Self-management of Persistent Neck Pain

A Multi-component Group Intervention in Primary Health Care

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Abstract

The overall aim of this thesis was to evaluate effects of a multi-component pain and stress self-management group intervention (PASS) and to explore plausible predictors associated with short-term and long-term treatment effects among patients with persistent tension-type neck pain in primary health care (PHC).

Study I was a pilot study in order to explore feasibility of the study design and methods. It included 37 participants randomly assigned to the intervention (n=18) or treatment-as-usual (n=19). Study II-III was a pragmatic randomized controlled trial that compared effects of the PASS and individually administered physiotherapy (IAPT) on patients with persistent tension-type neck pain in PHC. Study II evaluated short-term effects over a 20-week follow-up. Study III evaluated long-term effects on maintenance over a follow-up period of 2 years. Studies included 156 participants randomly assigned to PASS (n=77) or IAPT (n=79). Study IV explored predictive factors for favorable outcome in disability regarding participants assigned to PASS.

The results showed that PASS had better effects than IAPT regarding coping with pain, in terms of patients’ ability to control pain, self-efficacy regarding activities interfered with by pain, disability and catastrophizing, over the 20-week follow-up, and treatment effects were largely maintained over a 2-year follow-up. Post-treatment scores in disability, self-efficacy and pain intensity were associated with long-term outcome in pain-related disability 2 years post-treatment following PASS. Pre-treatment characteristics explained only a minor proportion of variance in disability, and were assumed weakly associated with treatment success and long-term outcome.

Key components for enhancement of long-term efficacy in pain self-management coping efforts were adequately targeted by PASS. It is suggested important to strengthen self-efficacy beliefs in regard to pain coping, to reduce disability and enhance pain self-management in the treatment of persistent neck pain, and to induce long-term maintenance of treatment gains on disability following a pain self-management intervention.

Keywords: coping, neck pain, physiotherapy, predictors, randomized controlled trial, self-assessment questionnaire, self-management

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Every step has a direction...
List of Papers

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


III Gustavsson C, Denison E, von Koch L. Self-management of persistent neck pain: 2-year follow-up of a randomized controlled trial of a multi-component group intervention in primary health care. *Accepted for publication in Spine*.

IV Gustavsson C, Bergström J, Denison E, von Koch L. Predictive factors for disability outcome at 20 weeks and 2 years following a pain self-management group intervention in patients with persistent neck pain in primary health care. *In manuscript*.

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### Abbreviations

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<tr>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>ANCOVA</td>
<td>Repeated measures analysis of covariance</td>
</tr>
<tr>
<td>AR</td>
<td>Applied Relaxation intervention program</td>
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<tr>
<td>AR/PASS</td>
<td>Applied Relaxation intervention program/Pain and stress self-management group intervention</td>
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<tr>
<td>BIC</td>
<td>Schwarz’s Bayesian Criterion</td>
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<tr>
<td>CSQ</td>
<td>The Coping Strategies Questionnaire</td>
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<tr>
<td>CSQ-CAT</td>
<td>The Catastrophizing subscale of the Coping Strategies Questionnaire</td>
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<tr>
<td>FABQ-W</td>
<td>The work subscale of the Fear-Avoidance Beliefs Questionnaire</td>
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<tr>
<td>fMRI</td>
<td>functional magnetic resonance imaging</td>
</tr>
<tr>
<td>HADS-A</td>
<td>The Anxiety subscale of the Hospital Anxiety and Depression Scale</td>
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<tr>
<td>HADS-D</td>
<td>The Depression subscale of the Hospital Anxiety and Depression Scale</td>
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<tr>
<td>IAPT</td>
<td>Individually administered physiotherapy</td>
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<tr>
<td>IASP</td>
<td>International Association for the Study of Pain</td>
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<tr>
<td>ICF</td>
<td>International Classification of Functioning, Disability and Health</td>
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<tr>
<td>NDI</td>
<td>Neck Disability Index</td>
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<tr>
<td>OLS</td>
<td>Multivariate regression analysis estimated by ordinary least squares</td>
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<tr>
<td>PASS</td>
<td>Pain and stress self-management group intervention</td>
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<tr>
<td>PHC</td>
<td>Primary health care</td>
</tr>
<tr>
<td>PLS</td>
<td>Multivariate regression analysis estimated by partial least squares</td>
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<tr>
<td>PT</td>
<td>Physiotherapist</td>
</tr>
<tr>
<td>SES</td>
<td>The Self-efficacy Scale</td>
</tr>
<tr>
<td>SOC-13</td>
<td>The Sense of Coherence Scale – Short form</td>
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<tr>
<td>TAU</td>
<td>Treatment as usual</td>
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<tr>
<td>TAU/IAPT</td>
<td>Treatment as usual/Individually administered physiotherapy</td>
</tr>
<tr>
<td>TENS</td>
<td>Transcutaneous electric nerve stimulation</td>
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<tr>
<td>TSK</td>
<td>The Tampa Scale for Kinesiophobia</td>
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Once upon a time, many years ago, a friend of mine was experiencing a range of symptoms, of which neck pain was one. She said to me: “Everybody tells me to relax my shoulders, but how?! I don’t know how to relax!” At that time I was a social worker engaged in helping people who were encountering difficulties in their daily lives, to use strategies for problem-solving, and to cope and manage the inevitable problems encountered in life. I found it strange that no one in medical health care had taken an interest in teaching my friend the skills she needed to allow her to relax. Some years later I started my career as a physiotherapist (PT) in primary health care with the same ambitions as in my previous work. The patients often came to me to get rid of their pain, but as equally important to me as reducing pain symptoms, was teaching the patient self-management coping strategies to prevent and to deal with possible future pain flares. My ambition was to equip the patients with the right tools, the necessary skills, to become the best expert in their own health and pain management.

My psychosocial background was not always easy to incorporate in the traditional biomedical approach. I found that there was a gap between the literature describing a preferred biopsychosocial perspective on illness together with my psychosocial background, as compared to the clinical practice of physiotherapy and health care in general, where the traditional biomedical approach was prevailing. A gap that needed to be bridged. I experienced a paucity of “knowledge transfer” from research to clinic.

This gave me a reason to examine the treatment modalities I had to hand as a PT and explore how to apply a biopsychosocial approach in physiotherapy by incorporating behavioral and cognitive treatment components into my practice repertoire. That was how this journey began. Not knowing where it would end, at least I had a direction. Since then, the direction has changed many times and I am happy in the knowledge that I still have a long journey ahead of me. This thesis is not the end-point. There is still much to see and discover beyond the next hill, the next turn.
Introduction

Pain is a very common health problem. Estimates of pain vary depending on definitions used and populations studied. The lifetime prevalence of spinal pain has been reported from 54% to 80%. The reported prevalence of persistent musculoskeletal pain in an adult population ranges from 2% to 40%.

In the general population 30% to 50% of adults will experience musculoskeletal neck pain in any given year. Prevalence of neck pain increases with age, peaking in middle age and is higher for women (48%) than men (38%), also with regard to persistent complaints; women (22%) men (16%). Of people who experience neck pain at some point, approximately 50% will report recurrences or persistent complaints 1 year and 5 years later. Within the population of those with neck pain, co-existing pain from other parts of the body is common, e.g. headache, lower back. A 12-year follow-up of a Swedish population showed that those who initially experienced neck pain, reported pain from other parts of the body 12 years later, to a higher extent than did those who originally reported low back pain.

Pain is one of the most common reasons for seeking medical care. People seek health care for pain not only for diagnostic evaluation and symptom relief, but also because pain interferes with daily activities, causes worry and emotional distress, and undermines confidence in one's health. When pain persists for weeks or months, its broader effects on well-being can be profound. Psychological health and performance of social responsibilities in work and family life can be significantly impaired.

The magnitude of the problem of neck pain and the risk of severe impact on a person’s quality of life and the costs for society emphasizes the importance of making efforts to reduce disability and increase the individual’s ability to cope with persistent pain.

Self-management of pain refers to the adaptation of coping strategies that help the individual to manage challenging situations encountered in life due to pain. The promotion of active self-management is an important way of empowering the patient to be involved in managing their own care, to make choices and to feel in control of their own health. Although the importance of self-management interventions has been increasingly recognized, such interventions are still insufficiently investigated in the context of persistent pain conditions.
The following text scrutinize several important aspects of pain and stress self-management to found a base for an effective neck pain self-management treatment approach.

Pain

The concept of Pain

Pain has been defined by the International Association for the Study of Pain (IASP) as:

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

Pain is a ubiquitous part of life. We all experience painful situations at some point of our lives, including headache, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain, such as illness, injury or dental procedures for example.

Pain is initiated by stimulation of nociceptors in the peripheral nervous system, or by damage to or malfunction of the peripheral or central nervous systems. Pain perception consists of three dimensions: “sensory-discriminative” (the intensity, location, quality and duration of the pain), “affective-motivational” (the emotional unpleasantness and urge to escape the unpleasantness), and “cognitive-evaluative” (the cognitions such as appraisal, cultural values, distraction and suggestion).

From an evolutionary perspective, pain perception serves as an important internal mechanism that increases the probability of survival. Pain alerts the individual to the possibility that the integrity of the body has been compromised, thus priming and adding urgency to action. Pain directs attention to the pain site, motivates and mobilizes behavior designed to act on the source; to withdraw from potentially damaging situations, protect a damaged body part while it heals, and avoid those situations in the future.

Pain as a warning signal is true for the typically acute pain. Most pain resolves promptly once the painful stimulus is removed and the body has healed, but sometimes pain persists despite removal of the stimulus and apparent healing of the body; and sometimes pain arises in the absence of any detectable stimulus, damage or pathology. Such persistent or recurrently occurring pain has little or no protective value as a warning signal from a survival perspective and should be viewed as a distinct phenomenon and a separate entity from acute pain. Consequently, recommendations for treatment approaches also differ between acute and persistent pain conditions.
The study of pain in a historical perspective

The systematic study of pain can be dated back to the French philosopher René Descartes who in the 17th century advanced a model of pain 22 that laid the foundation for many ensuing theoretical models 23. Descartes described how damage to the body, exemplified by a burning flame reaching a foot, would cause pores to open that controlled tubes that drove the spirits to the brain. In other words, how tissue damage stimulated ascending neural pathways and that pain was registered as these neural signals reached the brain. According to the model, pain intensity would be directly proportional to the amount of tissue damage. Descartes model represents a dualistic perspective that distinctly separates body processes from mind processes. Pain was conceptualized as a sensory phenomenon that could be explained entirely in mechanistic terms as part of the operations of the body 23. Even the graphic depiction that Descartes proffers of the boy with his foot in the fire (Figure 1) lacks all mental and psychological processing; he experiences pain in a social void, shows no expression of emotional distress, and takes no action to deal with the pain.

![Figure 1. Descartes model of pain perception 24.](image)

The Cartesian perspective dominated the understanding of pain until 1965 when the Gate Control Theory of pain was proposed by Melzack and Wall18. They described a gate control system at spinal level modulating sensory stimulation before pain is perceived and responded to. The model proposed that thin diameter (transmitting pain sensations) and large diameter (transmitting touch, pressure, vibration sensations) nerve fibers carry sensory information from the site of injury to two destinations in the dorsal horn of
the spinal cord; i.e. to “inhibitory” cells and “transmission” cells. The transmission cells are the “gate” to pain, and inhibitory cells can inhibit activation of the transmission cells by shutting the gate. When thin (pain) and large (touch, etc.) nerve fibers, are activated by a noxious event, the thin pain fibers impede the inhibitory cells (i.e. tend to leave the gate open) while the large diameter fibers excite the inhibitory cells (i.e. tend to close the gate). So, the more large fiber activity relative to thin fiber activity coming from the inhibitory cell, the less pain is felt. This explains why we perceive less pain by rubbing a smack. The model also includes an “action system”, i.e. behavioral responses by reflexes operating at the spinal level, primarily reflexive withdrawal or escape responses 18,25,26.

The Gate Control Theory revolutionized the scientific view on pain by presenting a perspective of pain experience as jointly determined by physiological, motivational, cognitive and emotional factors regulation neural excitatory and inhibitory processes, thus offering an explanation for pain in the absence of injury, and injuries in the absence of pain 18,27.

Melzack later proposed a “neuromatrix” theory of pain 28 (Figure 2) which provided a conceptual framework that expanded the understanding of pain perception from the peripheral nerves and spinal cord to the function of the brain.

![Figure 2. The body-self neuromatrix according to the model proposed by Melzack28.](image-url)
Melzack’s model proposed that the brain possesses a complex neural network: i.e. the “body-self neuromatrix”, that integrates information from multiple sources to produce an output pattern that is experienced as pain. The neuromatrix model also acknowledged the modulating role of the neural biological stress system. The neural network includes parallel processing in different brain areas that constitutes the sensory-discriminative, affective-motivational and cognitive-evaluative dimensions of the pain experience. The architecture of the neuromatrix is genetically determined and is modified by sensory experience as well as cognitive and affective activities in the brain, that give rise to “neurosignature” output patterns of pain. Neurosignature patterns may also be generated independently of sensory inputs. The output patterns of the neuromatrix is the primary mechanism that generates the neural pattern that produces the pain perception as well as homeostatic and behavioral responses after injury or pathology.

The neuromatrix framework provided a very important contribution to clinical pain management by explaining that pain can be treated not only by changing the sensory input, e.g. by anesthetic block or transcutaneous electric nerve stimulation (TENS), but also by influencing affective and cognitive factors as well as the biological stress-regulating system.

In recent years, brain-imaging studies, e.g. functional magnetic resonance imaging (fMRI), have made major contributions to the understanding of the complex neural network processing within the brain. The neurobiology of pain and emotional fear responses are closely related. Amygdala, in the medial temporal lobe, is a key structure in the brain’s fear circuitry, i.e. the emotional processing of the pain experience. Sensory information, e.g. nociceptive information, arrives in amygdala (lateral nucleus) from somatosensory thalamus and somatosensory cortices and projects behavioral, autonomic and endocrinal output responses by way of different areas in the brainstem. The hippocampus is important for coding contextual information about a fear-learning situation. Prefrontal cortex processes somatosensory information, including nociceptive stimuli on a more cognitive and reflective level, and is important for top-down regulation of affective responses through moderation of activation on subcortical regions, such as amygdala. The emotional (affective) processing of the pain experience, which produces more reflexive behavioral and autonomic responses, precedes by some milliseconds the cognitive (reflective) processing within the brain.

Wall discussed the link between pain symptoms and motor systems for escape and minimization of injury. Sullivan suggests a biopsychomotor model of pain, that emphasizes the behavioral dimensions of pain and considers behavioral motor programs as integral components of pain, which elicit and maintain pain behaviors. These behavioral dimensions include: communicative pain behaviors (e.g. facial and verbal expressions), protective pain behaviors (escape and withdrawal) and social response...
behaviors (e.g. attention, empathy, absolution from domestic and occupational responsibilities) 34.

Applying a biopsychosocial perspective on pain
The biopsychosocial model of illness was introduced by Engel in the 1970s, and was in contrast to the prevailing biomedical model 35. The biopsychosocial model gives an understanding of how disease and illness are influenced by a complex interaction of biological, psychological and social factors. It emphasizes the reciprocal interplay between these factors that shapes responses to symptoms and illness 36. The biopsychosocial framework is included in several theoretical models of health behavior e.g. Social Cognitive Theory 37.

The biopsychosocial model is highly applicable to the complexity of persistent pain, by emphasizing that the experience of pain and responses to it, are the result of the reciprocal interplay between biological, psychological and social factors that shape responses to symptoms 36. It is important to keep in mind that the separation of these constructs is substantially artificial, and it is presumed that psychological processes have biological effects, that biological processes affect an individual’s psychosocial environment, and so on 31,36.

To highlight the interplay between biological, psychological and social factors as jointly determining the experience of pain, an outline of the stress response to pain and the emotional aspect of pain are provided below.

