *Marie Höyer*, *Malin Masterton*, *Johan Glad*, *Maria Gottvall*, och *Monica Blom Johansson*. Ett stort tack till *Gunilla Burell* och *Barbro Wadensten*, som läste och gav synpunkter på min ramberättelse innan den gick i tryck. Likaså till *Ulrika Winblad Spångberg*, *Karin Nordin* och *Claudia Lampic*, forskare inom vårdvetenskap som hjälpt med mig med råd och dåd längs vägen.

Eva Landström utgör en egen kategori, som tidigare nära meddoktorand, Lindyhop-lärare och vän – tack till dig i alla rollerna!

Tack till *Catarina Olsson*, *Maj-Britt Sundelin*, *Rose-Marie Marcusson*, *Håkan Jansson* och *Assalie Ashir* för all hjälp med administration och IT-frågor!

Emma Swärdh och *Gunilla Söderström* som bidrog vid analyserna i delstudie III och IV. Ni kombinerar flexibilitet med att vara snabbtänkta och noggranna – tack för ovärderlig hjälp!

Alla doktorander, forskare och lärare på *Enheten för sjukgymnastik* vid Institutionen för neurovetenskap. Tack för att jag har fått delta i er doktorandseminarieserie och fått så många konstruktiva synpunkter på mitt arbete!

Mina vänner som bidragit till en god ”inre” forskarmiljö: speciellt tack till *Annika Thalén Lindström* som är expert på att *både* lyssna och berätta, *Gunilla Söderström* som lät sig giftas in i släkten av min kusin *Björn* och så *JM*, de *Jobbiga Morsorna: Ylva Carlsson, Tina Lager, Claudia Lampic, Ann Danared, Annika Ehn Magnusson* och *Lotte Lindberg*, som står för kvinnlig vänskap, odlad sedan 1993.

Min ursprungsfamilj: mina föräldrar *Olle* och *Gudrun* som inte finns mer men som lever kvar i mig och mina syskon *Maria, Karin och Gunnar*. Det är fint att dela historia, nutid och framtid med er. Tack för er lojalitet speciellt i slutfasen av mitt arbete med avhandlingen!

Till *Erik*, min följeslagare i livet sedan midsommardagen 1989. Tack för att du finns där i nöd och lust, för att du ger mig känslomässigt och intellektuellt stöd när jag behöver det. *Martin* och *Gustav*, våra fantastiska tonåringar med en enastående förmåga att avleda uppmärksamheten från forskningsfrågor och arbete. Jag tycker det är härligt att vara en del av vår lilla grupp!

Denna avhandling har delfinansierats med anslag från Medicinska och farmaceutiska fakultetsnämnden, Uppsala Universitet, Signhild Engkvists stiftelse, Stockholm och Wifstavarf AB, Frösön.

References

1. Descartes R. De Homine. Leyden: Moyardes and Leffen; 1662.
2. Engel. The need for a new medical model: a challenge for biomedical science. *Science*. 1977;196:129-36.
3. Melzack R, Wall P. Pain mechanisms: A new theory. *Science*. 1965; 150(3699):971-79.
4. Selye H. Stress. Montreal: Acta Medical; 1950.
5. Melzack R. From the gate to the neuromatrix. *Pain*. 1999;Suppl 6:S121-S6.
6. Turk D, Flor H. Chronic pain: a biobehavioural perspective. In: Gatchel R, Turk D, editors. *Psychosocial factors in pain Critical perspectives*. New York: Guilford Press; 1999.
7. Waddell G, Bircher M, Finlayson D, Main C. Symptoms and signs: physical disease or illness behaviour? *BMJ*. 1984;289:739-41.
8. Waddell G. Preventing incapacity in people with musculoskeletal disorders. *Br Med Bull*. 2006;77-78:55-69.
9. Waddell G. The biopsychosocial model. *The back pain revolution*. London: Churchill Livingstone; 2004.
10. van Tulder M, Becker A, Bekkering T, Breen A, Gil del Real M, Hutchinson A, et al. European guidelines for the management of acute nonspecific low back pain in primary care. 2006.
11. Briggs A, Smith A, Straker L, Bragge P. Thoracic spine pain in the general population: prevalence, incidence and associated factors in children, adolescents and adults. A systematic review. *BMC Musculoskelet Disord*; 2009.
12. Guzmán J, Hurwitz E, Carroll L, Haldeman S, Côté P, Carragee E, et al. A new conceptual model of neck pain. Linking onset, course, and care: the bone and joint decade 2000-2010 task force on neck pain and its associated disorders. *Spine*. 2008;33(45):S14-S23.
13. Deyo R, Rainville J, Kent D. What can the history and physical examination tell us about low back pain? *JAMA*. 1992;268(6):760-65.
14. Ferrari R, Russell A. Neck pain. *Best Pract Res Clin Rheumatol*. 2003;17(1):57-70.
15. Krismer M, van Tulder M. Low back pain (non-specific). *Best Pract Res Clin Rheumatol*. 2007;21(1):77-91.
16. Nachemson A, Jonsson E. Introduction. *Ont i ryggen, ont i nacken*. Back pain and neck pain. (In Swedish). Stockholm: SBU. The Swedish Council on Technology Assessment in Health Care; 2000. p. 33-50.
17. Smith B, Gribbin M. Etiology, prevention, treatment and disability management of chronic pain. Introduction. *Clin J Pain*. 2001;17(S1-S4).
18. Von Korff M, Miglioretti DL. A prognostic approach to defining chronic pain. *Pain*. 2005;117:304-13.
19. Melzack R, Perry C. Self-regulation of pain: the use of alpha feedback and hypnotic training for the control of chronic pain. *Exp Neurol*. 1975;46:452-69.

20. Kerns RD, Turk DC, Rudy TE. The West Haven-Yale Multidimensional Pain Inventory (WHYMPI). *Pain*. 1985;23:345-56.
21. Von Korff M, Ormel J, Keefe F, Dworkin S. Grading the severity of chronic pain. *Pain*. 1992;50:133-49.
22. Dunn K, Croft P, Main C, Von Korff M. A prognostic approach to defining chronic pain: replication in a UK primary care low back pain population. *Pain*. 2008;135:48-54.
23. von Korff M, Dunn K. Chronic pain reconsidered. *Pain*. 2008;138:267-76.
24. Manchikanti L, Singh V, Datta S, Cohen S, Hirsch J. Comprehensive review of epidemiology, scope, and impact of spinal pain. *Pain Physician*. 2009;12(4):E35-E70.
25. Gureje O, von Korff M, Simon GE, Gater R. Persistent pain and well-being. A world health organization study in primary care. *JAMA*. 1998;280(2):147-51.
26. Côté P, Cassidy J, Carroll L. The Saskatchewan health and back pain survey: the prevalence of neck pain and related disability in Saskatchewan adults. *Spine*. 1998;23(15):1689-98.
27. Pengel LHM, Herbert RD, Maher CG, Refshauge KM. Acute low back pain: systematic review of its prognosis. *BMJ*. 2003;327:323-7.
28. Hestbaek L, Leboeuf-Yde C, Manniche C. Low back pain: what is the long-term course? A review of studies of general patient populations. *Eur Spine J*. 2003;12(149-65).
29. Hestbaek L, Leboeuf-Yde C, Engberg M, Lauritzen T, Bruun N, Manniche C. The course of low back pain in a general population. Results from a 5-year prospective study. *J Manipulative Physiol Ther*. 2003;26:213-19.
30. Bot S, van der Waal J, Terwee C, van der Windt D, Scholten R, Bouter L, et al. Predictors of outcome in neck and shoulder symptoms. *Spine*. 2005;30(16):E459-70.
31. Kent PM, Keating JL. The epidemiology of low back pain in primary care. *Chiropr Osteopat*. 2005;13(13).
32. Woolf AD. Burden of major musculoskeletal conditions. *Bull World Health Organ*. 2003;81(9):646-56.
33. Deyo RA. Diagnostic evaluation of LBP. Reaching a specific diagnosis is often impossible. *Arch Intern Med*. 2002;162:1444-47.
34. McGorry R, Webster B, Snook S, Hsiang S. The relation between pain intensity, disability, and the episodic nature of chronic and recurrent low back pain. *Spine*. 2000;25(7):834-41.
35. Von Korff M, Saunders K. The course of back pain in primary care. *Spine*. 1996;21(24):2833-37.
36. Mäntyselkä PT, Kumpusalo EA, Ahonen RS, Takala JK. Direct and indirect costs of managing patients with musculoskeletal pain - challenge for health care. *Eur J Pain*. 2002;6:141-8.
37. Waddell G. The epidemiology of back pain. *The Back Pain Revolution*. Edinburgh: Churchill Livingstone; 2004. p. 27-44.
38. Picavet H, Struijs J, Westert G. Utilization of health resources due to low back pain. Survey and registered data compared. *Spine*. 2008;33(4):436-44.
39. Walker BF, Muller R, Grant WD. Low back pain in Australian adults. Health provider utilization and care seeking. *J Manipulative Physiol Ther*. 2004;27(5):327-35.
40. Andersson HI, Ejlertsson G. Musculoskeletal chronic pain in general practice. Studies of health care utilisation in comparison with pain prevalence. *Scand J Prim Health Care*. 1999;17:87-92.

41. Côté P, Cassidy J, Carroll L. The treatment of neck and low back pain. Who seeks care? Who goes where? *Med Care*. 2001;39(9):956-67.
42. Mäntyselkä P, Kumpusalo E, Ahonen R, Kumpusalo A, Kauhanen J, Viinamäki H, et al. Pain as a reason to visit the doctor: a study in Finnish primary health care. *Pain*. 2001;89:175-80.
43. Stewart W, Ricci J, Chee E, Morganstein D, Lipton R. Lost productive time and cost due to common pain conditions in the US workforce. *JAMA*. 2003;290:2443-54.
44. Hansson T, Jensen I. Swedish Council on Technology Assessment in Health Care (SBU). Chapter 6. Sickness absence due to back and neck disorders. *Scand J Public Health*. 2004;63:109-51.
45. Carroll L, Hogg-Johnson S, van der Velde G, Haldeman S, Holm L, Carragee E, et al. Course and prognostic factors for neck pain in the general population. Results of the Bone and Joint decade 2000-2010 task force on neck pain and its associated disorders. *Spine*. 2008;33:S75-S82.
46. Larsson B, Sogaard K, Rosendal L. Work related neck-shoulder pain: a review on magnitude, risk factors, biochemical characteristics, clinical picture and preventive interventions. *Best Pract Res Clin Rheumatol*. 2007;21(3):447-63.
47. Van Tulder M, Koes B, Bombardier C. Low Back Pain. *Best Pract Res Clin Rheumatol*. 2002;16(5):761-75.
48. van Nieuwenhuysse A, Somville P, Crombez G, Burdorf A, Verbeke G, Johannik K, et al. The role of physical workload and pain related fear in the development of low back pain in young workers: evidence from the BelCoBack study, results after one year of follow up. *Occup Environ Med*. 2006;63:45-52.
49. Côté P, van der Velde G, Cassidy J, Carroll L, Hogg-Johnson S, Holm L, et al. The burden and determinants of neck pain in workers. Results of the bone and joint decade 2000-2010 task force on neck pain and its associated disorders. *J Manipulative Physiol Ther*. 2009;32(25):S70-S86.
50. Vuori I. Dose-response of physical activity and low back pain. *Med Sci Sports Exerc*. 2001;33:S551-S86.
51. Chen S, Liu M, Cook J, Bass S, Lo S. Sedentary lifestyle as a risk factor for low back pain: a systematic review. *Int Arch Occup Environ Health*. 2009;82:797-806.
52. Croft PR, Lewis M, Papageorgiou AC, Thomas E, Jayson M, Macfarlane GJ, et al. Risk factors for neck pain: a longitudinal study in the general population. *Pain*. 2001;93:317-25.
53. Linton S. Do psychological factors increase the risk for back pain in the general population in both a cross-sectional and prospective analysis? *Eur J Pain*. 2005;9:355-61.
54. Ariëns G, Bongers P, Hoogendoorn W, Houtman I, van der Wal G, van Mechelen W. High quantitative job demands and low coworker support as risk factors for neck pain. *Spine*. 2001;26:1896-903.
55. Lakke S, Soer R, Takken T, Reneman M. Risk and prognostic factors for non-specific musculoskeletal pain: a synthesis of evidence from systematic reviews classified into ICF dimension. *Pain*. 2009;147:153-64.
56. Hoogendoorn W, van Poppel M, Bongers P, Koes B, Bouter L. Systematic review of psychosocial factors at work and private life as risk factors for back pain. *Spine*. 2000;25(16):2114-25.
57. Bigos S, Holland J, Holland C, Webster J, Battie M, Malmgren J. High-quality controlled trials on preventing episodes of back problems: systematic literature review in working-age adults. *Spine J*. 2009;9:147-68.