Stress response to pain
Hans Selye who founded the field of stress research, dealt with stress in the biological sense of physical injury, infection and pathology, but also recognized the importance of psychological stress 29. The latter has come to dominate the field and the common understanding of the stress concept. However, for the purpose of understanding pain, it is important to keep in mind that stress is a biological reaction, which is activated by physical injury, infection or threat to the biological homeostasis as well as by emotional and psychological threat and insult. Injury produces pain, but also disrupts the brain’s homeostatic regulation systems, thereby producing “stress” and the initiation of complex programs to reinstate homeostasis 28.

Stress could be defined as the physiological response to an internal or external stimulus; i.e. a stressor, for example pain, that triggers the behavioral fight-or-flight response by release of stress hormones 32. It involves the activation of the reticular activating system in the brain stem, the autonomic nervous system and the endocrine system 32,38. The biological stress reaction is activated by the sympathetic branch of the autonomic nervous system. The acute stress response give rise to immediate physical reactions associated with preparation for demanding muscular action (to
facilitate for example defense behavior): i.e. increased heart rate and breathing frequency, skin paling and/or flushing, inhibition of stomach and intestinal activity that slows down digestion, redirection of blood circulation from intestines to the muscles by vasoconstriction in many parts of the body, increased metabolic activity by release of blood sugar from the liver and free fatty acids into the blood circulation system, dilatation of pupils, loss of peripheral vision (“tunnel vision”) and hearing, increased muscular tension and down regulation of the immune system by depressed lymphoid activity e.g. natural killer cells, etc 20.

This stress response is desirable and adaptive in preparing the organism for necessary demanding physical action. However, activation of the stress response should be followed by restorative processes regulated by the second branch of the autonomic nerve system: the parasympathetic 20. Prolonged exposure to a stressor, which is the case in persistent pain conditions, may cause a chronic stress response with suppressed parasympathetic regulation, producing physiological and psychological dysfunction and illness symptoms such as increased muscular tension and inability to relax, pain, and tension-type headache 38.

**Emotional response to pain**

From an evolutionary perspective, emotions have evolved through their adaptive value in dealing with fundamental life tasks, in an environment were the fittest survived. Emotions are ways of relating to the environment; i.e. states of readiness for engaging, or not engaging in interaction with that environment. They are multi-component responses to challenges or opportunities that are important to the individual’s goals, particularly social ones 20. Emotions color our thoughts and enable our reasoning 30. Each emotion has unique features: signals, physiology and antecedent events. Each emotion also has characteristics in common with other emotions: rapid onset, short duration, unbidden occurrence, automatic appraisal, and coherence among responses 20, 39.

Pain is often accompanied by the emotional experience of “fear” 20. The person with pain expresses being scared that the pain is associated with potential harm to the body and describes how he/she avoids behavior that could evoke pain or increase pain. To expose a person to a painful stimuli e.g. an electric shock, is a method frequently used in experimental studies to provoke fear and measure the fear response 32. Pain perceived as fearful, activates or increases negative cognitions e.g. catastrophizing, which promotes anxiety and more fear, as well as avoidance behavior and pain-related disability, which impede tissue healing processes 38. Pain conditions that persist over an extended time period are often accompanied by perceptions of uncontrollability and unpredictability as well as heightened alertness to negative bodily signals, which in turn induce more fear 31, 40.
However, pain is not always associated with fear. Having pain originating from muscle soreness after exercise/physical activity could even be perceived with pleasure, as a reward for a good achievement. In this case the emotional value that the individual puts into the pain experience is completely different, and presumably such pain is seldom followed by avoidance behavior and disability. The “pain-sufferer” continues with daily activities that promote blood circulation, tissue healing and recovery. That is to say, apart from the intensity of the pain-inducing sensory stimuli (e.g. the electric shock), our cognitive judgments in the light of earlier experiences, appraisals and the context, will also affect the emotional outcome following pain.

Categorizing and classification of pain
Musculoskeletal pain is commonly categorized according to specific anatomic regions. Neck pain is in this thesis defined as originating from an area covering the occipital parts of the head (linea nuchae), laterally to acromion on the shoulder and following the scapular spine in a medial direction to the fourth thoracic vertebra.

Neck pain and other spinal pains are frequently classified according to duration. Various time spans have been suggested; acute pain is often defined as lasting for less than four or six weeks, chronic/persistent pain for more than three, six or twelve months, and sub-acute pain for the intermediate interval. In this thesis persistent neck pain is defined by a duration of more than 3 months. Musculoskeletal neck pain often exhibits a recurrent course, making temporal classification difficult. Thus, it is probably more correct to view persistent neck pain as recurrent pain episodes occurring over an extended time-span with varying degrees of recovery between episodes, rather than as a single event without permanent resolution within a specific time.

However, pain with a persistent or recurrent course of extended duration, should be viewed as a distinct type of pain, separated from acute pain. Central sensitization is a common sequela caused by pain conditions that persist for an extended time. It refers to the phenomenon of sensitization by which repeated stimulation of peripheral nerves produces a progressively amplified synaptic response of the peripheral nerves, in addition to a central component of reduced descending inhibitory pain control. In the literature the phenomenon is also discussed as dysfunction of Diffused Noxious Inhibitory Control (DNIC). In the clinical practice this type of pain is often observed as wide-spread and migrant pain, i.e. pain conditions that are difficult to categorize according to a specific anatomic region. It has been suggested that neck pain is more often part of widespread pain conditions than pain originating from other body sites, and that localized neck pain is rare.
Tension-type pain refers to pain due to sustained muscular contraction presumably provoked by emotional causes or by persistent overuse of particular muscles. Elevated muscle tension contributes to the maintenance of neck pain, displayed by elevated responses and extended duration of muscle tension during physical work and in stressful situations.

To acknowledge the behavioral aspects of pain and facilitate evaluation of the personal and societal impact of pain, it has been suggested that neck pain be categorized according to: “non-interfering neck pain” verses “interfering neck pain”. In order to evaluate the impact and interference of neck pain on functioning, the International Classification of Functioning, Disability and Health (ICF) could be used.

Disability and pain

The International Classification of Functioning, Disability and Health (ICF) comprises a biopsychosocial model in which a person’s functioning and disability is conceived as a dynamic, reciprocal interaction between health conditions and both environmental and personal contextual factors. ICF shifts the focus from “cause” to “impact” of health conditions. Functioning denotes the positive aspects and disability the negative aspects of the interaction between an individual with a health condition and his or her contextual factors, i.e. environmental and personal factors. Disability is an umbrella term for impairments (i.e. the negative aspects of body functions and structures), activity limitations and participation restrictions. However, functioning is implicitly addressed when disability is studied and vice versa.

ICF-based “Core Sets” for classification of health conditions have been developed. These core sets select a subset of categories that can serve as minimal standards for the assessment of functioning and health in relation to specific disorders. There is currently no available core set for neck pain, but the ICF Core Sets for arthritis, low back pain and other chronic musculoskeletal conditions may also be applicable for persistent neck pain. For example, the brief ICF Core Set for chronic widespread pain suggests that when evaluating the ICF components “activities and participation”, the following categories should be considered: carrying out daily routines, handling stress and other psychological demands, family relationships, employment, intimate relationships, walking, recreation and leisure, solving problems, lifting and carrying objects and doing housework.

In this thesis the Neck Disability Index (NDI) has been used to measure pain-related disability. The NDI is a widely used self-assessment instrument regarding disability in patients with neck pain. It was developed in the 1990s to measure perceived interference with daily activities due to neck pain. When applied to the ICF model, the majority of the items in NDI can be said to measure a person’s self-rated activity limitations and/or
Physiotherapy management of pain

Musculoskeletal pain is a very common reason for seeking care from a PT in primary health care (PHC)\(^63\)-\(^65\). PTs in PHC use a variety of treatment modalities, specific exercises and more comprehensive exercise programs to treat musculoskeletal neck pain\(^66\)-\(^69\). The majority of the treatment modalities used by PTs are focused on the “sensory-discriminative” dimension of pain\(^70\)-\(^73\).

For patients with neck pain, systematic literature reviews have shown that treatments involving different types of exercise programs combined with manual therapy, are more effective for pain reduction, improved functioning and quality of life than single manual treatment approaches\(^68\). Treatment approaches that combine active exercise with education emphasizing self-management and return to normal functioning are more beneficial in reducing pain and disability than stand-alone treatment approaches by manual therapy, TENS, neck collar or simple advice/education\(^67\). Educational interventions or advice explicitly addressing self-efficacy have yielded benefits by reducing pain-related disability as compared to other physiotherapy treatments for patients with neck pain\(^67\),\(^72\),\(^74\),\(^75\). However, the most frequently used educational programs focus on delivering advice regarding the beneficial effects of physical activity and provide unidirectional information from the therapist to the patient. In a review, such interventions showed limited benefits on pain reduction in persistent neck pain conditions\(^76\). Studies have indicated that the effectiveness of typical physiotherapy pain-directed interventions characterized by functional physical restoration could be further improved by addition of cognitive-behavioral treatment components targeting psychosocial factors of importance for pain-related disability\(^70\),\(^75\),\(^77\),\(^78\).

In studies, relaxation therapies for persistent pain conditions have been shown to be effective in reducing pain and disability\(^79\)-\(^81\) and are widely applied in the treatment of neck pain. The effects of relaxation therapies have often been attributed to reduction in the muscle tension associated with pain\(^79\),\(^82\). Different types and combinations of mind-body treatment approaches, such as relaxation, meditation, yoga and Tai chi are widely applied for patients with persistent pain conditions\(^83\). In studies they have shown best effects on pain, functional status and behavioral outcomes when used in combination with stress management, coping skills training and/or cognitive restructuring\(^83\),\(^84\). Studies suggest that the positive effects on pain in mind-body interventions may in part be mediated by changes in sense of control and self-efficacy\(^85\).
Applied relaxation is a treatment approach that combines several relaxation techniques with coping skills training according to behavioral learning principles. It is grounded in the principles of skill mastery, in which relaxation is trained as a semiautomatic response to physical arousal and applied to counteract anxiety and pain. Studies have shown Applied relaxation to be effective in regard to decreasing pain in patients with musculoskeletal pain disorders. Although the method of Applied relaxation is frequently used by PTs in the management of persistent pain conditions, there are no studies of Applied relaxation when performed by PTs in physiotherapy settings.

Body Awareness Therapy is a commonly used mind-body treatment approach among Swedish PTs, however infrequently applied outside Scandinavia. The treatment consists of movement exercises aimed at cultivating a particular quality of mind-body awareness characterized by a non-judgmental, accepting and “mindful” awareness of oneself in the present moment, i.e. the ability to sustain attention and awareness of bodily events and current experiences in a non-evaluative moment-to-moment manner, often labeled as mindfulness. In patients with persistent pain conditions studies have shown some support for the benefits offered by Body Awareness Therapy on improved health-related quality of life measures, but not on pain. The effects of Body Awareness Therapy in the treatment of persistent pain conditions is insufficiently explored and there is a need for more studies of high methodological quality concerning different pain conditions and populations.

Based on evidence-based guidelines, a stepped care approach for physiotherapy management of neck and back pain has been proposed. At an early stage it is incumbent upon the PT to be able to identify patients with serious spinal pathology in need of other specialist care (called “red flags”), and identify patients who are at risk of developing psychosocial barriers to recovery (called “yellow flags”). Initially, advice providing messages of explanation, reassurance and the encouragement of an early return to normal activities, form the basis of a patient education package. In these guidelines it is emphasized that self-management of pain should be accentuated throughout all stages. For patients who do not recover after a few weeks, a short period of physiotherapy based on an active management approach, for example exercise therapy, should be considered. Also manual therapy has some scientific support, at this stage. It is recommended that passive physical modalities be used with caution. Psychosocial barriers to recovery should be explored and addressed. In later stages, for patients with persistent and interfering pain causing limitations in daily life and work, a more intensive multidisciplinary approach may be needed in order to address all aspects of the pain experience. These guidelines also acknowledge the importance for PTs of focusing on helping the patient with persistent pain complaints, to “come to terms with their pain.”
In summary, reviews and evidence-based guidelines show that treatment approaches, which combine active management with education addressing self-efficacy and emphasizing self-management, are more beneficial than stand-alone treatments, especially passive physical modalities, in the management of persistent pain. As yet such combined treatment approaches are sparsely investigated in the context of physiotherapy. It is emphasized throughout empirical research that physiotherapy interventions for pain could be further improved by the addition of cognitive and behavioral treatment components targeting psychosocial factors, but such multi-component treatment approaches are sparsely studied and are very scarce in the context of PHC physiotherapy.

Self-management

Self-management refers to the adaptation of behavioral and cognitive coping strategies which help the individual to manage challenging situations encountered in life, and the adaptation of health behavior. Self-management indicates that the patient is an active participant in the management of disease and illness \(^{13, 15}\). In essence, all behavior related to adjustment to illness, is management, whether adaptive healthful behavior or not \(^{14}\). Self-management interventions though, focus on the adaptation of favorable management strategies in relation to a specific health condition, for example persistent pain \(^{12, 13, 106}\). It should be emphasized that self-management interventions have unique features in regard to the specific health condition that is targeted. Generic self-management interventions are seldom sufficient. Thorough tailoring of the self-management intervention according to the specific health condition under study is needed, in addition to application of general guidelines for self-management \(^{12, 107}\). Self-management interventions tailored to persons with neck pain are lacking.

Self-management education programs are distinct from simple patient education or skills training, in that they are designed to allow people with persistent health conditions to take an active part in the management of their own condition \(^{12, 107, 108}\). This could be done by concentrating on three sets of self-management tasks: 1) the medical or behavioral management of the condition, e.g. taking medication or adhering to specific exercises and other health behaviors, 2) the role management, i.e. to maintain, change and create new meaningful behaviors related to different life roles. For example, persons with neck pain may need to change the way they garden, participate in favorite sports or organize their working day, 3) the emotional management, i.e. dealing with the negative emotions of anger, fear, frustration and depression that are commonly experienced by persons with a chronic disease \(^{13}\).
Another specific characteristic that distinguishes self-management interventions from other more traditional health education programs is “self-tailoring”. That is, the ability to use self-management skills and knowledge and to apply, i.e. tailor these to oneself as appropriate. This is different from compliance/adherence, which refers to getting the patients to do what they are told. It is also somewhat different from general tailored interventions where health providers tailor what they tell or do to the patient based on tests of the patient’s readiness to learn, stage of change, health beliefs etc. Self-tailoring is done by the individual him/herself, based on learning the principles for changing behaviors and self-management skills.

Lorig and Holman suggest five core self-management skills that should be central to self-management programs: problem-solving, decision making, resource utilization, forming of patient/health care provider partnership and taking action.

Self-management education is problem based, i.e. individuals are not taught solutions to their problems, but rather they are taught basic problem-solving skills to apply to their problems. Such skills include the process of problem definition, generation of possible solutions, solution implementation and evaluation of results. Decision making is part of problem-solving and sufficient “knowledge” is the key. In order to make day-to-day decisions in response to changes in disease condition, the person needs the knowledge, i.e. the appropriate information necessary to meet these common changes. For example, a person with neck pain could be taught to identify serious symptoms that require medical attention and in addition what to do when such symptoms are not present. Resource utilization refers to information seeking skills. Self-management health programs encourage individuals to seek and utilize information from multiple sources. Thus, promoting awareness of, and openness to, more than one perspective (as opposed to acting from a single perspective) which is beneficial in supporting active problem-solving processes. When dealing with persistent pain conditions and to support self-management, the role of the health care provider becomes that of teacher, coach and professional supervisor. The relation is characterized by a partnership and bidirectional information exchange. The patient is supposed to be able to report accurately the trends of the disease, make informed choices about treatment, and discuss these with the health care provider. The skill of “taking action” refers to making plans on how to achieve change of specific behaviors.
Theoretical and empirical support for self-management of pain

Self-management of pain embraces the biopsychosocial perspective on illness, and the area of interest for self-management concerns many theoretical aspects, and applies to a variety of theoretical models and concepts of human behavior and incentives for behavioral change. Psychological factors that have been shown to be associated with improved adjustment to persistent pain, are active pain coping strategies, self-efficacy, readiness to change and acceptance.