58. Linton SJ, Van Tulder MW. Preventive interventions for back and neck pain problems. What is the evidence? *Spine*. 2001;26(7):778-87.
59. Burton A, Balagué F, Cardon G, Eriksen H, Henrotin Y, Lahad A, et al. European guidelines for prevention in low back pain. Chapter 2. *Eur J Spine*. 2006;15(Suppl 2):S136-68.
60. van Oostrom S, Driessen M, De Vet H, Franche R, Schonstein E, Loisel P, et al. Workplace interventions for preventing work disability *Cochrane Database Syst Rev*. 2009(2).
61. Leonardi M, Birkenbach J, Ustun T, Kostanjsek N, Chatterji S. The definition of disability: what is in a name? *Lancet*. 2006;368:1219-21.
62. WHO. World Health Organization. *International Classification of Functioning, Disability and Health*.:ICF. Geneva: World Health Organization; 2001.
63. Nicholas M. Pain management in musculoskeletal conditions. *Best Pract Res Clin Rheumatol*. 2008;22(3):451-70.
64. Turk D, Monarch E. Biopsychosocial perspective on chronic pain. In: Gatchel R, Turk D, editors. *Psychological approaches to pain management. A practitioner's handbook*. 2 ed. New York: The Guilford Press; 1996. p. 3-32.
65. Bergström G, Bodin L, Bertilsson H, Jensen I. Risk factors for new episodes of sick leave due to neck or back pain in a working population. A prospective study with an 18-month and a three-year follow-up. *Occup Environ Med*. 2007;64:279-87.
66. Gheldof E, Vinck J, van den Bussche E, Vlaeyen J, Hidding A, Crombez G. Pain and pain-related fear are associated with functional and social disability in an occupational setting: Evidence of mediation by pain-related fear. *Eur J Pain*. 2006;10(6):513-25.
67. Gheldof E, Vinck J, Vlaeyen J, Hidding A, Crombez G. Development of and recovery from short- and long-term low back pain in occupational settings: a prospective study. *Eur J Pain*. 2007;11:841-54.
68. Grotle M, Brox J, Glomsrød B, Lönn J, Völlestad N. Prognostic factors in first-time care seekers due to acute low back pain. *Eur J Pain*. 2007;11:290-98.
69. IJzelenberg W, Molenaar D, Burdorf A. Different risk factors for musculoskeletal complaints and musculoskeletal sickness absence. *Scand J Work Environ Health*. 2004;30(1):56-63.
70. Soucy I, Truchon M, Côté D. Work-related factors contributing to chronic disability in low back pain. *Work*. 2005;26:313-26.
71. van den Heuvel SG, Ariens GA, Boshuizen HC, Hoogendoorn WE, Bongers PM. Prognostic factors related to recurrent low-back pain and sickness absence. *Scand J Work Environ Health*. 2004;30(6):459-67.
72. Casey C, Greenberg M, Nicassio P, Harpin R, Hubbard D. Transition from acute to chronic pain and disability: A model including cognitive, affective, and trauma factors. *Pain*. 2008;134:69-79.
73. Linton SJ. A review of psychological risk factors in back and neck pain. *Spine*. 2000;25(9):1148-56.
74. Pincus T, Burton A, Vogel S, Field A. A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain. *Spine*. 2002;27(5):E109-20.
75. Swinkels-Meewisse I, Roelofs J, Schouten E, Verbeek A, Oostendorp R, Vlaeyen J. Fear of movement/(re)injury predicting chronic disabling low back pain: a prospective inception cohort study. *Spine*. 2006;31(6):658-64.
76. Denison E, Åsenlöf P, Lindberg P. Self-efficacy, fear avoidance, and pain intensity as predictors of disability in subacute and chronic musculoskeletal pain patients in primary health care. *Pain*. 2004;111:245-52.

77. Picavet H, Vlaeyen J, Schouten J. Pain catastrophizing and kinesiophobia: predictors of chronic low back pain. *Am J Epidemiol.* 2002;156(11):1028-34.
78. Turner J, Franklin G, Fulton-Kehoe D, Sheppard L, Wickizer T, Wu R, et al. Worker recovery expectations and fear-avoidance predict work disability in a population-based workers' compensation back pain sample. *Spine.* 2006;31(6):682-89.
79. Vlaeyen JWS, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain.* 2000;85:317-32.
80. Dionne C, Bourbonnais R, Frémont P, Rossignol M, Stock S, Nouwen A, et al. Determinants of "return to work in good health" among workers with back pain who consult in primary care settings: a 2-year prospective study. *Eur Spine J.* 2007;16:641-55.
81. Wessels T, van Tulder M, Sigl T, Ewert T, Limm H, Stucki G. What predicts outcome in non-operative treatments of chronic low back pain? A systematic review. *Eur Spine J.* 2006;15:1633-44.
82. Vlaeyen JW, Kole-Snijders AM, Boeren RG, Van Eek H. Fear of movement/(re)injury in chronic low back pain and its relation to behavioral performance. *Pain.* 1995;62(3):363-72.
83. Keefe F, Brown G, Wallston K, Caldwell D. Coping with rheumatoid arthritis pain: catastrophizing as a maladaptive strategy. *Pain.* 1989;37:51-6.
84. Bandura A. Self-efficacy. The exercise of control. New York: W. H. Freeman and Company; 1997.
85. Crook J, Milner R, Schultz I, Stringer B. Determinants of occupational disability following a low back injury: a critical review of the literature. *J Occup Rehabil.* 2002;12(4):277-95.
86. Hill J, Lewis M, Papageorgiou A, Dziedzic K, Croft P. Predicting persistent neck pain. A 1-year follow-up of a population cohort. *Spine.* 2004;29(15):1648-54.
87. Linton S. Occupational psychological factors increase the risk for back pain: a systematic review. *J Occup Rehabil.* 2001;11(1):53-66.
88. van den Heuvel S, Ariëns G, Boshuizen H, Hoogendoorn W, Bongers P. Prognostic factors related to recurrent low-back pain and sickness absence. *Scand J Work Environ Health.* 2004;30(6):459-67.
89. Gheldof E, Vinck J, Vlaeyen J, Hidding A, Crombez G. The differential role of pain, work characteristics and pain-related fear in explaining back pain and sick leave in occupational settings. *Pain.* 2005;113(1-2):71-81.
90. Crombez G, Vlaeyen JWS, Heuts PHTG, Lysens R. Pain-related fear is more disabling than pain itself: evidence on the role of pain-related fear in chronic back pain disability. *Pain.* 1999;80:329-39.
91. Leeuw M, Goossens M, Linton S, Crombez G, Boesma K, Vlaeyen J. The fear-avoidance model of musculoskeletal pain: current state of scientific evidence. *J Behav Med.* 2007;30(1):77-94.
92. Turner J, Franklin G, Heagerty P, Wu R, Egan K, Fulton-Kehoe D, et al. The association between pain and disability. *Pain.* 2004;112:307-14.
93. Gatchel R, Turk D. Musculoskeletal disorders: primary and secondary interventions. *J Electromyogr Kinesiol.* 2004;14:161-70.
94. Pincus T, Vogel S, Burton A, Santos R, Field A. Fear avoidance and prognosis in back pain. A systematic review and synthesis of current evidence. *Arthritis Rheum.* 2006;54(12):3999-4010.
95. Steenstra I, Verbeek J, Heymans M, Bongers P. Prognostic factors for duration of sick leave in patients sick listed with acute low back pain: a systematic review of the literature. *Occup Environ Med.* 2005;62:851-60.

96. Airaksinen O, Brox J, Cedraschi C, Hildebrandt J, Klaber-Moffett J, Kovacs F, et al. European guidelines for the management of chronic nonspecific low back pain. *Eur J Spine*. 2006;15(Suppl 2):S192-300.
97. Chou R, Qaseem A, Snow V, Casey D, Cross T, Shekelle P, et al. Diagnosis and treatment of low back pain: A joint clinical practice guideline from the American College of Physicians and the American Pain Society. *Ann Intern Med*. 2007;147:478-91.
98. van Tulder M, Becker A, Bekkering T, Breen A, Gil del Real M, Hutchinson A, et al. European guidelines for the management of acute nonspecific low back pain in primary care. *Eur Spine J*. 2006;15(Suppl 2):S169-91.
99. Bekkering G, Hendriks H, Koes B, Oostendorp R, Ostelo R, Thomassen J, et al. Dutch physiotherapy guidelines for low back pain. *Physiother*. 2003;89(2):82-96.
100. Moffett J, McLean S. The role of physiotherapy in the management of non-specific back pain and neck pain. *Rheumatol*. 2006;45:371-78.
101. Rubinstein S, van Tulder M. A best-evidence review of diagnostic procedures for neck and low-back pain. *Best Pract Res Clin Rheumatol*. 2008;22(3):471-82.
102. Childs J, Cleland J, Elliott J, Teyhen D, Wainner R, Whitman J, et al. Neck pain: clinical guidelines linked to the ICF from the Orthopaedic Section of the American Physical Therapy Association. *J Orthop Sports Phys Ther*. 2008;38(9):A1-A34.
103. Tugwell P. Philadelphia Panel evidence-based clinical practice guidelines on selected rehabilitation interventions for neck pain. *Phys Ther*. 2001;81(10):1701-17.
104. Picavet HSI, Schouten JSAG. Musculoskeletal pain in the Netherlands: prevalences, consequences and risk groups, the DMC3-study. *Pain*. 2003;102:167-78.
105. Webb R, Brammah T, Lunt M, Urwin M, Allison T, Symmons D. Prevalence and predictors of intense, chronic, and disabling neck and back pain in the UK general population. *Spine*. 2003;28(1):1195-202.
106. NSC. UK National Screening Committee. 2009.
107. Linton SJ. Early identification and intervention in the prevention of musculoskeletal pain. *Am J Ind Med*. 2002;41(5):433-42.
108. Gatchel R, Polatin P, Noe C, Gardea M, Pulliam C, Thompson J. Treatment and cost-effectiveness of early intervention for acute low-back pain patients: a one-year prospective study. *J Occup Rehabil*. 2003;13(1):1-9.
109. Waddell G, Burton A, Main C. Screening to identify people at risk of long-term incapacity for work. London: Royal Society of Medicine Press Ltd; 2003.
110. van der Windt D, Hay E, Jellema P, Main C. Psychosocial interventions for low back pain in primary care. Lessons learned from recent trials. *Spine*. 2008;33(1):81-9.
111. Linton S, Boersma K. Early identification of patients at risk of developing a persistent back problem: the predictive validity of the Örebro Musculoskeletal Pain Questionnaire. *Clin J Pain*. 2003;19:80-6.
112. Linton SJ, Halldén K. Can we screen for problematic back pain? A screening questionnaire for predicting outcome in acute and subacute back pain. *Clin J Pain*. 1998;14:209-15.
113. Neubauer E, Junge A, Pirron P, Seemann H, Schiltenswolf M. HKF-R 10 - screening for predicting chronicity in acute low back pain (LBP): a prospective clinical trial. *Eur J Pain*. 2006;10:559-66.