A large body of evidence suggests that the construct of “control” expressed as a sense of personal control, and “self-efficacy” as conceptualized by Bandura, have important implications for a person’s ability to manage pain by themselves, i.e. to apply active pain coping strategies. Self-efficacy supports motivation for change, and is considered an important predictor of pain-related disability.

The Fear-Avoidance model of pain provides a possible framework for how two opposing coping strategies; “avoidance” verses “confrontation”, may guide the development of disabling pain conditions, but also indicates the direction for the process of recovery.

Body awareness and mindfulness are two connected aspects of a constantly ongoing internal process of a non-judgemental relating to the body and self, which nourish acceptance, and are here considered prerequisites for the ability to self-manage pain.

Pain-related behavior and behavioral change are shaped and ruled by behavior learning principles. It is essential to understand and apply respondent and operant learning principals to interventions which aim to induce a health behavior change towards more adaptive pain self-management coping behavior/skills.

An outline of these important theoretical perspectives and concepts, and their empirical support for pain self-management, is provided below.

Coping and control

Pain experience is a threat that needs to be coped with. Coping is primarily the process of behavioral and cognitive efforts to manage external or internal demands which are appraised as taxing and exceeding the resources of the person. Cognitive processes of appraisal are central in determining whether a situation is potentially threatening, constitutes a harm or loss, a challenge, or is benign. Coping is flexible in that the individual generally examines the effectiveness of the coping strategy on the situation; and if it is not having the desired effect, he or she will try different strategies. Both personal and contextual factors influence the selection of coping efforts. Problem-focused coping is directed at managing the problem, while...
emotion-focused coping processes are directed at managing the negative emotions\textsuperscript{112}.

Coping strategies directed towards pain refer to the way in which the individual who experiences pain develops ways to tolerate, minimize or reduce pain and to continue everyday life activities in spite of pain\textsuperscript{36, 119}. Considerable research has demonstrated that pain coping strategies influence perceived pain intensity, physical functioning and disability, and that differences in pain coping styles shape the persistence of pain complaints\textsuperscript{40, 119}.

Pain coping could be conceptualized as active or passive by nature. Active pain self-management coping strategies refer to behavior that requires the person to take responsibility for pain management and make attempts to control the pain, and function in daily activities in spite of pain\textsuperscript{120}. Exercise is the most frequently used active pain self-management strategy, although much less frequently used than passive self-management strategies in a general pain population\textsuperscript{14}. Passive coping involves giving responsibility for pain management to an outside source or allowing other areas of life to be adversely affected by pain\textsuperscript{120}. Passive pain self-management coping strategies, such as resting, taking medication and using hot/cold packs, are associated with increased disability and more health care utilization\textsuperscript{14, 121}. Catastrophizing impedes confidence and control\textsuperscript{122} and has been shown to play a significant role in shaping maladaptive coping strategies\textsuperscript{40, 123}.

The perception of control is an important factor in pain coping as it promotes independence, self-confidence\textsuperscript{104} and pain-related self-efficacy beliefs\textsuperscript{110}. Locus of control refers to the extent to which individuals believe that they can exert personal control over events that affect them and could be defined as a generalized expectancy for either internal or external control of reinforcements\textsuperscript{124}. Internal locus of control refers to the belief that one can exert control over one’s life. External locus of control refers to the belief that consequences of behavior rely on external factors, and are thereby out-with one’s control, e.g. fate, luck, powerful others such as caregivers or uncontrollable circumstances\textsuperscript{108, 124}. Studies have shown a relationship between internal locus of control, the use of active coping strategies and favorable adaptation to pain\textsuperscript{40, 108}. When addressing pain control efforts, perceived control over the effects of pain on activity and role functioning, i.e. control over the situation, rather than control over pain itself, should be considered most important and proposed as the preferred focus for interventions\textsuperscript{125, 126}.

Self-efficacy in Social Cognitive learning theory

Social Cognitive Theory\textsuperscript{37} is a theoretical framework for understanding human social behavior, which expands the understanding of cognitive and behavioral learning. It emphasizes the individuals’ abilities to exercise
personal control over their lives. Behavior is executed in a dynamic interaction between the individual and the environment; conceptualized as “reciprocal determinism” \(^{110}\) (Figure 3).

*Figure 3. Reciprocal determinism, i.e. the reciprocal interaction between the person, behavior and environment according to Social Cognitive Theory \(^{110}\).*

The three determinants of this bidirectional interaction are: *Personal factors* of internal cognitive, affective and biological events, including beliefs of personal efficacy (self-efficacy), anticipated outcome of a behavior (outcome expectations), self-regulation of goal-directed behavior and performance including components of self-monitoring and goal-setting in relation to a specific behavior (self-control). *Behavior* refers to the frequency and the manner in which the behavior is performed and is influenced by e.g. knowledge about a specific behavior and having the skills to perform it (behavioral capability). *Environmental factors* are external to the individual, e.g. family, care providers and peers, but also include cognitive and mental representations of specific situations, i.e. the individuals’ perception of the environment. The environment is important in part by providing models for behavior. The environment can provide reinforcement, or punishment, either directly, as in operant learning, but also vicariously by watching others and the reinforcement that they receive (observational learning), and by self-reinforcement (self-control). The concept of behavioral capability emphasizes that if a person is to perform a particular behavior, he or she must have knowledge of the behavior and the necessary skills to perform it. Performance presumes learning, but a task can be learned and still not performed. For example, educational programs that provide information only, are presumed to be less efficient than programs that include training in and actual application of performance skills \(^{37, 110}\).

Self-efficacy is a key concept in Social Cognitive Theory \(^{127}\). Bandura proposed self-efficacy as the construct undergirding many aspects of behavioral change. It refers to the confidence a person feels in performing a particular activity/behavior, including confidence in overcoming the barriers
to performing that behavior\textsuperscript{110}. The stronger self-efficacy beliefs a person possesses, the more persistent he or she will be in their efforts towards behavioral change. The concept emphasizes four factors that enhance self-efficacy beliefs: personal experience of accomplishments (mastery experiences), social reinforcements and modeling (vicarious experience), verbal persuasion from others, and affective states within the individual (emotional arousal)\textsuperscript{110, 127}.

Mastery experiences are the most powerful sources of self-efficacy beliefs, as they are the result of direct performance. Methods to enhance mastery experiences include dividing learning into small steps and learning by repetition. Through repeated successful enactment of incremental tasks, the person acquires enhanced expectations of success, which in turn affect task persistence and promote behavioral change\textsuperscript{110}.

Vicarious experiences are mediated through observational learning, i.e. another persons’ performance of the behavior. This source of enhancing self-efficacy beliefs probably plays a more important role when there is substantial uncertainty of one’s capabilities. Verbal persuasion has limited power alone but exhibits a supportive role, especially if expressed by significant others, such as health care providers and other participants of a social group\textsuperscript{110}.

Emotional arousal inhibits learning and performance and thus affects self-efficacy beliefs negatively. People are more inclined to expect success when they are not beset by aversive arousal\textsuperscript{110}. Thus, methods that decrease emotional and physiological stress reactions, increase performance and the probability of mastery experience. Such behavioral management includes stress management techniques, e.g. relaxation techniques, and cognitive coping techniques, such as correcting interpretation of bodily signals or methods for effective problem solving\textsuperscript{128}.

Self-efficacy beliefs are suggested to be highly amenable to change in response to treatment\textsuperscript{129}. It has been proposed that pain-related self-efficacy is a mediator associated with change in other outcomes of pain self-management programs\textsuperscript{130}. In PHC samples of patients with persistent musculoskeletal pain, studies have found pain-related self-efficacy to be a better predictor of disability than fear-avoidance and pain intensity\textsuperscript{131, 132}. Self-efficacy beliefs are also important for maintenance of self-management behavior\textsuperscript{106}. When studied in a 6-month perspective, perceived control over constraints, i.e. behavioral control and self-efficacy beliefs, discriminated between successful and unsuccessful maintainers of physical activity health behavior\textsuperscript{133}.

Fear-Avoidance Model of Pain

The Fear-Avoidance model of Pain was developed by Vlaeyen and colleagues\textsuperscript{113, 134, 135}. The central concept of the model is fear of pain.
“Confrontation” and “avoidance” are the two extreme responses to this fear, of which the former leads to the reduction of fear over time (Figure 4). If pain (e.g. caused by an injury or strain) is interpreted as threatening, by means of pain catastrophizing, pain-related fear develops. This leads to avoidance behavior and hypervigilance regarding bodily sensations, followed by disability, disuse and depression. The last three factors will maintain the pain experience, thereby fueling the vicious circle increasing fear and avoidance. In patients who do not catastrophize, pain-related fear will probably not occur. These patients are likely to rapidly confront daily activities, leading to a fast recovery\textsuperscript{135}.

\textit{Figure 4.} The Fear-Avoidance Model of Pain according to Vlaeyen and colleagues\textsuperscript{134}.

Catastrophizing is a cognitive concept characterized by a lack of confidence and control and an expectation of negative outcome\textsuperscript{122}. Catastrophizing intensifies the experience of pain, induces avoidance, increases disability, reduces the patient’s own capability to control pain\textsuperscript{113} and acts as an inappropriate pain coping strategy\textsuperscript{40}. Hypervigilance, which refers to excessive attention to pain, which may even interrupt ongoing activities, is dependent on the presence of pain-related fear. Pain catastrophizing has also been shown to increase the attentional demand of pain. Sullivan described three components in catastrophizing, i.e. magnification, rumination, and helplessness\textsuperscript{122}. Magnification and rumination may reflect a focus on and evaluation of painful stimuli as extremely threatening, whereas helplessness reflects the evaluation of painful stimuli as being unable to cope with. Due to the significant impact on pain-related disability and pain coping abilities,
cognitions and appraisals connected to catastrophizing ought to be exposed and explored for their relevance, in order to correct misinterpretation and promote adaptive cognitions and appraisals.31

Disability is denoted as a significant maladaptive pain behavior in the Fear-Avoidance model. The degree of disability is defined in relation to an individual’s performance of activities in a specific context. In addition to intensifying the pain experience, disability is associated with extensive health care utilization and sick leave, which emphasizes the importance of addressing disability when present.136

The prevalence of depression in pain cohorts and pain in depressed cohorts, are higher than when these conditions are individually examined. The presence of pain negatively affects the detection and treatment of depression. When pain is moderate to severe, impairs function, and/or is refractory to treatment, it is associated with more depressive symptoms and worse outcomes, such as reduced quality of life, decreased work capacity, and increased health care utilization. Similarly, depression in patients with pain is associated with more pain complaints and disability.137

The clinical utility of the fear-avoidance model needs further investigation. Thus far, interventions based on the model have delivered mixed results.138

Body awareness and mindfulness

Mehling and coworkers have defined body awareness as the perception of bodily states, processes and actions that is presumed to originate from sensory proprioceptive and interoceptive afferents and of which an individual has the capacity to be aware. Body awareness involves an attentional focus on, and an awareness of, internal body sensations. It includes both the perception of specific physical sensations (e.g. awareness of heart activity, proprioception of limb position) as well as complex syndromes (e.g. pain, sense of relaxation, somatic markers of emotions).

Body awareness could be considered the product of an interactive and dynamic emerging process that a) reflects complex afferent, efferent, forward and back-projecting neural activities, b) includes cognitive appraisal and unconscious gating, and c) is shaped by the person’s attitudes, beliefs, experience and learning in a social and cultural context. They propose a multi-dimensional construct with four inter-related dimensions: 1) the perceived body sensation, i.e. the primary, sensory, physiological aspect of body awareness with the early, mostly pre-conscious appraisal or affective coloring of the sensation, 2) the quality of attention, i.e. the intensity (attentive or suppressive), the self-efficacy for control and the mode (judging or non-judging) of attention, 3) the attitude of body awareness, i.e. relating to body cues as trustful and helpful or worrying and catastrophizing, and 4)
the awareness of mind-body integration, i.e. perceived interconnectedness of mental, emotional and physical processes to an “embodied self” 97.

Empirically the term body awareness has, in studies of anxiety and panic disorders, by tradition been associated with exaggerated negative focus on physical symptoms and internal body sensations, generating somatosensory amplification and beliefs of catastrophic outcomes. Accordingly, the dominant view in clinical science has considered heightened awareness to somatic information as potentially distressing and maladaptive 139. However, more recent research has shown that the ability to notice subtle bodily sensations is a process distinct from somatosensory amplification, and that it may be beneficial in coping with pain 140, 141, and suggested to be more beneficial than distracting from pain 142.

The philosophical perspective and theoretical base of mindfulness is closely related to the concept of body awareness. Mindfulness is essentially a philosophical approach to life 143, although it is often incorrectly or carelessly referred to as a treatment method in current literature 144. It concerns being mindfully present in the moment and the body-self, and acting in a non-judgmental, accepting and “mindful” way in relation to the body and the self 145. It has its origin in the zen-buddhism philosophy 145 and has been adopted by several western psychological health behavior orientations and treatment methods 96, 146-148. Body Awareness Therapy is a movement therapy that has incorporated the philosophical approach of mindfulness together with methods from several movement schools, e.g. Feldenkrais and Tai Chi 95, 96, 149.

Langer 114 has conceptualized mindfulness according to a western psychological understanding, as a flexible state of mind characterized by openness to novelty, sensitivity to context and engagement with the present moment 150. She defined the mindful state of being, by three key qualities and their counterparts (i.e. mindlessness): 1) “continual creation of mental categories”, as opposed to “entrapment by category”, 2) “openness to new information”, as opposed to “automatic behavior”, 3) “awareness of more than one perspective”, as opposed to “acting from a single perspective” 114, 150, 151. Bishop and coworkers 115 provide a similar definition of mindfulness, but emphasize the importance of attention to internal stimuli by self-observation and introspection, rather than external stimuli as described by Langer 115.