114. Vos C, Verhagen A, Koes B. The ability of the acute low back pain screening questionnaire to predict sick leave in patients with acute neck pain. *J Manipulative Physiol Ther.* 2009;32(3):178-83.
115. Meijer E, Sluiter J, Frings-Dresen M. Evaluation of effective return-to-work treatment programs for sick-listed patients with non-specific musculoskeletal complaints: a systematic review. *Int Arch Occup Environ Health.* 2005;78:523-32.
116. Moore JE, Von Korff M, Cherkin D, Saunders K, Lorig K. A randomized trial of a cognitive-behavioral program for enhancing back pain self care in a primary care setting. *Pain.* 2000;88:145-53.
117. Jensen I, Busch H, Bodin L, Hagberg M, Nygren Å, Bergström G. Cost effectiveness of two rehabilitation programmes for neck and back pain patients: a seven year follow-up. *Pain.* 2009;142:202-08.
118. Bell J, Burnett A. Exercise for the primary, secondary and tertiary prevention of low back pain in the workplace: a systematic review. *J Occup Rehabil.* 2009;19:8-24.
119. Schonstein E, Kenny D, Keating J, Koes B, Herbert R. Physical conditioning programs for workers with back and neck pain: a Cochrane systematic review. *Spine.* 2003;28(19):E391-95.
120. von Korff M, Balderson BHK, Saunders K, Miglioretti DL, Lin EHB, Berry S, et al. A trial of an activating intervention for chronic back pain in primary care and physical therapy settings. *Pain.* 2005;113:323-30.
121. Kreuter M, Skinner C. Editorial. Tailoring: what's in a name? *Health Educ Res.* 2000;15:1-4.
122. Haynes S, Leisen M, Blaine D. Design of individualized behavioral treatment programs using functional analytic clinical case models. *Psychol Assess.* 1997;9(4):334-48.
123. Åsenlöf P, Denison E, Lindberg P. Individually tailored treatment targeting activity, motor behavior and cognitions reduces pain-related disability: a randomized controlled trial in patients with musculoskeletal pain. *J Pain.* 2005;6(9):588-603.
124. Åsenlöf P, Denison E, Lindberg P. Individually tailored treatment targeting motor behavior, cognition, and disability: 2 experimental single-case studies of patients with recurrent and persistent musculoskeletal pain in Primary Health Care. *Phys Ther.* 2005;85(10):1061-77.
125. Shaw W, van der Windt D, Main C, Loisel P, Linton S. Early patient screening and intervention to address individual-level occupational factors ("blue flags") in back disability. *J Occup Rehabil.* 2009;19:64-80.
126. Gamlin J. NHS Working in Partnership Programme. Direct access to physiotherapy. 2005 [cited Oct 2009]; Available from: http://www.wipp.nhs.uk/uploads/gpdb/case_daphysio.pdf
127. Taylor S, Ellis I, Gallagher M. Patient satisfaction with a new physiotherapy telephone service for back pain patients. *Physiother.* 2002;88(11):645-57.
128. Frost H, Lamb S, Doll H, Taffe Carver P, Stewart-Brown S. Randomised trial of physiotherapy compared with advice for low back pain. *BMJ*, doi:10.1136/bmj.38216.868808.7C (published 17 Sept 2004)
129. Rivero-Arias O, Gray A, Frost H, Lamb S, Stewart-Brown S. Cost-utility analysis of physiotherapy treatment compared with physiotherapy advice in low back pain. *Spine.* 2006;31(12):1381-87.
130. Kendall N, Linton S, Main C. Guide to assessing psychosocial yellow flags in acute low back pain: risk factors for long-term disability and work loss. *Wel-*

- lington: Accident Rehabilitation and Compensation Insurance Corporation of New Zealand and the National Health Committee; 1997.
131. Fullen B, Baxter G, O'Donovan B, Doody C, Daly L, Hurley D. Factors impacting on doctors' management of acute low back pain: a systematic review. *Eur J Pain*. 2009;13:908-14.
 132. Somerville S, Hay E, Lewis M, Barber J, van der Windt D, Hill J, et al. Content and outcome of usual care for back pain: a systematic review. *Br J Gen Pract*. 2008;58(556):790-97, i-vi.
 133. Mikhail C, Korner-Bitensky N, Rossignol M, Dumas J. Physical therapists' use of interventions with high evidence of effectiveness in the management of a hypothetical typical patient with acute low back pain. *Physical Therapy*. 2005;85(11):1151-67.
 134. Poitras S, Blais R, Swaine B, Rossignol M. Practice patterns of physiotherapists in the treatment of work-related back pain. *J Eval Clin Pract*. 2007;13:412-21.
 135. Swinkels I, van den Ende C, van den Bosch W, Dekker J, Wimmers R. Physiotherapy management of low back pain: does practice match the Dutch guidelines? *Aust J Physiother*. 2005;51:35-41.
 136. Bishop A, Foster N. Do physical therapists in the United Kingdom recognize psychosocial factors in patients with acute low back pain? *Spine*. 2005;30(1):1316-22.
 137. Overmeer T, Linton SJ, Boersmaa K. Do physical therapists recognise established risk factors? Swedish physical therapists' evaluation in comparison to guidelines. *Physiother*. 2004;90:35-41.
 138. Green A, Jackson D, Klaber Moffett J. An observational study of physiotherapists' use of cognitive-behavioural principles in the management of patients with back and neck pain. *Physiother*. 2008;94:306-13.
 139. Stevenson K, Lewis M, Hay E. Does physiotherapy management of low back pain change as a result of an evidence-based educational programme? *J Eval Clin Pract*. 2006;12(3):365-75.
 140. Overmeer T, Boersma K, Main C, Linton S. Do physical therapists change their beliefs, attitudes, knowledge, skills and behaviour after a biopsychosocially oriented university course? *J Eval Clin Pract*. 2009;15:724-32.
 141. Sandborgh M, Åsenlöf P, Lindberg P, Denison E. Implementing behavioural medicine in physiotherapy treatment. Part II: Adherence to treatment protocol. *Adv Physiother*. 2010;12:13-23.
 142. van der Wees P, Jamtvedt G, Rebbeck T, de Bie R, Dekker J, Hendriks E. Multifaceted strategies may increase implementation of physiotherapy clinical guidelines: a systematic review. *Aust J Physiother*. 2008;54:233-41.
 143. Bero L, Grilli R, Grimshaw J, Harvey E, Oxman A, Thomson M. Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. *BMJ*. 1998;317:465-68.
 144. Grimshaw J, Shirran L, Thomas R, Mowatt G, Fraser C, Bero L, et al. Changing Provider Behavior. An overview of systematic reviews of interventions. *Med Care*. 2001;39(8 Suppl 2):II-2-II-45.
 145. Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet*. 2003;362:1225-30.
 146. Gross P, Greenfield S, Cretin S, Ferguson J, Grimshaw J, Grol R, et al. Optimal methods for guidelines implementation. Conclusions from Leeds castle meeting. *Med Care*. 2001;2001(8 suppl 2):II-85-II-92.

147. Lugtenberg M, Zegers-van Schaick J, Westert G, Burgers J. Why don't physicians adhere to guideline recommendations in practice? An analysis of barriers among Dutch general practitioners. *Implement Sci.* 2009;4(54).
148. van Tulder M, Croft P, van Splunteren P, Miedema H, Underwood M, Hendriks H, et al. Disseminating and implementing the results of back pain research in primary care. *Spine.* 2002;27(5):E121-27.
149. Chenot J, Scherer M, Becker A, Donner-Banzhoff N, Baum E, Leonhardt C, et al. Acceptance and perceived barriers of implementing a guideline for managing low back pain in general practice. *Implement Sci.* 2008;3(7).
150. Schers H, Braspenning J, Drijver R, Wensing M, Grol R. Low back pain in general practice: reported management and reasons for not adhering to the guidelines in the Netherlands. *Br J Gen Pract.* 2000;50:640-44.
151. Côte A, Durand M, Tousignant M, Poitras S. Physiotherapists and use of low back pain guidelines: a qualitative study of the barriers and facilitators. *J Occup Rehabil.* 2009;19:94-105.
152. Jette D, Bacon K, Batty C, Carlson M, Ferland A, Hemingway R, et al. Evidence-based practice: beliefs, attitudes, knowledge, and behaviors of physical therapists. *Phys Ther.* 2003;83(9):786-805.
153. Metcalfe C, Lewin R, Wisher S, Perry S, Bannigan K, Klaber Moffett J. Barriers to implementing the evidence base in four NHS therapies. *Physiother.* 2001;87(8):433-41.
154. Cheater F, Baker R, Gillies C, Hearnshaw H, Flottorp S, Robertson N, et al. Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev;* 2005.
155. Abraham C, Michie S. A taxonomy of behavior change techniques used in interventions. *Health Psychol.* 2008;27(3):379-87.
156. Eccles M, Grimshaw J, Walker A, Johnston M, Pitts N. Changing the behaviour of healthcare professionals: the use of theory in promoting the uptake of research findings. *J Clin Epidemiol.* 2005;58:107-12.
157. Godin G, Bèlanger-Gravel A, Eccles M, Grimshaw J. Healthcare professionals' intentions and behaviours: a systematic review of studies based on social cognitive theories. *Implement Sci.* 2008;3(36).
158. Baldwin J, Baldwin J. Behavior principles in everyday life. Upper Saddle River: Prentice Hall; 2001.
159. Fordyce W, Fowler R, DeLateur B. An application of behavior modification technique to a problem of chronic pain. *Behav Res Ther.* 1968;6:105-7.
160. Fordyce W. Behavioral methods for chronic pain and illness. St. Louis, MO: Mosby; 1976.
161. Bandura A. Health promotion by social cognitive means. *Health Educ Behav.* 2004;31(2):143-64.
162. Bandura A. Social foundations of thought and action. A social cognitive theory. N J: Prentice Hall; 1986.
163. Bandura A. Social Cognitive Theory: an agentic perspective. *Ann Rev Psychol.* 2001;52:1-26.
164. Locke E, Latham G. Building a useful theory of goal setting and task motivation. *Am Psychol.* 2002;57(9):705-17.
165. McLellan D. Principles of the acquisition of sensorimotor skills. In: Wilson B, McLellan D, editors. *Rehabilitation Studies Handbook.* Cambridge: Cambridge University Press; 1997.
166. Merskey H, Bogduk N. Classification of chronic pain: Description of chronic pain syndromes and definition of pain terms. IASP Press. Seattle; 1994.

167. Sullivan MJL. Toward a biopsychomotor conceptualization of pain. Implications for research and intervention. *Clin J Pain*. 2007;24(4):281-90.
168. Linton SJ. Why does chronic pain develop? A behavioral approach. In: Linton SJ, editor. *New avenues for the prevention of chronic musculoskeletal pain and disability*. Örebro, Sweden: Elsevier Science B V; 2002. p. 67-82.
169. Turk D, Okifuji A. Psychological factors in chronic pain: evolution and revolution. *J Consult Clin Psychol*. 2002;70(3):678-90.
170. Rowe R, McDaid D. Implementation: the need for a contextual approach to the implementation of musculoskeletal guidelines. *Best Pract Res Clin Rheumatol*. 2007;21(1):205-19.
171. SCB. Ohälsa och sjukvård 1980-2005. (Statistics Sweden. Disease and health care 1980-2005). 2006 [cited Nov 2006]; Available from: http://www.scb.se/templates/Listning2_180856.asp
172. Geisser ME, Haig AJ, Theisen ME. Activity avoidance and function in persons with chronic back pain. *J Occup Rehabil*. 2000;10(3):215-27.
173. Estlander A, Vanharanta H, Moneta GB, Kaivanto K. Anthropometric variables, self-efficacy beliefs, and pain and disability ratings on the isokinetic performance of low back pain patients. *Spine*. 1994;19:941-7.
174. Dziewaltowski D. Toward a model of exercise motivation. *J Sport Exerc Psychol*. 1989;11:251-69.
175. Zigmond AS, Snaith RP. The hospital and anxiety and depression scale. *Acta Psychiatr Scand*. 1983;67:361-70.
176. Rosenstiel AK, Keefe F. The use of coping strategies in chronic low back pain patients: relationship to patient characteristics and current adjustment. *Pain*. 1983;17:33-44.
177. McWilliams LA, Asmundson GJG. Assessing individual differences in attention to pain: psychometric properties of the Pain Vigilance and Awareness Questionnaire modified for a non-clinical sample. *Pers Individ Dif*. 2001;31:239-46.
178. Elo A, Leppänen A, Jahkola A. Validity of a single-item measure of stress symptoms. *Scand J Work Environ Health*. 2003;29(6):444-51.
179. WHO. World Health Organization. Global database on Body Mass Index. [cited Nov 2005] Available from: http://www.who.int/bmi/index.jsp?introPage=intro_3.html
180. Crombez G, Vervaeke L, Lysens R, Baeyens F, Eelen P. Avoidance and confrontation of painful, back-straining movements in chronic back pain patients. *Behav Modif*. 1998;22(1):62-77.
181. Engström L, Ekblom B, Forsberg A, V Koch M, Seger J. Livsstil-Prestation-Hälsa. LIV 90. Life style-Performance-Health. LIV 90. (In Swedish) Stockholm: Folksam. Högskolan för lärarutbildning, Idrottshögskolan, Karolinska Institutet, Korpen, Riksidrottsförbundet; 1990. Report No.: 1.
182. Bergström G, Jensen I, Bodin L, Linton S, Nygren Å, Carlsson S. Reliability and factor structure of the Multidimensional Pain Inventory - Swedish language version (MPI-S). *Pain*. 1998;75:101-10.
183. Pendleton D, Schoefield T, Tate P, Havelock P. *The consultation: an approach to learning and teaching*. London: Oxford University Press; 1984.
184. Houben RMA, Ostelo RWJG, Vlaeyen JWS, Wolters PMJC, Peters M, Stomp-van den Berg SGM. Health care providers' orientations toward common low back pain predict perceived harmfulness of physical activities and recommendations regarding return to normal activity. *Eur J Pain*. 2005;9:173-83.