Acceptance is embedded within the constructs of body awareness and mindfulness. It is the active willingness to engage in meaningful activities in life regardless of pain sensations, thoughts and emotional expressions that might otherwise impede that engagement 152. It is regarded as a reconciliation with the pain experience. Acceptance has been associated with lower levels of perceived pain and fewer activity limitations in patients with persistent pain 152, 153.
Respondent and operant learning theory

Most of human behavior is learned and a subject for continuous relearning during life. Behavior could be explained by respondent and operant learning principles. The mechanisms of respondent and operant learning operate simultaneously and interchangeably.\(^{116,117}\)

Respondent learning could be described as learning by association.\(^{116}\) It concerns biologically established reflexes and the processes by which new stimuli become associated with these reflexes. We have biologically established reflexes in which some significant stimulus (unconditioned stimulus US) evokes an innate, reflexive response (unconditioned response UR). Respondent conditioning occurs when some previously neutral stimulus becomes associated with an existing stimulus and takes the power to elicit the reflexive response. The neutral stimulus (NS), then becomes a conditioned stimulus (CS), associated with a preexisting, unconditioned stimulus (US), and the response becomes a conditioned response (CR).\(^{116}\) For example, sudden, intense pain while sweeping snow would be an unconditioned stimulus to elicit fear and physiological arousal as a reflexive unconditioned response. Contextual factors that are connected in time to the movement, e.g. the shovel, heavy lifting, bending the back and cold weather, can be associated with pain, elicit fear and become conditioned stimuli. Thus, previously neutral situations become threatening by being associated with a painful experience.\(^{36}\) Even the mere thought of performing a movement can elicit fear and a physiological fear response.\(^{41}\) This is one important explanatory mechanism for mal-adaptive pain behavior such as fear of movement and exaggerated avoidance of activity.\(^{135,154,155}\)

Operant learning refers to learning governed by the consequences of behavior.\(^{116}\) The three main components of operant conditioning can be expressed in an ABC formulation where A stands for “Antecedent cues”, B stands for “Behavior”, and C stands for “Consequences”.

\[ A : B \rightarrow C \]

The antecedent cues (A) are the situations that precede and set the stage for the behavior (B). The behavior (B) causes consequences (C). The consequences (C) can be either desired or undesired effects, causing the behavior (B) to become more or less frequent in the future. Consequences (C) that are perceived as desirable, increase the probability that the behavior (B) will be repeated. The consequences also influence whether the preceding situation, the antecedent cues (A), will set the stage for repeating or not repeating the behavior in the future. In particular, the direct consequences influence the probability that the behavior will be repeated in the future. We are more receptive to consequences that will occur in the near future, i.e. that
produce some kind of instant gratification, than to long-term consequences that are hard to foresee.\(^{116}\)

Consequences can act as “reinforcers”, i.e. a reward that increases the likelihood of the behavior occurring in the future, e.g. attention from others. Consequences can also act as “punishers” that decrease the likelihood of the behavior recurring, e.g. getting a speeding ticket or having a traffic accident due to careless driving.\(^{116}\) Avoidance of undesirable and unwanted consequences, such as pain, can also act reinforcing (called “negative reinforcement”) by increasing future avoidance of activity involvement. Avoidance of a once aversive situation can prevent people from learning that the situation has ceased to be aversive, thus it is dysfunctional pain behavior that sets the stage for more avoidance of an increasing number of daily activities and may cause severe disability.\(^{117}\) Withdrawal of desired consequences, such as attention, also suppresses behavior (a type of “negative punishment”). When behavior is repeatedly preceded by an antecedent cue that has been shown to predict reinforcing consequences, it is also called a “discriminative stimulus”, indicating that it sets the stage for repeating that specific behavior.\(^{116}\) For example, if a patient has experienced reinforcing attention when providing detailed descriptions of pain symptoms in previous contacts with caregivers, the patient will likely give very detailed descriptions of pain symptoms in the future, merely on sight of a caregiver.\(^{36}\) Fordyce is acknowledged for applying operant learning principles on pain. He emphasized that persistent pain is a subject for operant learning, producing pain-related behaviors, above all avoidance behavior.\(^{117}\)

The rationale for this thesis

A core assumption for this thesis is that pain is a complex phenomenon of sensory, affective and cognitive dimensions that should be understood from physiological, affective, cognitive, behavioral and contextual aspects.\(^{40}\) Subsequently, treatment approaches should involve components that attend to all dimensions and aspects of pain.\(^{18,28}\) There is a dearth of studies of multi-component treatment approaches towards pain conditions in general and neck pain in particular.\(^{67}\)

Studies regarding self-management approaches towards neck pain are sparse, as are pragmatic studies which take into account current clinical practice in PHC.\(^{67}\) Despite the fact that a considerable number of people with persistent neck pain are cared for by PTs in PHC there is a paucity of studies conducted in such settings.\(^{72}\) There is a need to identify physiotherapy treatment approaches that in addition address modifiable psychosocial factors involved in the maintenance of neck pain.\(^{14,21,40,106}\) and
examine the applicability and effectiveness of such treatment approaches in PHC physiotherapy settings.

The intention of this thesis was to evaluate an empirically derived multi-component pain and stress self-management treatment approach to persistent neck pain in PHC. The pain and stress self-management program had previously been developed in a clinical physiotherapy setting and offered on a regular basis for several years by PTs at a PHC center. The treatment components had been chosen and included, based on clinical experience together with available empirical and theoretical knowledge. No self-management intervention for persons with neck pain had been reported in the literature prior to the present. Thus, there was neither empirical evidence available supporting the effectiveness of the intervention, nor common recommendations or guidance concerning outcome measures suitable for the evaluation of self-management approaches towards neck pain prior to the intervention.
Aims

The overall aim of this thesis was to evaluate effects of a multi-component pain and stress self-management group intervention (PASS) and to explore plausible predictors associated with short-term and long-term treatment effects among patients with persistent tension-type neck pain in primary health care (PHC).

The specific aims of the studies included in this thesis were:

- To explore the feasibility of study design and methods, including a comprehensive set of instruments for the evaluation of physiotherapy treatment effects on patients with persistent neck pain, and to compare the treatment effects of a multi-component pain and stress self-management group intervention (AR) with individual physiotherapy treatment as usual (TAU) for patients with persistent tension-type neck pain in a PHC setting. (Study I)
- To compare treatment effects of a) a multi-component pain and stress self-management group intervention (PASS) and b) individually administered physiotherapy (IAPT) on patients with persistent tension-type neck pain in a PHC setting and to evaluate treatment effects over a follow-up period of 20 weeks, on the primary outcomes pain control and self-efficacy. (Study II)
- To compare long-term effects on maintenance of a) a multi-component pain and stress self-management group intervention (PASS) and b) individually administered physiotherapy (IAPT) on patients with persistent tension-type neck pain in a PHC setting over a follow-up period of 2 years, on pain control, self-efficacy, disability and catastrophizing. (Study III)
- To explore plausible predictors associated with short-term and long-term treatment success in terms of pain-related disability for patients with persistent tension-type neck pain following a multi-component pain and stress self-management group intervention (PASS) in PHC. (Study IV)
Methods

Design

**Study I** was a pilot study of a randomized controlled trial conducted to explore feasibility of study design and methods. It included a pre-treatment assessment and two post-treatment follow-ups. **Study II** and **Study III** was a full-scale pragmatic randomized controlled trial with two treatment arms: experimental treatment and an active control treatment. **Study II** entailed short-term follow-up: a pre-treatment assessment and two post-treatment follow-ups. **Study III** entailed long-term follow-up: a pre-treatment assessment, two post-treatment follow-ups and two long-term follow-ups. **Study IV** was an explorative longitudinal study of predictors for favorable treatment outcome. An overview of study designs, and the inclusion and follow-up procedures in the studies is shown in Figure 5.

*Figure 5. Overview of study designs, inclusion and follow-up procedures in Study I-IV.*
The pilot study (Study I) was conducted in order to evaluate the feasibility of study design and method for evaluating effects of a self-management intervention on patients with persistent neck pain. Persons seeking physiotherapy treatment due to neck pain at a PHC center in a middle-sized town in Sweden were randomly assigned to either the intervention program: multi-component pain and stress self-management group intervention (AR), or to the control group condition: individually administered physiotherapy (“treatment-as-usual”) (TAU). Treatment effects were assessed at 7 and 20 weeks after inclusion by a self-assessment questionnaire regarding neck pain, sick leave, utilization of health care, analgesic use, disability, fear and avoidance of movement, pain-related coping strategies and perceived control over pain, depression, anxiety and sleep.

With the same design and method as the pilot study, with some modifications, a pragmatic randomized controlled study (Study II-III) was conducted in order to compare treatment effects of a) a multi-component pain and stress self-management group intervention (PASS) and b) individually administered physiotherapy (IAPT) on patients with persistent musculoskeletal tension-type neck pain in a PHC setting and to evaluate short-term effects over a follow-up period of 20 weeks (Study II) respectively long-term effects on maintenance over a follow-up period of 2 years (Study III). A power calculation was performed based on the results from the pilot study. Persons seeking physiotherapy treatment due to neck pain at nine PHC centers in eight towns in a county of Sweden were randomly assigned to either the experimental or control treatment condition. Effects were assessed by a self-assessment questionnaire regarding neck pain intensity, analgesics, sick leave, health care utilization, disability, pain-related self-efficacy, pain control, catastrophizing, depression and anxiety at four occasions following the baseline assessment: at 10 weeks, 20 weeks, 1 year and 2 years after inclusion.

In Study IV a longitudinal, prospective design was used to explore predictive factors for treatment success in disability. Analyses were performed regarding participants assigned to the PASS treatment condition in study II-III. Data from the self-assessment questionnaire completed by the participants before intervention, immediately post-treatment (20 weeks) and at 2 years after the intervention, was used.

Subjects and procedures

The studies are based on two samples of patients with neck pain in PHC. Participants were included at two occasions. In Study I, patients were consecutively recruited to participate in the study from May to October 2002. In Study II-III, patients were consecutively recruited from September
2004 to April 2006. In **Study IV** a sample from Study II-III was examined consisting of participants randomized to the experimental condition PASS.

At both inclusion occasions, the patients were examined by a PT and were considered eligible if they were 18-65 years old and had musculoskeletal tension-type neck pain of persistent duration i.e. more than 3 months. Tension-type neck pain was defined as: subjective statements of ache/pain in an area covering the occipital parts of the head to acromion on the shoulder and following the scapular spine to the fourth thoracic vertebra, together with palpation tenderness in the same area and without signs of neurological symptoms or cervical facet joint pathology \(^{160}\) as assessed by the PT’s physical examination. Patients were excluded if they had insufficient fluency in Swedish, had a medical history of psychotic disorder, were pregnant, or if they had previously received the PASS program. In **Study II-III** also patients who had signs of depression, i.e. \( \geq 11 \) points on the depression subscale of the Hospital Anxiety and Depression Scale (HADS-D) \(^{161, 162}\) were excluded as well. This exclusion criterion was based on experience from the pilot study in which persons with high scores on HADS-D withdrew from the study.

The allocation sequence was prepared prior to the enrolment of patients to the studies with the help of a random number table, in permuted blocks of two, four or eight individuals sequentially located at random (**Study I-III**) and stratified by PHC center (**Study II-III**). The participants were given written and oral information concerning the study and gave their written informed consent. After completing the baseline self-assessment questionnaire, the participants were randomly assigned to either the intervention program AR/PASS or to the control treatment TAU/IAPT. A PT or a PT-assistant who were not involved in delivering the treatments administered the baseline questionnaires and the opening of sealed, opaque envelopes containing group allocation. Follow-up was conducted by means of self-assessment questionnaires that were sent to the home address of the participants, and then returned by mail. The baseline and follow-up questionnaires were similar. Two reminders for each follow-up occasion were sent to participants that failed to answer.

In **Study I**, one PT provided the experimental treatment (AR) and four other PTs working at the PHC center provided the individually administered physiotherapy treatment to the patients in the control condition (TAU).

In **Study II-III**, all participating PHC centers employed at least three experienced PTs in order to be able to carry out both treatment arms at the same center without risking contamination between treatment conditions. Each PT was only allowed to deliver either one of the treatment arms. The PTs had 2-30 years of professional practice in PHC physiotherapy rehabilitation. The PTs that delivered the PASS at each PHC center volunteered and were specially trained. Prior to the study all PTs delivering the PASS attended a course during four half-days. The course contained
lectures and practical exercises based on a detailed written manual for the PASS-treatment approach. To ensure adherence to the treatment manual the PTs received three performance feedback sessions during the study period. All other PTs working at the PHC centers were informed about the study and agreed to provide IAPT treatment to the control group participants. Treatment was provided in accordance with ordinary procedures at the clinics and was given in the same ways as to other patients not participating in the study. To facilitate that ordinary procedures were followed, the participants were asked not to reveal to their PTs that they were participating in the study. After the study period the PTs patient records were examined to check that the PTs had delivered the assigned treatment.

Interventions
All studies involved the same two treatment conditions but with slightly different names and abbreviations:
- a multi-component pain and stress self-management group intervention, in Study I called AR and in Study II-IV called PASS
- an active control treatment: individually administered physiotherapy (treatment-as-usual), in Study I called TAU and in Study II-IV called IAPT.

The experimental treatment AR/PASS
The AR/PASS intervention program consisted of an information and training program carried out with groups of patients, including both participants in the study and other patients with musculoskeletal pain referred to the PHC centers. The program had been developed and offered on a regular basis for several years at one of the PHC centers. It consisted of seven 1.5-hour sessions, over a period of 7 weeks, and an additional booster session at 20 weeks after the initial session. Each session consisted of applied relaxation training, body awareness exercises, lectures and group discussions. Table 1 gives an overview of the components and content of the experimental treatment (AR/PASS).
Table 1. Overview of components and content of group sessions in the experimental treatment PASS.

<table>
<thead>
<tr>
<th>Session</th>
<th>Applied relaxation</th>
<th>Body awareness exercises</th>
<th>Addressing pain – theories, concepts &amp; beliefs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Progressive relaxation: upper half of the body by tension-release cycles.</td>
<td>Standing movement exercises: • finding balance and posture • coordinating knee and arm movements • shifting weight between feet • rotation around the vertical axis of the body</td>
<td>Presentation of course content and aim: extensive practice between sessions along with application to situations encountered in everyday life, as a basis for success in coping with pain. Instructions for home assignments and exercise diary. Introduction to pain and stress physiology and psychology.</td>
</tr>
<tr>
<td></td>
<td>Practice Progressive relaxation (upper half of the body) twice a day at home and keep a record in the exercise diary.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Progressive relaxation: both upper and lower half of the body by tension-release cycles.</td>
<td>The same movement exercises as in session 1.</td>
<td>Pain and stress physiology and psychology (lecture and written material). Breathing physiology in relation to muscle tension and relaxation.</td>
</tr>
<tr>
<td></td>
<td>Practice Progressive relaxation twice a day at home, and if possible, also at other places (e.g. at work). Read and reflect on a written material regarding pain and stress physiology and psychology.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Release-only relaxation: omitting the tension instruction.</td>
<td>The same movements with additional focus: body awareness by scanning the body for signs of relaxation.</td>
<td>Reflections on the written material received at session 2. Cognitions, emotions and behaviors in relation to pain coping.</td>
</tr>
<tr>
<td></td>
<td>Practice Release-only relaxation twice a day, and extend practice to more challenging situations: in an undisturbed corner at work, on the bus, sitting in the dentist’s waiting room etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practice Cue-controlled relaxation twice a day, and extend practice to identifying and applying relaxation in personal “yellow-light risk situations” in everyday life.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Differential relaxation: release-only relaxation followed by focusing on the ability to differentiate muscle tension.</td>
<td>The same movements with additional focus: differentiation of muscle tension.</td>
<td>Body-mind awareness. Mindfully present/mindfulness (previous experiences and future expectations affects the present).</td>
</tr>
</tbody>
</table>

*Table 1. To be continued on next page.*
Table 1 continued. Overview of components and content of group sessions in the experimental treatment PASS.

<table>
<thead>
<tr>
<th>Home-work</th>
<th>Practice</th>
<th>Differential relaxation twice a day, and further explore ability to recognize personal “yellow-light situations” and frequently apply relaxation skills in these everyday life risk situations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Rapid relaxation: short (20-60 seconds) breathing relaxation. Differential relaxation: in standing, walking and while imitating activities/situations of daily life.</td>
<td>The same movements with additional focus: applying breathing relaxation during exercises. The rationale for applying a short relaxation in everyday situations. Creating individual strategies for home assignment according to identified risk situations in everyday life.</td>
</tr>
<tr>
<td>Home-work</td>
<td>Practice optional relaxation technique twice a day, and in addition frequently apply Rapid relaxation in everyday life situations, especially personally identified risk situations “yellow-light situations”.</td>
<td>Maintenance of pain coping skills. Personal plan/strategy for application and maintenance of relaxation and body-mind awareness skills.</td>
</tr>
<tr>
<td>7</td>
<td>Rapid relaxation: applied while sitting, standing and while imitating activities/situations of daily life.</td>
<td></td>
</tr>
<tr>
<td>Home-work</td>
<td>Personal plan: practice one relaxation technique in order to maintain the ability to scan the body for muscle tension and apply Rapid relaxation frequently in every day situations to prevent and/or control pain.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Rehearsal of relaxation techniques according to needs expressed by the participants.</td>
<td>The same movements. Durable strategies for maintenance of pain coping skills. Revision and adjustment of personal plan.</td>
</tr>
<tr>
<td>Continued application</td>
<td>Practice and application of relaxation and body-mind awareness skills in everyday life according to each participant’s revised personal plan to prevent and/or control pain and stress.</td>
<td></td>
</tr>
</tbody>
</table>

The rationale for the AR/PASS was to apply a treatment approach that combined active pain self-management coping skills training together with education addressing and strengthening self-efficacy beliefs and internal locus of control. And to apply a treatment approach that contrasted to passive physical modalities and stand-alone treatment approaches. It was assumed that such a multi-component approach which added cognitive and behavioral treatment components targeting psychosocial factors would improve the management of neck pain in the context of PHC physiotherapy.

The constructs of “control”; in literature expressed either as a sense of personal control or internal locus of control, and “self-efficacy”; as conceptualized by Social Cognitive Theory, were important treatment targets, due to empirical studies suggesting that they have important implications for the person’s ability to manage pain by themselves, i.e. to apply active pain coping strategies. The construct of
“confrontation” as opposed to “avoidance” as conceptualized in the Fear-Avoidance model of pain \(^{135}\) guided the process of practice and application of self-management coping skills by providing a direction for the process of recovery from a disabling pain condition.

The relaxation training was largely derived from the method of Applied relaxation \(^{86}\). The rationale was to teach the patient self-management coping skills to prevent or control pain. Participants were first taught to relax using progressive and autogenic relaxation methods. As the participants improved their ability to relax through practice, the length of instruction and time allowed to reach relaxation were gradually decreased. Secondly, they were taught conditioned relaxation exercises, also called cue-controlled relaxation, which involves saying “Relax!” while exhaling. When participants were able to reach a relaxed state quickly, they practiced relaxation in a variety of situations in which they began to feel pain and/or stress (or increased pain and/or stress). They were instructed on how to identify personal “risk situations” consisting of any stimuli, i.e. activity, movement or thought, which were believed to cause the individual’s pain, and to apply the relaxation technique in these real-life stressful situations in order to prevent the pain from starting or to control it. The participants were instructed to practice relaxation exercises twice a day at home between sessions in addition to applying the relaxation skills in everyday situations.

The body awareness exercises consisted of standing movement exercises according to the method of Body Awareness Therapy \(^{95}\). The purpose of the body awareness exercises was twofold: both to increase the awareness of bodily signals and increase ability to be mindfully present in the body, thus increasing body-mind awareness, and secondly to provide an opportunity to practice and apply relaxation when standing and during movement.

The sessions also included short lectures combined with group discussions on issues related to pain and pain self-management: anatomy, etiology, physiology and the psychology of pain and stress, e.g. the associations between pain, stress and muscle tension by means of the muscle tension pain cycle, and cognitive and behavioral aspects of pain and stress self-management, e.g. catastrophizing, adapting more favorable coping strategies and acting in a non-judgmental mindful way in relation to the body.

Four factors are important to address to enhance self-efficacy beliefs: personal experience of accomplishments “mastery experiences”, social reinforcements and modeling “vicarious experience”, verbal persuasion from others, and affective states within the individual “emotional arousal” \(^{110}\).

The most powerful source of self-efficacy beliefs are “mastery experiences” as they result from direct performance \(^{110}\). In the PASS intervention program, methods to enhance mastery experiences were included throughout. Learning of coping skills; i.e. practice and application of relaxation techniques, was divided into small steps of repeated successful
enactment of incremental tasks. The person thus acquired enhanced expectations of success, inducing task persistence and promoting behavior change.\textsuperscript{110}

Emotional arousal inhibits learning and performance and thus, affect self-efficacy beliefs negatively. People are more inclined to expect success when they are not beset by aversive arousal.\textsuperscript{110} Thus, the relaxation techniques and body awareness exercises in this intervention program represented behavioral management techniques that served to decrease emotional and physiological stress reactions, increase performance and the probability of mastery experiences. The short lectures combined with group discussions provided theoretical understanding of the interpretation of bodily signals and methods for problem solving effectively with aversive emotional arousal. The body awareness exercises provided occasions for practical application of attendance to bodily signals through an accepting, non-judgmental awareness.

According to Social Cognitive Theory the environment could provide models for behavior, opportunities for observational learning and reinforcements.\textsuperscript{110} The group format was chosen to cultivate a reinforcing and supporting environment. It was supposed to enhance self-efficacy beliefs primarily by social reinforcements and modeling (“vicarious experience”). In addition, the group format enabled provision of affirmative feed-back of performance accomplishments (“verbal persuasion”) from several sources, both from the PT and from other participants in the group.

The control treatment TAU/IAPT

TAU/IAPT entailed individual physiotherapy sessions in accordance with current practice and was not a standardized treatment procedure. Type of treatment, frequency of visits and duration of contact were left to the judgment of the PTs and their patients. The participants in the TAU/IAPT group were not to receive the AR/PASS but in no other way was treatment restricted. Information regarding the frequency of visits and type of treatment modalities delivered to the participants as part of the TAU/IAPT was collected from the patient records at the PHC centers and is reported in the results section.

Measures

In all studies, data was collected by use of a self-assessment questionnaire. The questionnaires comprised demographic and background information and data on outcome variables by instruments frequently used in studies concerning pain conditions and questions regarding neck pain, sick leave, health care utilization, analgesics, sleep, satisfaction with care and use of
skills learned during treatment. Table 2 gives an overview of the content in the self-assessment questionnaires and modifications made in between the pilot study and the full-scale studies.

Table 2. Overview of variables by questions and instruments used in the self-assessment questionnaires in Study I-IV.

<table>
<thead>
<tr>
<th>Variable (range)</th>
<th>Study I</th>
<th>Study II,III</th>
<th>Study IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Age (18-65)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Duration of neck pain (1-4)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Days of sick leave during preceding 3 months (0-90)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Current level of sick leave (0-4)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SOC-13: Sense of Coherence Scale-Short form (13-91)</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Health care visits due to neck pain during preceding 3 months</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pain intensity Present (0-10)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pain intensity Average (0-10)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pain intensity Worst/Maximum (0-10)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Analgesics due to neck pain (0-4)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>NDI: Neck Disability Index (0-100)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CSQ subscale: Diverting attention (0-36)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CSQ subscale: Reinterpreting pain sensations (0-36)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CSQ subscale: Ignoring sensations (0-36)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CSQ subscale: Coping self-statements (0-36)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CSQ subscale: Praying/hoping (0-36)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CSQ subscale: Increased behavioral activities (0-36)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CSQ subscale: Pain behaviors (0-36)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CSQ subscale: Catastrophizing (0-36)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CSQ single question: Ability to control pain (0-6)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CSQ single question: Ability to reduce pain (0-6)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>HADS-D: Hospital Anxiety&amp;Depression Scale-Depression Subscale(0-21)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>HADS-A: Hospital Anxiety&amp;Depression Scale-Anxiety Subscale(0-21)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TSK: Tampa Scale of Kinesiophobia (0-51)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>FABQ-work: Fear-Avoidance Beliefs Questionnaire-Work Subscale(0-42)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SQ: self-efficacy expectancies of ability to work in the future (0-10)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SES: Self-Efficacy Scale (0-200)</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Satisfaction with care (allocated treatment) (1-5)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Use of skills acquired during treatment to cope with pain in everyday life (1-5)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SQ: sleep quality (1-5)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SQ: ability to fall asleep (1-5)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SQ: loss of control over pain (1-5)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SQ: work-related fear of pain (1-5)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SQ: work-related fear of future injury (1-5)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

CSQ= Coping Strategies Questionnaire  SQ= Single question
The questionnaire was slightly modified in **Study II-III** according to result and experiences from the pilot study, **Study I**. Pain-related fear of movement or of (re)injury was measured using the Tampa Scale for Kinesiophobia (TSK) together with six items from Fear-Avoidance Beliefs Questionnaire in **Study I** and then replaced in **Study II-III** with the work subscale of the Fear-Avoidance Beliefs Questionnaire (FABQ-W). The Self-efficacy Scale (SES) was included in the questionnaire in **Study II-III** because a measure of pain-related self-efficacy was lacking in the preceding pilot study. In **Study IV** data collected from Study II-III was used regarding the participants assigned to the experimental treatment condition (PASS).

Information regarding the frequency and type of treatment modalities delivered to the participants as part of the studies was collected from the patient records at the PHC centers.

The self-assessment questionnaire comprised the following:

**Demographic and background data.** Information regarding the participants’ age, gender and duration of neck pain were collected in the baseline questionnaire. The participants reported duration of neck pain since onset on a 4-point scale (with the options “3-6 months”, “7-12 months”, “1-2 years” and “more than 2 years”). The short-form of Antonovsky’s Sense of Coherence Scale (SOC-13), which assesses view-of-life related personal characteristics that influence appraisals of meaning, was used in the baseline questionnaire as part of background data. The SOC-13 was also applied in the 2 years follow-up questionnaire.

**Pain.** Pain intensity (present, average and worst) was assessed using 11-point numeric rating scales ranging between 0=“no pain” and 10=“worst possible pain”. The participants also reported presence of pain from other bodily locations (“Yes”, “No” and “If Yes, what part of the body?”).

**Analgesics.** Consumption of analgesics due to neck pain, or due to pain from other parts of the body was reported on two separate 5-point scales (“never”, “a couple of days per month”, “1 or 2 days a week”, “every second day” and “every day”).

**Health care utilization.** The number of self-reported health care visits (to physicians, PTs and other health care providers) and the number of days on sick leave related to neck pain, in the three months prior to each data collection, was recorded.

**Pain control.** The two single questions from the Coping Strategies Questionnaire (CSQ) assessing the overall effectiveness of coping strategies, were used. Participants rated the extent to which they were able to control, respectively reduce pain on a 7-point scale ranging from 0=“no control/cannot decrease”, to 6=“complete control/can decrease completely”.

**Self-efficacy.** Perceived self-efficacy in performing common everyday activities was assessed by the Self-Efficacy Scale (SES). The participants rated how confident they felt about performing 20 everyday activities in spite of pain, e.g. “taking out the trash”, “concentrating on a
project”, “going shopping” and “driving the car” on a 11-point numerical rating scale ranging from 0=“not at all confident” to 10=“very confident”. SES has shown good internal consistency in samples with chronic low back pain 131, 167.

**Disability.** Perceived interference with daily activities due to neck pain was assessed using the Neck Disability Index (NDI) 60 consisting of 10 items, scored from 0 to 5. The total score is expressed as an overall index of 0-100 with a higher score corresponding to greater disability. The Swedish modified version has shown acceptable validity and reliability 168. This commonly applied index calculation was applied in Study I-III. In Study IV a revised 8-item version transformed into a 0-50 interval Rasch-weighted scale/score was used 61. Item “lifting” (number 3) and “headaches” (number 5) was excluded.

**Catastrophizing.** The propensity to engage in negative thinking and worry in response to pain, was assessed by The Catastrophizing subscale (CSQ-CAT) of the Coping Strategies Questionnaire (CSQ) 119, 166, 169, (0=“never”, 6=“always”). In Study I, type and use of pain-related coping strategies were assessed by means of responses to all eight subscales in the Coping Strategies Questionnaire (CSQ) 119 which includes 48 items describing different ways of dealing with pain. Summarized responses form eight subscales of six items each. In Study II-IV, the CSQ was administered in its entirety but only the CSQ-CAT was used in the analyses. The CSQ-CAT subscale contains six items assessing the propensity to catastrophize i.e. tendency to engage in negative thinking and worry in response to pain. The participants rate the frequency with which they engage in catastrophic thoughts about their pain on a 7-point scale ranging from 0=“never” to 6=“always”. The CAT subscale has shown good internal consistency 166 and test-retest reliability 170.

**Pain-related fear of movement or of (re)injury** was in Study I measured using the Tampa Scale for Kinesiophobia (TSK) together with six items from Fear-Avoidance Beliefs Questionnaire while in Study II-III assessed with the work subscale of the Fear-Avoidance Beliefs Questionnaire (FABQ-W). TSK 171 contains 17 items measuring pain-related fear of movement or of (re)injury. The participants rated their degree of agreement with 17 statements on a 4-point Likert scale ranging from 1=“strongly disagree” to 4=“strongly agree”. A higher score indicates a greater amount of pain-related fear of movement. FABQ assess how beliefs about work-related and physical activities affect pain, and consists of two subscales, FABQ-work (7-items) and FABQ-physical activity (4-items). Each item is scored on a 7-point Likert scale ranging from 0=“do not agree at all” to 6=“completely agree”. Higher scores indicate more fear-avoidance beliefs. Only the FABQ-work subscale was analyzed in Study II-III. The FABQ-work has shown good internal consistency, test-retest reliability and validity 169.
Depression and anxiety. Presence of symptoms that could indicate depression and/or anxiety was measured by the Hospital Anxiety and Depression Scale (HADS)\textsuperscript{161, 162} consisting of two subscales of seven items each, reflecting depression and anxiety respectively. Each item is measured on a 4-point scale with a higher score indicating more severe signs of depression or anxiety. HADS has been found to be reliable for detecting depression in medical outpatient clinical use and a valid measure of disorder severity. Recommended cut-off points on each subscale have been set to \( \leq 7 \) “non-cases”, 8-10 “doubtful cases” and \( \geq 11 \) “definite cases”\textsuperscript{161}.

Satisfaction with care (allocated treatment). Satisfaction with the treatment received during the intervention period was assessed by a single question: “How satisfied are you with the care that you received during the intervention period?”, on a 5-point scale ranging from 1=“very discontent/dissatisfied” to 5=“very content/satisfied”.

Use of skills acquired during treatment to cope with pain in everyday life situations. A single question was applied on a 5-point scale: “Can you use/apply things you learned during treatment in everyday life situations to cope with pain?” (with response options: 1=“never”, 2=“seldom”, 3=“occasionally” 4=“often” and 5=“every day”).

Data analyses

In Study I, data were analyzed for all participants who completed treatment (on treatment/”per protocol” analysis). For continuous variables that were not approximately normally distributed and for ordinal variables, the Mann-Whitney U test was used. The Friedman test was applied to evaluate changes within groups. A p-value \( p \leq 0.05 \) was accepted as statistically significant. All analyses were conducted using the statistical software SPSS 10\textsuperscript{172}.

Prior to Study II a power calculation was conducted based on data from Study I. It was estimated that for the primary outcome variables “Ability to control pain” and “SES: self-efficacy beliefs in regard to performing activities interfered with by pain” a sample size of 150 would be sufficient to detect a 10% difference between groups (with an estimated withdrawal of 30%, power 0.80, \( p=0.05 \))\textsuperscript{173}. No difference in outcome between the treatments regarding pain was assumed.

In Study II outcome was analyzed with separate 2 x 3 (intervention group/control group x baseline/10-week follow-up/20-week follow-up) repeated measures analysis of variances with the baseline score of the NDI as covariate (ANCOVAs)\textsuperscript{174}. The Chi-square test was applied for analyses of differences between the groups at follow-ups regarding, “Analgesics”, “Satisfaction with care/treatment” and “Use of coping skills in everyday life”. A p-value \( \leq 0.01 \) was accepted as statistically significant. All analyses were conducted using the statistical software SPSS 15\textsuperscript{172}. Data were
analyzed in two ways: 1) “per protocol” analyses including all participants who completed treatment and returned all self-assessment questionnaires. Occasional missing items in the separate questionnaires were substituted with the median of the individual’s total sum score on that same instrument

2) “intention-to-treat” analyses including all randomized participants with baseline measures according to group allocation. Participants who withdrew without completing treatment, were analyzed according to group allocation. The longitudinal imputation method of last value carried forward was used to obtain complete data for all participants. Because both methods of analysis revealed the same overall effects, the latter was reported in the results.