185. Bandura A. Guide for constructing self-efficacy scales. In: Pajares F, Urdan T, Editors. *Self-efficacy beliefs for adolescents: Information Age Publishing*; 2006. p. 337-77.
186. Boersma K, Linton S. How does persistent pain develop? An analysis of the relationship between psychological variables, pain and function across stages of chronicity. *Behav Res Ther.* 2005;43:1495-507.
187. Heijbel B, Josephson M, Jensen I, Stark S, Vingård E. Return to work expectations predicts work in chronic musculoskeletal disorders: prospective study with clinical implications. *J Occup Rehabil.* 2006;16:173-84.
188. Kuijer W, Groothoff J, Brouwer S, Geertzen J, Dijkstra P. Prediction of sickness absence in patients with chronic low back pain: a systematic review. *J Occup Rehabil.* 2006;16:439-67.
189. Reme S, Hagen E, Eriksen H. Expectations, perceptions, and physiotherapy predict prolonged sick leave in subacute low back pain. *BMC Musculoskelet Disord.* 2009;10(139).
190. Schultz I, Crook J, Meloche G, Berkowitz J, Milner R, Zuberbier O, et al. Psychosocial factors predictive of occupational low back disability: towards development of a return-to-work model. *Pain.* 2004;107:77-85.
191. Boersma K, Linton S. Expectancy, fear and pain in the prediction of chronic pain and disability: a prospective analysis. *Eur J Pain.* 2006;10:551-57.
192. Fransen M, Woodward M, Norton R, Coggan C, Dawe M, Sheridan N. Risk factors associated with the transition from acute to chronic occupational back pain. *Spine.* 2002;27(1):92-8.
193. Kovacs F, Abaira V, Zamora J, Fernández C. The transition from acute to subacute and chronic low back pain. *Spine.* 2005;30(15):1786-92.
194. Philips H, Grant L. The evolution of chronic back pain problems: a longitudinal study. *Behav Res Ther.* 1991;29(5):435-41.
195. Sullivan M, Feuerstein M, Gatchel RJ, Linton S, Pransky G. Integrating psychosocial and behavioral interventions to achieve optimal rehabilitation outcomes. *J Occup Rehabil.* 2005;15(4):475-89.
196. Bekkering G, Hendriks H, van Tulder M, Knol D, Simmonds M, Oostendorp R, et al. Prognostic factors for low back pain in patients referred for physiotherapy. *Spine.* 2005;30(16):1881-86.
197. Dunn K, Croft P. The importance of symptom duration in determining prognosis. *Pain.* 2006;121:126-32.
198. Mallen C, Peat G, Thomas E, Dunn K, Croft P. Prognostic factors for musculoskeletal pain in primary care: a systematic review. *Br J Gen Pract.* 2007;57(541):655-61.
199. Wahlgren D, Atkinson J, Epping-Jordan J, Williams R, Pruitt S, Klapow J, et al. One-year follow-up of first onset low back pain. *Pain.* 1997;73:213-21.
200. Woby S, Watson P, Roach N, Urmston M. Are changes in fear-avoidance beliefs, catastrophizing, and appraisals of control, predictive of changes in chronic low back pain and disability? *Eur J Pain.* 2004;8:201-10.
201. Landis J, Koch G. The measurement of observer agreement for categorical data. *Biometrics.* 1977;33:159-74.
202. Daykin A, Richardson B. Physiotherapists' pain beliefs and their influence on the management of patients with chronic low back pain. *Spine.* 2004;29(7):783-95.
203. Smart K, Doody C. The clinical reasoning of pain by experienced musculoskeletal physiotherapists. *Man Ther.* 2007;12:40-9.
204. Jeffels K, Foster N. Can aspects of physiotherapist communication influence patients' experiences? A systematic review. *Phys Ther Rev.* 2003;8:197-210.

205. Maguire P, Pitceathly C. Key communication skills and how to acquire them. *BMJ*. 2002;325:697-700.
206. Bogduk N. What's in a name? The labelling of back pain. *Austr J Med*. 2000;173:400-1.
207. Bonetti D, Johnston M, Pitts N, Deery C, Ricketts I, Tilley C, et al. Knowledge may not be the best target for strategies to influence evidence-based practice: using psychological models to understand RCT effects. *Int J Behav Med*, doi:10.1007/s12529-008-9017-1 (published 20 Febr 2009).
208. Shuval K, Berkovits E, Netzer D, Hekselman I, Linn I, Brezis M, et al. Evaluating the impact of an evidence-based medicine educational intervention on primary care doctors' attitudes, knowledge and clinical behaviour: a controlled trial and before and after study. *J Eval Clin Pract*. 2007;13:581-98.
209. Ostelo R, Stomp-van den Berg SGM, Vlaeyen JWS, Wolters PMJC, De Vet HCW. Health care provider's attitudes and beliefs towards chronic low back pain: the development of a questionnaire. *Man Ther*. 2003;8(4):214-22.
210. Van Tulder M, Kovacs F, Müller G, Airaksinen O, Balagué F, Broos L, et al. European guidelines for the management of low back pain. *Acta Orthop Scand*. 2002;Suppl 305:20-5.
211. Rutten G, Kremers S, Rutten S, Harting J. A theory-based cross-sectional survey demonstrated the important role of awareness in guideline implementation. *J Clin Epidemiol*. 2009;62:167-76.
212. Kuijpers T, van der Windt D, van der Heijden G, Bouter L. Systematic review of prognostic cohort studies on shoulder disorders. *Pain*. 2004;109:420-31.
213. Iles R, Davidson M, Taylor N, O'Halloran P. Systematic review of the ability of recovery expectations to predict outcomes in non-chronic non-specific low back pain. *J Occup Rehabil*. 2009;19:25-40.
214. Klaber Moffett J, Green A, Jackson D. Words that help, words that harm. In: Gifford L, editor. *Topical Issues in Pain 5 Cornwall: CNS Press Ltd; 2006*. p. 105-25.
215. Östbom A. Rehabiliteringsgaranti. Kunskapsunderlag om psykiska diagnoser och smärta. The rehabilitation guarantee. Evidence base on psychiatric diagnoses and pain. (In Swedish). 2008 [cited Nov 2009]; Available from: www.skl.se/sjukskrivningar
216. Sieben J, Vlaeyen J, Portegijs P, Verbunt J, Van Riet-Rutgers S, Kester A, et al. A longitudinal study on the predictive validity of the fear-avoidance model in low back pain. *Pain*. 2005;117:162-70.
217. Burdorf A, Jansen J. Predicting the long term course of low back pain and its consequences for sickness absence and associated work disability. *Occup Environ Med*. 2006;63:522-29.
218. Gerdle B, Björk J, Henriksson C, Bengtsson A. Prevalence of current and chronic pain and their influences upon work and health-care seeking: a population study. *J Rheumatol*. 2004;31(7):1399-406.
219. Edwards P, Roberts I, Clarke M, DiGuseppi C, Pratap S, Wentz R, et al. Methods to increase response rates to postal questionnaires. *Cochrane Database Methodol Rev*. 2003(4).
220. Andersson I. Analysera. Epidemiologi för hälsovetare. Analyse. Epidemiology for health scientists (In Swedish). Vanneberga: Studentlitteratur; 2006.p. 73-129.
221. Overmeer T, Linton S, Holmquist L, Eriksson M, Engfeldt P. Do evidence-based guidelines have an impact in primary care? A cross-sectional study of Swedish physicians and physiotherapists. *Spine*. 2005;30(1):146-51.