In **Study III** linear mixed models for repeated measures analysis were performed to evaluate differences between groups in the primary outcome measures: “Ability to control pain” and “Self-efficacy for performing activities interfered with by pain” and for secondary outcomes. An interaction term: “time x group” was included in the model and the baseline value of the NDI was used in all analyses as covariate. The model for analysis of NDI only included the four follow-ups, since the NDI baseline value was applied as a covariate, which excludes comparison of time by group interaction effect in relation to the NDI baseline assessment. The Schwarz’s Bayesian Criterion (BIC) suggested that a compound symmetry covariance structure yielded the best fit in all mixed model analyses, except for NDI where an unstructured covariance structure was suggested. Pairwise comparisons of simple main effects were conducted for variables with significant interaction effect to investigate differences between groups at each time-point. Bonferroni corrections were made in the analyses of simple main effects to guard against Type-1 errors due to multiple comparisons. The Chi-square test was applied for analyses of between-group differences in; “Analgesics”, “Satisfaction with care/treatment” and “Use of acquired skills in everyday life”. A \( p \)-value \( \leq 0.01 \) was accepted as statistically significant. Analyses were conducted using the statistical software SPSS 18.

Also in this study, data was analyzed both: 1) “per protocol”, based on all available data and occasional missing items in the questionnaires substituted with the median of the instrument’s sum score on the same instrument, and 2) “intention-to treat”, including all randomized participants with baseline measures according to group allocation. Participants who withdrew without completing treatment, were analyzed according to group allocation. The imputation method of last value carried forward was used to obtain complete data for all participants. Both methods revealed the same overall effects, and the latter was reported in the results.

In **Study IV** initial Pearson correlation analyses and factor analysis of baseline and 20-week follow-up variables revealed multicollinearity among variables. To evaluate the effect of the independent variables self-efficacy (SES), pain control (CSQ), disability (NDI), catastrophizing (CSQ-
CAT), anxiety and depression (HADS-A and HADS-D) and questions regarding neck pain and analgesics on the dependent variable pain-related disability (NDI), multiple linear regression analyses were performed. Two different models were set up: 1) the independent variables at 20 weeks on NDI at 2 years, 2) the independent variables at baseline on NDI at 20 weeks. Multicollinearity rendered multivariate regression analysis estimated by ordinary least squares (OLS) inappropriate. Thus, multiple linear regression analyses estimated by partial least squares (PLS) were performed. Wold’s variable importance for projection (VIP) and the estimated standardized coefficients (mean=0, standard deviation=1) were used to evaluate the contribution of each predictor on the fitted regression model. The analysis was then performed without independent variables displaying a VIP<0.8 and with low standardized coefficients. To confirm the final results and to produce a measure of uncertainty, univariate OLS linear regression analysis was performed for each independent variable included in the final PLS model. The analyses were performed using the statistical software’s SAS 9.2 and SPSS Statistics 18. Data were analysed according to “intention-to-treat” and included all randomised participants with baseline measures. The imputation method of last value carried forward was used to obtain complete data for all participants. Occasional missing items from the separate questionnaires were substituted with the median of the individual’s total sum score on the instrument.

Ethical considerations

The studies were approved by the Local Ethics Committee at Uppsala University (Dnr Ups 02-088).
Results

Study I
Participants and participation in the intervention programs
Thirty-seven participants, 34 women and 3 men, aged 19-67 years, were randomly assigned: 18 to the AR group and 19 to the TAU group. Two participants, randomized to the AR group, withdrew before the intervention started referring to psychological problems. These two persons reported the highest baseline scores on HADS Depression scale (scores above cut-off point indicating depression) of all participants. Six participants did not return the 7-week or 20-week self-assessment questionnaire. In total, 29 participants (78%), 13 in the AR group and 16 in the TAU group, participated in both the 7-week and the 20-week follow-ups. A flow chart of participation is displayed in Figure 6. Baseline characteristics of the 29 participants are shown in Table 3.

Figure 6. Flow-chart of participation in Study I.
Table 3. Baseline characteristics of the participants (n=29) in Study I.

<table>
<thead>
<tr>
<th>Variable (range)</th>
<th>AR-group (n=13)</th>
<th>TAU-group (n=16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (female/male)</td>
<td>13/0</td>
<td>15/1</td>
</tr>
<tr>
<td>Age (years)</td>
<td>43 36-54</td>
<td>36 24.5-48.5</td>
</tr>
<tr>
<td>Duration of neck pain (months)</td>
<td>72 14-156</td>
<td>33 12.5-60</td>
</tr>
<tr>
<td>Days of sick leave (during preceding 3 month)</td>
<td>23* 0-82.5*</td>
<td>0 0-12.2</td>
</tr>
<tr>
<td>Health care visits due to neck pain (preceding 3month)</td>
<td>4 2.5-10.5</td>
<td>1.5 1-3.8</td>
</tr>
<tr>
<td>Perceived pain (0-10)</td>
<td>6 2.5-8</td>
<td>6.5 5-7.8</td>
</tr>
<tr>
<td>Analgesics due to neck pain (0-4)</td>
<td>2 1-3.5</td>
<td>1 1-2.8</td>
</tr>
<tr>
<td>Analgesics due to pain from other parts of the body (0-4)</td>
<td>1 0-2.5</td>
<td>0 0-1</td>
</tr>
<tr>
<td>NDI (0-50)</td>
<td>17 9-25.5</td>
<td>14 10-24</td>
</tr>
<tr>
<td>CSQ Diverting attention (0-36)</td>
<td>11 6-18</td>
<td>13.5 8.8-15</td>
</tr>
<tr>
<td>CSQ Reinterpreting pain sensations (0-36)</td>
<td>3 1-5</td>
<td>3 0-8</td>
</tr>
<tr>
<td>CSQ Ignoring sensations (0-36)</td>
<td>14 7.5-18.5</td>
<td>12.5 7.8-17.2</td>
</tr>
<tr>
<td>CSQ Coping self-statements (0-36)</td>
<td>22 16.5-24.5</td>
<td>17.5 15-18.8</td>
</tr>
<tr>
<td>CSQ Praying/hoping (0-36)</td>
<td>9 6-13.5</td>
<td>11 6.2-14.8</td>
</tr>
<tr>
<td>CSQ Catastrophizing (0-36)</td>
<td>9 5.5-14</td>
<td>8 2.2-13.8</td>
</tr>
<tr>
<td>CSQ Increased behavioral activities (0-36)</td>
<td>15 7-22</td>
<td>16.5 13.2-19.5</td>
</tr>
<tr>
<td>CSQ Pain behaviors (0-36)</td>
<td>19 15.5-25.5</td>
<td>19 15.2-23.8</td>
</tr>
<tr>
<td>CSQ Ability to control pain (0-6)</td>
<td>3 2.5-3.5</td>
<td>4 3-4</td>
</tr>
<tr>
<td>CSQ Ability to reduce pain (0-6)</td>
<td>3 2-3</td>
<td>3 3-3.8</td>
</tr>
<tr>
<td>TSK (0-51)</td>
<td>9 8-15</td>
<td>12.5 8.2-17.8</td>
</tr>
<tr>
<td>HADS Depression sum score (0-21)</td>
<td>3 1.5-7.5</td>
<td>2 1-5</td>
</tr>
<tr>
<td>HADS Anxiety sum score (0-21)</td>
<td>5 3-7</td>
<td>7.5 4-11</td>
</tr>
<tr>
<td>SQ: Quality of sleep (1-5)</td>
<td>3 2.5-4.5</td>
<td>3 3-4</td>
</tr>
<tr>
<td>SQ: Ease of falling asleep (1-5)</td>
<td>3 2-4.5</td>
<td>3 3-3</td>
</tr>
<tr>
<td>SQ: Loss of control over pain (1-5)</td>
<td>2 1-3</td>
<td>3.5 2-4</td>
</tr>
<tr>
<td>SQ: Work related fear of pain (1-5)</td>
<td>3 1-3.5</td>
<td>2.5 2-4.8</td>
</tr>
<tr>
<td>SQ: Work related fear of future injury (1-5)</td>
<td>2 1-3.5</td>
<td>3 2-4</td>
</tr>
</tbody>
</table>

* n=12  Md= median  IQR= inter-quartile range  NDI= Neck Disability Index  CSQ= Coping Strategies Questionnaire  TSK= Tampa Scale of Kinesiofobia  HADS= Hospital Anxiety and Depression Scale  SQ= Single Question

Attendance at group-sessions among AR participants was high. Nine participants attended all 7 sessions. None of the participants attended less than 5 sessions (70% of sessions). The TAU group received an average of 11 treatment sessions (ranging from 2 to 32). Six participants in the TAU group had completed their treatment at 7-week follow-up and six were still in treatment at the 20-week follow-up. TAU consisted of: acupuncture, massage, spinal mobilization techniques, hot-pack, transcutaneous electric nerve stimulation (TENS), ultrasound and/or introducing the patient to different exercise programs: gym-based exercises, home-exercise programs or water-exercise programs.
Outcome – Between and within group comparisons

*Coping and control.* At the 20-week follow-up, the AR group, as compared to the TAU group, reported both better ability to control pain (p=0.003) and better ability to decrease pain (p=0.003) by use of coping strategies as per the two overall effectiveness questions in CSQ as well as lower ratings on the single question (SQ) loss of control over pain (p=0.035).

*Fear and avoidance.* The AR group reported a significantly lower work-related fear of future neck injury than the TAU group (p=0.009) as per SQ, derived from FABQ.

*Depression and Anxiety.* According to analysis of the participants that completed treatment (“per-protocol”), the median score on the HADS Depression subscale did not at any assessment occasion reach the cut-off point indicating depression. The AR group reported a lower HADS Anxiety sum score than the TAU group both at the 7-week (p=0.023) and the 20-week follow-up (p=0.001). The two groups reported about the same HADS Depression sum score at the 20-week follow-up.

There were no statistically significant differences between the groups at follow-ups regarding health care utilization, pain and analgesics, disability, pattern of coping strategies, pain-related fear/avoidance or sleep. However, analysis of within-group changes between baseline and the 7-week and 20-week follow-ups indicated a decrease in the AR group and an increase in the TAU group in health care consumption and in consumption of analgesics due to neck pain.

Study II

Participants and participation in the intervention programs

Two hundred and thirty two persons were screened for inclusion in the study. Twenty two persons did not meet the inclusion criteria. Twenty nine persons declined participation. Twenty five persons were excluded. One hundred fifty six participants, 139 women and 17 men, aged 19-65 years, were randomly assigned: 77 to the PASS group and 79 to the IAPT group. Fifteen participants, 11 from the PASS group and five from the IAPT group, withdrew before the intervention started or without completing assigned treatment, referring to either decreased neck pain and no need for treatment or lack of time. In total, 40 participants withdrew or did not return one or both of the follow-up self-assessment questionnaires. Subsequently, 116 participants (74%) completed the assigned treatment and returned both the 10-week and the 20-week follow-ups. A flow-chart of the study is illustrated in Figure 7.
Figure 7. Flow-chart of participation in Study II-IV.

Analysis of baseline characteristics of the 156 participants who were included in the study (Table 4) showed that the groups did not differ with the exception of that the PASS group had a lower average NDI score, indicating slightly less disability due to neck pain at baseline than the IAPT group. The difference between groups at baseline was 4.6 points on the 101 point scale.
Table 4. Baseline characteristics of the participants (n=156) in Study II-III and participants (PASS-group n=77) in Study IV.

<table>
<thead>
<tr>
<th></th>
<th>PASS-group (n=77)</th>
<th>IAPT-group (n=79)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td>n(%)</td>
<td>n(%)</td>
</tr>
<tr>
<td>Female / Male</td>
<td>69 (90) / 8 (10)</td>
<td>70 (89) / 9 (11)</td>
</tr>
<tr>
<td><strong>Age (18-65)</strong></td>
<td>Mean (SD) / Range</td>
<td>Mean (SD) / Range</td>
</tr>
<tr>
<td>45.7 (11.5) / 19-65</td>
<td>45.7 (11.6) / 20-63</td>
<td></td>
</tr>
<tr>
<td><strong>Pain intensity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present (0-10)</td>
<td>5.5 (2) / 5.9 (2)</td>
<td></td>
</tr>
<tr>
<td>Average (0-10)</td>
<td>6 (1.8) / 6.4 (2)</td>
<td></td>
</tr>
<tr>
<td>Worst/Maximum (0-10)</td>
<td>8.4 (1.4) / 8.5 (1.2)</td>
<td></td>
</tr>
<tr>
<td>Health care visits due to neck pain</td>
<td>2.4 (3.2)</td>
<td>2.8 (3.5)</td>
</tr>
<tr>
<td>Days of sick leave (0-90)</td>
<td>22 (35.2)</td>
<td>32.9 (40.8)</td>
</tr>
<tr>
<td>Self-efficacy for ability to work (0-10)</td>
<td>7.9 (3.2)</td>
<td>6.3 (3.7)</td>
</tr>
<tr>
<td>NDI: Neck Disability Index (0-100)</td>
<td>30.8 (10.7)</td>
<td>35.4 (14)</td>
</tr>
<tr>
<td>SES: Self-Efficacy Scale (0-200)</td>
<td>136.7 (39.8)</td>
<td>128.3 (43.5)</td>
</tr>
<tr>
<td>CSQ() Ability to control pain (0-6)</td>
<td>3.3 (1.1)</td>
<td>3.1 (1.2)</td>
</tr>
<tr>
<td>CSQ() Ability to reduce pain (0-6)</td>
<td>2.9 (1)</td>
<td>2.9 (0.9)</td>
</tr>
<tr>
<td>CSQ() Catastrophizing (0-36)</td>
<td>11.3 (7.4)</td>
<td>11.8 (7.1)</td>
</tr>
<tr>
<td>FABQ-Work() (0-42)</td>
<td>19.6 (11.9) / 22.1 (11.3)</td>
<td></td>
</tr>
<tr>
<td>HADS-D-Depression Subscale (0-21)</td>
<td>4.3 (3.1)</td>
<td>4.9 (8.9)</td>
</tr>
<tr>
<td>HADS-A-Anxiety Subscale (0-21)</td>
<td>8.2 (4.1)</td>
<td>8.1 (3.9)</td>
</tr>
<tr>
<td>SOC-13: Sense of Coherence Scale (13-91)</td>
<td>65 (12.3)</td>
<td>62 (11.6)</td>
</tr>
<tr>
<td><strong>Duration of neck pain (1-4)</strong></td>
<td>4 (3-4) / 4 (2-4)</td>
<td></td>
</tr>
<tr>
<td>3-6 months</td>
<td>7 (9) / 11 (14)</td>
<td></td>
</tr>
<tr>
<td>7-12 months</td>
<td>4 (5) / 9 (11)</td>
<td></td>
</tr>
<tr>
<td>1-2 years</td>
<td>12 (16) / 12 (15)</td>
<td></td>
</tr>
<tr>
<td>more than 2 years</td>
<td>54 (70) / 47 (60)</td>
<td></td>
</tr>
<tr>
<td>Analgesics due to neck pain (0-4)</td>
<td>1 (1-2.5) / 2 (1-3)</td>
<td></td>
</tr>
<tr>
<td>&quot;Never&quot;</td>
<td>12 (16) / 12 (15)</td>
<td></td>
</tr>
<tr>
<td>&quot;1 or 2 days per month&quot;</td>
<td>28 (36) / 19 (24)</td>
<td></td>
</tr>
<tr>
<td>&quot;1 or 2 days per week&quot;</td>
<td>18 (23) / 20 (25)</td>
<td></td>
</tr>
<tr>
<td>&quot;Every second day&quot;</td>
<td>9 (12) / 11 (14)</td>
<td></td>
</tr>
<tr>
<td>&quot;Everyday&quot;</td>
<td>10 (13) / 17 (22)</td>
<td></td>
</tr>
<tr>
<td>Current level of sick leave (0-4)</td>
<td>0 (0-2) / 1 (0-4)</td>
<td></td>
</tr>
<tr>
<td>Not on sick-leave</td>
<td>52 (67) / 39 (49)</td>
<td></td>
</tr>
<tr>
<td>25% off work due to sick leave</td>
<td>3 (4) / 6 (8)</td>
<td></td>
</tr>
<tr>
<td>50% off work due to sick leave</td>
<td>9 (12) / 7 (9)</td>
<td></td>
</tr>
<tr>
<td>75% off work due to sick leave</td>
<td>3 (4) / 2 (2)</td>
<td></td>
</tr>
<tr>
<td>Totally off work due to sick leave</td>
<td>10 (13) / 25 (32)</td>
<td></td>
</tr>
</tbody>
</table>

\(^a n=75 \) \(^b n=74 \) \(^c \text{CSQ=Coping Strategies Questionnaire} \) \(^d \text{HADS=Hospital Anxiety&Depression Scale} \)

The PASS participants attended an average of 7 (range 4-8) group sessions and the IAPT participants received an average of 11 (range 1-52) individual sessions over the 20 week follow-up period. In the IAPT group, 24 participants (43%) had completed their treatment at 10-week follow-up and 9 (16%) were still in treatment at the 20-week follow-up. IAPT sessions consisted of: spinal manipulation/mobilization techniques, massage and
other manual mobilization techniques e.g. cervical traction (received by 51% of the participants), acupuncture (38% of the participants), hot-pack (20% of the participants), TENS (20% of the participants) and less used: ultrasound (5% of the participants). IAPT sessions also consisted of introducing the patient to different individually tailored exercise programs: most frequently home-exercise programs (received by 65% of the participants), gym-based exercises (26% of the participants), or water-exercise programs (16% of the participants). The participants often received several treatment modalities during their treatment period. Nine participants in the IAPT group were, at some occasion during their treatment period, given some kind of advice or information regarding relaxation e.g. instruction-CD on relaxation techniques or verbal information about the beneficial effect of relaxation.