222. Kazdin A. The case study and single-case research designs. *Research design in clinical psychology*. Boston: Allyn and Bacon; 2003. p. 265-99.
223. Kazdin A. *Single-case experimental designs: methods for clinical and applied settings*. Oxford: Oxford University Press; 1982.
224. Prochaska JO, DiClemente C, Norcross JC. In search of how people change. *Am Psychol*. 1992;47:1002-14.
225. Heaven C, Clegg J, Maguire P. Transfer of communication skills training from workshop to workplace: The impact of clinical supervision. *Patient Educ Couns*. 2006;60:313-25.
226. Parry R, Brown K. Teaching and learning communication skills in physiotherapy: What is done and how should it be done? *Physiother*. 2009;95:294-301.
227. Foster N, Thomas E, Bishop A, Dunn K, Main C. Distinctiveness of psychological obstacles to recovery in low back pain patients in primary care. *Pain*. 2010;148:398-406.

Appendix

Red and yellow flags in protocol study IV (in Swedish)

- **Historia/tecken på allvarlig spinal patologi**

Innebär frågor och diskussioner om kraftigt trauma senaste tiden, allmäntillstånd, bröstsmärta, cancer, feber, långvarig cortisonbehandling, viktnedgång, cauda equina-syndrom. Även om det framkommer att patienten är utredd medicinskt via läkare för sina besvär, t.ex. efter trauma. Inte om sjukgymnasten bara frågar om patienten har remiss.

- **Smärtintensitet**

Innebär frågor och diskussioner om hur intensiv smärtan är, t.ex. genom att patienten får skatta sin smärta på en skala. T.ex. ”Hur ont har du haft i genomsnitt den senaste veckan?” ”Kan du skatta din smärta från 0 till 10?” Om sjukgymnasten bara noterar att det gör ont räknas det inte som undersökning av smärtintensitet. Inte heller frågor och yttranden om vad som ökar/minskar smärtan.

- **Sjukskrivning**

Innebär frågor och diskussioner om nuvarande eller tidigare sjukskrivning för samma besvär. T.ex. ”Är du sjukskriven för dina besvär?” ”Har du varit sjukskriven tidigare för dina besvär?” ”Jag är ju sjukskriven nu” ”Jag har varit halvtidssjukskriven”.

- **Delaktighet**

Innebär frågor och diskussioner om hur olika aktiviteter (inklusive sömn) som fungerar, i relation till arbete, skötsel av hemmet och fritid. T.ex. ”Vad klarar du av att göra?” ”Vilka aktiviteter måste du avstå från?” ”Jag har svårt att ta mig till jobbet” ”Jag kan inte ägna mig åt fritidsaktiviteter” ”Jag kan inte sova”. Inte generellt som att stå, gå, sitta. Inte heller vad patienten får mer/mindre ont av.

- **Föreställningar om att smärtan beror på något allvarligt fel**

Innebär frågor och diskussioner om vad patienten själv tror att smärtan beror på, patientens eventuella farhågor och oro kring detta. T.ex. ”Vad tror du själv att smärtan beror på?” och beroende på svaret specificering ”Vad är du rädd/orolig för?”, ”Vad tror du skulle hända om du provade att ...?”. Även diskussioner kring negativa föreställningar hos patienten som ”Ryggen är helt slut” och ”Kotorna och bäckenet hoppar snett”.

- **Egen beteendemässig hantering av besvären**

Innebär frågor och diskussioner om vad patienten själv gör för att lindra eller förebygga smärta. T.ex. ”Vad kan du själv göra för att lindra dina besvär?” ”Vad gör du för att hantera dina besvär?” ”Jag använder värme” ”Jag gör inget speciellt”. Även smärtlindrande medicin som patienten tar på eget initiativ.

- **Egen kognitiv hantering av besvären**

Innebär frågor och diskussioner om hur patienten tänker för att hantera sin smärta. T.ex. ”När du får så där ont, hur tänker du då för att hantera dina besvär?” och t.ex. ”Jag tänker att det finns andra som har det värre.”

- **Rörelserädsla**

Innebär frågor och diskussioner om undvikandebeteende och rädsla för att röra sig. T.ex. ”Är du rädd för att röra dig på grund av smärtan?” ”Undviker du att...för att du är rädd för smärtan?” ”Jag har blivit rädd för att röra mig” ”Jag törs inte...”.

- **Förväntan om långvarig smärta**

Innebär frågor och diskussioner om patientens föreställningar om hur långvarig smärtan kommer att bli. ”Har du själv någon fundering kring hur långvarig den här smärtan kan bli?” och t.ex. ”Jag kommer väl aldrig mer att kunna arbeta”

- **Omgivningens reaktioner**

Innebär frågor och diskussioner om hur familj, vänner och arbetskamrater reagerar på patientens smärta. T.ex. ”Hur reagerar din familj nu när du har så här ont?” och ”Maken gör ju allting åt mig nu”.

- **Nedstämdhet/depression**

Innebär frågor och diskussioner om känslor av nedstämdhet och tendenser att dra sig undan. T.ex. ”Hur klarar du humöret nu när du har de här besvären?” ”Känner du dig nedstämd på grund av dina besvär?” och ”Jag blir irriterad och sur” eller ”Jag orkar inte vara bland folk”.

Acta Universitatis Upsaliensis

*Digital Comprehensive Summaries of Uppsala Dissertations
from the Faculty of Social Sciences 55*

Editor: The Dean of the Faculty of Social Sciences

A doctoral dissertation from the Faculty of Social Sciences, Uppsala University, is usually a summary of a number of papers. A few copies of the complete dissertation are kept at major Swedish research libraries, while the summary alone is distributed internationally through the series Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Social Sciences. (Prior to January, 2005, the series was published under the title "Comprehensive Summaries of Uppsala Dissertations from the Faculty of Social Sciences".)

Distribution: publications.uu.se
urn:nbn:se:uu:diva-121424



ACTA
UNIVERSITATIS
UPSALIENSIS
UPPSALA
2010