Intervention outcome – Comparisons between groups

Intention-to-treat analyses of outcome at 10 weeks and 20 weeks after baseline including all 156 randomised participants (PASS group n=77 and IAPT group n=79) according to repeated measures ANCOVA between baseline, 10-week and 20 week follow-up are displayed in Table 5.

Table 5. Results of between and within group comparisons for PASS-group (n=77) and IAPT-group (n=79) in Study II.

<table>
<thead>
<tr>
<th>Outcome and measurement condition</th>
<th>Baseline</th>
<th>10 weeks follow-up</th>
<th>20 weeks follow-up</th>
<th>Between-group ANCOVA* (time)</th>
<th>Within-subjects repeated measures ANCOVA* (time*group)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSQ Ability to control pain (0-6)</td>
<td>14.8 (1.153)</td>
<td>3.7 (1.1)</td>
<td>3.9 (1.8)</td>
<td>p = .000</td>
<td>0.27 to 0.83</td>
</tr>
<tr>
<td>PASS-group</td>
<td>3.3 (1.1)</td>
<td>3.7 (1.1)</td>
<td>3.8 (1.9)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>3.1 (1.2)</td>
<td>3.6 (1.1)</td>
<td>3.6 (1.8)</td>
<td>4.9 (1.153)</td>
<td>.001</td>
</tr>
<tr>
<td>SES (0-200)</td>
<td>137.4 (40.4)</td>
<td>147.4 (38.8)</td>
<td>152.1 (33.9)</td>
<td>p = .324</td>
<td>-4.86 to 14.64</td>
</tr>
<tr>
<td>PASS-group</td>
<td>30.8 (10.7)</td>
<td>26.4 (13.0)</td>
<td>23.9 (13.3)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>35.4 (14)</td>
<td>34 (16.4)</td>
<td>33.7 (16.5)</td>
<td>11.4 (1.153)</td>
<td>.001</td>
</tr>
<tr>
<td>CSQ Catastrophizing (0-36)</td>
<td>11.3 (7.4)</td>
<td>8.4 (7)</td>
<td>6.6 (6.2)</td>
<td>p = .324</td>
<td>-3.51 to -0.38</td>
</tr>
<tr>
<td>PASS-group</td>
<td>2.9 (1)</td>
<td>2.9 (1)</td>
<td>2.9 (1.8)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>2.9 (0.9)</td>
<td>2.9 (1)</td>
<td>3.1 (0.8)</td>
<td>2.9 (1.153)</td>
<td>.001</td>
</tr>
<tr>
<td>CSQ Ability to reduce pain (0-6)</td>
<td>2.9 (1)</td>
<td>2.9 (1)</td>
<td>2.9 (1.8)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>PASS-group</td>
<td>2.9 (1)</td>
<td>2.9 (1)</td>
<td>2.9 (1.8)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>2.9 (0.9)</td>
<td>2.9 (1)</td>
<td>3.1 (0.8)</td>
<td>2.9 (1.153)</td>
<td>.001</td>
</tr>
<tr>
<td>FABQ-work (0-42)</td>
<td>19.8 (12.1)</td>
<td>18.8 (12)</td>
<td>16.8 (11.3)</td>
<td>p = .220</td>
<td>-0.87 to 0.20</td>
</tr>
<tr>
<td>PASS-group</td>
<td>5.5 (2)</td>
<td>4.4 (2.3)</td>
<td>4.1 (2.6)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>5.9 (2)</td>
<td>5.1 (2.3)</td>
<td>4.8 (2.2)</td>
<td>1.5 (1.153)</td>
<td>.001</td>
</tr>
<tr>
<td>Pain Present/Current (0-10)</td>
<td>22.3 (11.3)</td>
<td>20.8 (11.3)</td>
<td>21.1 (11.7)</td>
<td>p = .220</td>
<td>-0.87 to 0.20</td>
</tr>
<tr>
<td>PASS-group</td>
<td>6.4 (2)</td>
<td>5.1 (2.1)</td>
<td>4.9 (2.2)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>6.4 (2)</td>
<td>5.1 (2.1)</td>
<td>4.9 (2.2)</td>
<td>0.7 (1.153)</td>
<td>.001</td>
</tr>
<tr>
<td>Pain Average (0-10)</td>
<td>0.006 (1.153)</td>
<td>0.006 (1.153)</td>
<td>0.006 (1.153)</td>
<td>p = .006</td>
<td>0.27 to 0.83</td>
</tr>
<tr>
<td>PASS-group</td>
<td>8.4 (1.4)</td>
<td>7.6 (2)</td>
<td>7.3 (2.3)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>8.5 (1.2)</td>
<td>7.8 (2)</td>
<td>7.5 (2.2)</td>
<td>3.1 (1.153)</td>
<td>.001</td>
</tr>
<tr>
<td>Pain Worst/Maximum (0-10)</td>
<td>4.3 (3.1)</td>
<td>3.7 (3.1)</td>
<td>3.4 (3.1)</td>
<td>p = .324</td>
<td>-3.51 to -0.38</td>
</tr>
<tr>
<td>PASS-group</td>
<td>4.3 (3.1)</td>
<td>3.7 (3.1)</td>
<td>3.4 (3.1)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>4.9 (2.9)</td>
<td>5.1 (3.6)</td>
<td>5.3 (3.9)</td>
<td>3.1 (1.153)</td>
<td>.001</td>
</tr>
<tr>
<td>HADS Depression (0-21)</td>
<td>8.2 (4.1)</td>
<td>6.4 (4.4)</td>
<td>6.2 (3.8)</td>
<td>p = .324</td>
<td>-3.51 to -0.38</td>
</tr>
<tr>
<td>PASS-group</td>
<td>8.1 (4.3)</td>
<td>7.4 (4.3)</td>
<td>7.1 (3.9)</td>
<td>F(df)</td>
<td>p-value</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>8.1 (4.3)</td>
<td>7.4 (4.3)</td>
<td>7.1 (3.9)</td>
<td>3.1 (1.153)</td>
<td>.001</td>
</tr>
</tbody>
</table>

*All analysis include: The Neck disability Index (NDI) at baseline as covariate
CSQ= Coping Strategies Questionnaire, SES= Self-Efficacy Scale, NDI= Neck Disability Index, FABQ= Fear-Avoidance Beliefs Questionnaire, HADS= Hospital Anxiety and Depression Scale

56
Analyses showed significant time × group interaction effects regarding the primary outcomes: ability to control pain (p<0.001) and self-efficacy for performing activities interfered with by pain (p=0.005) in favour of PASS. There was also significant time × group interaction effects regarding the level of catastrophic thinking according to CSQ Catastrophizing subscale (p<0.001) in favour of PASS. After adjusting for the baseline difference, there was still a significant time × group interaction effect regarding disability due to neck pain (NDI) (p=0.01), in favour of PASS.

Both groups showed decreased pain intensity regarding all three pain scores at follow-ups, but there was no time × group interaction effect.

The PASS-group had a significant lower consumption of analgesics at the 20-week follow-up compared to the IAPT-group (p=0.001). The PASS-group reported a higher satisfaction with care than the IAPT-group at the 10-week follow-up (p=0.024) and the 20-week follow-up (p=0.041). The PASS-group reported that they used skills, learned during treatment, in everyday life to cope with pain, to a significantly higher degree than the IAPT-group, both at the 10-week (p<0.001) and the 20-week follow-up (p=0.006).

Study III
Participants and participation in the intervention programs
This study comprised the same 156 participants as in Study II. Baseline characteristics of the participants are shown in Table 4. In addition to the 15 participants that withdrew without completing the assigned treatment, 39 participants completed treatment but did not return all four follow-up questionnaires. A flow-chart of the study is illustrated in Figure 7. Compared to the 102 participants (65%) who completed all follow-ups, the withdrawals/non-responders were younger (p=0.002).

Intervention outcome – Comparisons between groups
Intention-to-treat analyses of long-term outcome at 1 year and 2 years after baseline including all 156 randomised participants (PASS group n=77 and IAPT group n=79) by part of linear mixed models for repeated measures analyses is displayed in Table 6. Analyses showed significant time × group interaction effects in favor of PASS regarding the primary outcomes: ability to control pain (p<0.001) and self-efficacy for performing activities interfered with by pain (p=0.002). There was also a significant time × group interaction effect regarding levels of catastrophic thinking according to CSQ Catastrophizing subscale (p<0.001) in favor of PASS. After adjusting for the baseline differences in NDI, there was no longer a time × group interaction effect regarding disability due to neck pain as measured by NDI. Both
groups showed decreased pain intensity regarding pain scores at follow-ups, but there was no time x group interaction effect.

Table 6. Results of between and within group comparisons for PASS-group (n=77) and IAPT-group (n=79) in Study III.

<table>
<thead>
<tr>
<th>Outcome measure and treatment condition</th>
<th>Baseline Mean (SD)</th>
<th>10 weeks follow-up Mean (SD)</th>
<th>20 weeks follow-up Mean (SD)</th>
<th>1 year follow-up Mean (SD)</th>
<th>2 year follow-up Mean (SD)</th>
<th>Mixed linear models comparison (group) p-value</th>
<th>(time) p-value</th>
<th>(time*group) p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSQ Pain control (0-6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASS-group</td>
<td>3.3 (1.1)</td>
<td>3.7 (1.0)</td>
<td>3.9 (1.0)</td>
<td>3.9 (1.1)</td>
<td>3.9 (1.2)</td>
<td>.002</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>3.1 (1.2)</td>
<td>3.0 (1.0)</td>
<td>3.6 (1.0)</td>
<td>3.3 (1.1)</td>
<td>3.6 (1.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES (0-200)</td>
<td>137.4 (40.8)</td>
<td>147.4 (38.8)</td>
<td>152.1 (33.9)</td>
<td>156.8 (36.4)</td>
<td>156.8 (36.4)</td>
<td>.082</td>
<td>.000</td>
<td>.002</td>
</tr>
<tr>
<td>PASS-group</td>
<td>30.8 (10.7)</td>
<td>26.4 (13)</td>
<td>25.9 (13.3)</td>
<td>23.7 (15.2)</td>
<td>22.4 (14.2)</td>
<td>.011</td>
<td>.001</td>
<td>.019</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>35.4 (14)</td>
<td>34.3 (16.4)</td>
<td>31.7 (16.9)</td>
<td>32.7 (16)</td>
<td>31.3 (16.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NDI (0-100)</td>
<td>11.3 (7.1)</td>
<td>10.9 (8.1)</td>
<td>11.4 (7.6)</td>
<td>11.6 (8.4)</td>
<td>10.3 (8)</td>
<td>.033</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>CSQ Catastrophizing (0-36)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASS-group</td>
<td>11.3 (7.1)</td>
<td>8.4 (7)</td>
<td>6.6 (6.2)</td>
<td>6.9 (6.9)</td>
<td>7.2 (7.3)</td>
<td>.015</td>
<td>.015</td>
<td>.000</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>11.8 (7.1)</td>
<td>10.9 (8.1)</td>
<td>11.4 (7.6)</td>
<td>11.6 (8.4)</td>
<td>10.3 (8)</td>
<td></td>
<td>.091</td>
<td>.392</td>
</tr>
<tr>
<td>CSQ Ability to reduce pain (0-6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASS-group</td>
<td>2.9 (0.9)</td>
<td>2.9 (1)</td>
<td>3.1 (0.8)</td>
<td>3.1 (1)</td>
<td>3.3 (1)</td>
<td>.091</td>
<td>.000</td>
<td>.328</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>5.5 (2)</td>
<td>4.4 (2.3)</td>
<td>4.1 (2.6)</td>
<td>3.9 (2.6)</td>
<td>3.6 (2.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Present/Current (0-10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASS-group</td>
<td>5.9 (2)</td>
<td>5.1 (2.3)</td>
<td>4.8 (2.2)</td>
<td>4.8 (2.2)</td>
<td>4.6 (2.4)</td>
<td>.236</td>
<td>.000</td>
<td>.540</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>6.4 (2)</td>
<td>5.1 (2.1)</td>
<td>4.9 (2.2)</td>
<td>5.1 (2.2)</td>
<td>4.7 (2.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain Average (0-10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASS-group</td>
<td>8.4 (1.4)</td>
<td>7.6 (2)</td>
<td>7.2 (2.3)</td>
<td>7.2 (2.5)</td>
<td>6.5 (3)</td>
<td>.314</td>
<td>.000</td>
<td>.093</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>8.5 (1.2)</td>
<td>7.8 (2)</td>
<td>7.5 (2)</td>
<td>7.6 (2.1)</td>
<td>7.4 (2.2)</td>
<td></td>
<td>.020</td>
<td>.238</td>
</tr>
<tr>
<td>HADS Depression (0-21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASS-group</td>
<td>4.3 (1.1)</td>
<td>3.7 (3)</td>
<td>3.4 (3)</td>
<td>3.5 (3.2)</td>
<td>3.2 (3.3)</td>
<td>.020</td>
<td>.238</td>
<td>.046</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>4.9 (2.9)</td>
<td>5.1 (3.4)</td>
<td>5.0 (3.5)</td>
<td>5.2 (3.5)</td>
<td>5.2 (3.8)</td>
<td></td>
<td>.393</td>
<td>.004</td>
</tr>
<tr>
<td>HADS Anxiety (0-21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASS-group</td>
<td>8.2 (4.1)</td>
<td>6.4 (4)</td>
<td>6.2 (3.8)</td>
<td>6.2 (3.9)</td>
<td>6.4 (4)</td>
<td>.393</td>
<td>.000</td>
<td>.003</td>
</tr>
<tr>
<td>IAPT-group</td>
<td>8.1 (3.9)</td>
<td>7.4 (4.3)</td>
<td>7.1 (3.9)</td>
<td>6.8 (3.6)</td>
<td>7.4 (3.7)</td>
<td></td>
<td>.393</td>
<td>.000</td>
</tr>
</tbody>
</table>

All analyses include the NDI at baseline as covariate. Based on four follow-up measures; i.e., the BL measure is instead included as a covariate.

CSQ= Coping Strategies Questionnaire, SES= Self-Efficacy Scale, NDI= Neck Disability Index, FABQ= Fear-Avoidance Beliefs Questionnaire.

HADS= Hospital Anxiety and Depression Scale.

Pair-wise comparisons of “CSQ Pain control” x group showed significant differences at 10-week, 20-week and 1-year follow-ups, but not at the 2-year follow-up. Pair-wise comparisons of “SES” x group showed significant difference only at 1 year. Pair-wise comparisons of “CSQ Catastrophizing subscale” x group showed significant differences at 20 week and 1 year but not at 2 years.

There were no longer differences between groups in consumption of analgesics at 1 or 2 years. At 1 year (p=0.001) and 2 years (p=0.001) the PASS-group reported a higher satisfaction with treatment received during the intervention, than the IAPT-group. At the 1-year follow-up the PASS-group reported that during treatment they had learned useful skills which they could apply in everyday life to cope with pain, to a significantly higher degree than the IAPT-group (p<0.002), and with a trend towards a difference at 2 years (p=0.030).
Study IV

Participants

Analyses were performed regarding the participants assigned to the PASS treatment condition in Study II-III. The PASS treatment arm included 77 participants and baseline characteristics of the participants are shown in Table 4.

Outcome – exploration of predictors for disability outcome

Multivariate PLS regression analysis showed that baseline scores in NDI, SES and pain intensity explained 31\% of the variance in disability (NDI) post-treatment (20-week follow-up). Additional univariate OLS linear regression analyses were performed for each variable which indicated that the variables contributed significantly in explaining the variation in NDI at post-treatment follow-up: NDI \( (p<0.001) \), pain intensity \( (p=0.001) \), SES \( (p=0.006) \). Table 7 shows the results of PLS and OLS regression analyses of NDI at 20 weeks.

Table 7. Results of PLS and OLS regression analyses of NDI at 20 weeks for the PASS-group \( (n=77) \) in Study IV.
Multivariate PLS regression analysis showed that post-treatment scores in NDI, SES and pain intensity explained 68% of the variance in disability (NDI) at 2 years follow-up. Additional univariate OLS linear regression analyses were performed for each variable which indicated that the variables contributed significantly in explaining the variation in NDI at 2 years follow-up: NDI \((p<0.001)\), pain intensity \((p<0.001)\), SES \((p<0.001)\). Table 8 shows the results of PLS and OLS regression analyses of NDI at 2 years.

Table 8. Results of PLS and OLS regression analyses of NDI at 2 years for the PASS-group \((n=77)\) in Study IV.

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Full model</th>
<th>Final model PLS*</th>
<th>Univariate OLS regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain Intensity</td>
<td>0.213 0.511 0.300 0.722</td>
<td>1.492 0.218 1.059 1.926 0.377</td>
<td>0.001</td>
</tr>
<tr>
<td>Neck Disability Index (NDI)</td>
<td>0.519 0.565 0.401 0.437</td>
<td>0.903 0.070 0.764 1.043 0.685</td>
<td>0.001</td>
</tr>
<tr>
<td>Self-efficacy Scale (SES)</td>
<td>-0.254 -0.046 -0.273 -0.050</td>
<td>-0.103 0.017 -0.138 -0.069 0.311</td>
<td>0.001</td>
</tr>
<tr>
<td>Pain control (CSQ)</td>
<td>-0.080 -0.500</td>
<td>-0.094 -0.048</td>
<td>-0.139 -0.069 0.311</td>
</tr>
<tr>
<td>Catastrophizing (CSQ-CAT)</td>
<td>-0.084 -0.084</td>
<td>-0.099 -0.048</td>
<td>-0.139 -0.069 0.311</td>
</tr>
<tr>
<td>Depression (HADS-D)</td>
<td>0.048 0.099</td>
<td>-0.103 0.017 -0.138 -0.069 0.311</td>
<td></td>
</tr>
<tr>
<td>Anxiety (HADS-A)</td>
<td>-0.085 -0.139</td>
<td>-0.103 0.017 -0.138 -0.069 0.311</td>
<td></td>
</tr>
</tbody>
</table>

*Proportion of variation in NDI at 2 years explained = 67.5%

CSQ-C = Coping Strategies Questionnaire Pain Control CSQ-CAT = Coping Strategies Questionnaire Catastrophizing Subscale
HADS-D = Hospital Anxiety & Depression Scale Depression subscale HADS-A = Hospital Anxiety & Depression Scale Anxiety subscale
Discussion

When the pain self-management intervention in this thesis was planned, there was no theoretical or empirical consensus on how to design and frame such an intervention for persons with persistent tension-type neck pain. Thus, as described in the introduction, the theoretical and empirical support was drawn from multiple theories, and the empirical research from related areas and health conditions. The intervention represents one of very few self-management interventions for patients with neck pain, especially in a PHC context.

Interpretation of the results

This thesis presents the evaluation of an empirically derived pain self-management treatment approach. Prior to the intervention there were no recommendations or guidelines available concerning outcome measures suitable for the evaluation of self-management approaches to neck pain. Thus, it was essential to perform a pilot study (Study I) in order to explore the feasibility of study design, measures and methods. The pilot study used a broad variety of outcome measurements in order to explore plausible primary outcome measures in relation to patients with persistent tension-type neck pain. The result indicated that the intervention program AR/PASS had an impact on pain control, although there was no difference in perceived pain. This supported the rational for AR/PASS as a means to increase the patient’s perceived control over pain, rather than to focus exclusively or mainly on pain per se and pain reduction\(^{86, 100}\). The findings were in line with theoretical and empirical research suggesting that pain control was important for the ability to cope with pain\(^{104}\), and a key component to target in pain self-management\(^{106}\). The results highlighted the need to explore and incorporate outcomes beyond pain intensity as the single primary outcome. According to the results, perceived pain control rather than perceived pain intensity was assumed to be the most appropriate primary outcome variable in a full-scale study. AR/PASS was considered a plausible and important complement to individually administered pain-reducing treatments for patients suffering from persistent tension-type neck pain, conveying more appropriate coping strategies and perceived pain control.
The short-term follow-up of the full-scale study (Study II), showed that a multi-component pain and stress self-management group intervention (PASS) had better effects than individually administered physiotherapy (IAPT) for patients with persistent tension-type neck pain, with regard to the primary outcomes perceived ability to control pain and self-efficacy for performing activities interfered with by pain, over the 20-week follow-up period, displayed by both between-group differences and significant time x group interaction effects. IAPT did bring about changes in a range of measures but these changes were not as large as the changes observed in the PASS-group. The results suggested that the components included in PASS were important for affecting behavioral and cognitive aspects of pain self-management and that IAPT did not have the same impact. Even after controlling for initial differences between the groups in NDI, there was still a significant difference in reduction of neck pain-related disability in favor of PASS in Study II. In the PASS group there was a decrease in neck pain-related disability over time, while in the IAPT group the index value stayed almost unaltered over time. There was also a difference in levels of catastrophic thinking in favor of PASS.

The long-term follow-up of the full-scale study (Study III) showed that the initial treatment effects of the PASS, were largely maintained over a 2-year follow-up period and with superior long-term effects as compared to IAPT, for patients with persistent tension-type neck pain with regard to the primary outcomes: ability to control pain and self-efficacy for performing activities interfered with by pain, and the secondary outcome: catastrophizing. Albeit statistically significant differences, the magnitude of the observed effect sizes and differences between groups, were in some cases small, which limited conclusions concerning clinically meaningful changes. However, and most importantly, initial treatment gains were largely maintained over the 2-year follow-up period.

Despite changes in self-efficacy and pain control, no outcome differences in disability between groups could be ascertained in the long-term follow-up (Study III), as previously observed in the short-term evaluation (Study II). Possibly due to the large number of withdrawals which limited the statistical power to detect differences between groups in NDI and also due to the decision to include baseline values of NDI as covariate in the analyses to adjust for baseline differences between groups. Study IV intended to explore plausible predictors associated with short-term and long-term treatment success, in terms of pain-related disability, for patients with neck pain following PASS. Study IV revealed that treatment gains measured by immediate post-treatment scores at the 20-week follow-up, in disability, self-efficacy and pain intensity, were associated with long-term outcome in pain-related disability two years post-treatment, in patients with persistent neck pain participating in the PASS.
Perceived pain control was a key target in PASS in accordance with literature emphasizing the importance of “control”, expressed as a sense of personal control or internal locus of control, for the perception of pain and for the person’s ability to manage pain on their own, i.e. to apply active pain coping strategies. Internal locus of control refers to the belief that one can exert control over one’s life, as opposed to the belief that consequences of behavior rely on external factors, and are thereby out-of-one’s control. Studies have shown relationships between internal locus of control, the use of active coping strategies and favorable adaptation to pain. The perception of control was considered to be an important factor in pain coping by promoting self-confidence and pain-related self-efficacy beliefs. The results of the studies showed that PASS did have a superior impact on perceived pain control than IAPT, both in the short-term and long-term evaluation. However, treatment gains measured by post-treatment scores, in disability, self-efficacy and pain intensity, were most important for long-term outcome in pain-related disability two years post-treatment regarding the participants in the PASS-group.

The results from these studies is in concordance with empirical studies emphasizing the importance of self-efficacy beliefs for success in enhancing self-management, by supporting motivation for change and adopting active self-management behavior. Self-efficacy beliefs for performing activities interfered with by pain have been shown to be an important predictor of pain-related disability and suggested to be highly amenable to change in response to treatment. Self-efficacy for managing pain has been associated with change in other outcomes in regard to coping with persistent pain. In PHC samples of patients with persistent musculoskeletal pain, studies have found self-efficacy to be a better predictor of disability than fear-avoidance and pain intensity and therefore an important factor to address in self-management programs.

The concept of self-efficacy, according to Social cognitive theory, emphasizes four factors that influence self-efficacy beliefs: personal experience of accomplishments (mastery experiences), social reinforcements and modeling (vicarious experience), verbal persuasion, and affective states within the individual (emotional arousal). In the present pain self-management program, all four factors for enhancing self-efficacy beliefs were addressed. Behavioral coping skills were practiced in a variety of situations and applied to everyday life activities by a step-wise approach of repeated successful performances of incremental tasks, in order to reinforce personal mastery experiences, and to diminish anticipatory aversive emotional arousal in relation to pain. The intervention was offered in a group setting providing social reinforcement and modeling (“vicarious experience”) and affirmative feedback on performance accomplishments (“verbal persuasion”) both from the PT and from other participants in the group.
The treatment components in this pain self-management program had been chosen and included, based on clinical experience together with available empirical and theoretical knowledge. Each of the principal treatment components served multiple purposes. Applied relaxation represented foremost an adaptive pain coping skill to be applied in daily life activities and thus increasing behavioral capability, and inducing a sense of personal control over pain, in accordance with the original rationale for the method of Applied relaxation. But the training in relaxation techniques also served to induce physical and mental relaxation, thus reducing stress response and physical arousal, and increasing the ability to be mindfully present in the body-self. The body awareness exercises provided additional occasions for the practical application of attendance to bodily signals through an accepting, non-judgmental awareness, thus increasing the ability to be mindfully present in the body-self and with the intention to promote an perceived interconnectedness of mental, emotional and physical processes which in literature has been called “an embodied self”. But the body awareness exercises also served to increase physical and mental relaxation during movement, reduce fear of movement/pain-related movement, improve posture and reduce physical/functional restrictions, e.g. breathing pattern. The short lectures, combined with group discussions, served to convey information and education in an interactive learning format, to challenge perceptions, attitudes, cognitions and behaviors in relation to pain and to provide methods for effective problem-solving and self-tailoring in relation to pain self-management. The short lectures and group discussions provided theoretical understanding of the interpretation of bodily signals and methods for problem-solving effectively with aversive emotional arousal.

The group format of the PASS is deemed a worthy treatment component on its own merits. The group format was considered important to enhance self-efficacy beliefs, and cultivate a reinforcing and supportive environment. Social Cognitive Theory implies that the environment can provide reinforcement, either directly as in operant learning, or vicariously by watching others and the reinforcement that they receive (observational learning) and by self-reinforcement (self-control). It is suggested that for a pain self-management approach, a group setting is preferred, providing a supportive environment with ample opportunity for social reinforcement by observing others and receiving feedback on accomplishments from the therapist and fellow group participants.

PASS was beneficial in decreasing catastrophizing as compared to IAPT. Catastrophizing could also be viewed in the light of the fear-avoidance model, with two extreme responses to fear of pain: confrontation and avoidance. The model proposes that if pain is interpreted as threatening (through catastrophizing), pain-related fear develops, leading to avoidance behavior and hypervigilance regarding bodily sensations, followed by disability, disuse and depression. Catastrophizing is
characterized by a lack of confidence and control and an expectation of negative outcome. Avoidance and catastrophizing intensify the experience of pain, increase disability, reduce the patient’s own capability to control pain and act as an inappropriate pain coping strategy.

Both treatment groups showed decreased pain intensity at follow-ups, but there was no time x group interaction effect, suggesting that both treatments had an effect on patients’ perceived pain although neither was superior to the other in regard to pain reduction. These findings are in agreement with other studies on persistent neck pain in which similar improvements are often reported between treatments, regarding the outcome “pain intensity.” The PASS group had a significantly lower consumption of analgesics at the 20-week follow-up compared to the IAPT group, possibly indicating that the IAPT group relied more upon analgesics for their pain coping than did the PASS group. There were no longer differences between groups in consumption of analgesics at 1 or 2 years. Studies suggest that taking medication should be considered a passive pain self-management strategy and consequently an important factor to consider when evaluating the use of coping strategies in relation to pain. Passive coping has been shown to be disadvantageous as compared to active coping in pain self-management, and a risk factor for developing disabling neck pain.

Study III is one of few long-term evaluations of a pain self-management intervention for patients with persistent neck pain in a PHC setting. The initial treatment effects of the PASS were largely maintained over a 2-year follow-up period with regard to ability to control pain and self-efficacy for performing activities interfered with by pain, and levels of catastrophic thinking. This suggests that key components for enhancement of long-term effects in self-management coping efforts were adequately targeted in the intervention and supported the assumptions and rationale for the pain and stress self-management program. For self-management interventions to be perceived as beneficial, effects need to be sustained over time. Self-efficacy has been suggested an important factor for motivation in adopting but also in maintaining self-management behavior. Other studies have shown that when studied in a 6-month perspective, perceived control over constraints, i.e. behavioral control and self-efficacy, discriminated between successful maintainers of physical activity health behavior, and unsuccessful. It has been proposed that pain-related self-efficacy is a mediator associated with change in other outcomes in pain self-management programs, and an important predictor of disability in PHC samples of patients with persistent pain. Studies suggest that when patients with persistent pain use more active coping skills, their disability decreases. The results from the studies in this thesis support previous studies, in that the ability to control pain and self-efficacy beliefs for performing activities interfered with by pain, are important factors to address, in order to induce long-term maintenance of treatment gains in disability following a pain self-management intervention.
The intervention program PASS entailed a limited number of sessions and one post-treatment booster session. Maintenance components were included in each group session, primarily by identification of personal “high-risk” everyday life situations for pain flares and the application of coping skills in these situations and also by construction of a personal plan for the practice and application of coping skills after the intervention. The single post-treatment session was devoted exclusively to maintenance of coping skills. Other pain self-management group interventions have included more extensive additional maintenance components to continue reinforcing the class sessions, e.g. individual sessions or telephone calls monthly over a year, or additional follow-up group sessions after the program. The results in Study III suggested that the treatment procedure in PASS, i.e. the number of sessions and distribution over time, was enough to sustain behavioral change. However, it is possible that additional sessions, with check-ups on adherence to training, could have produced even more exhaustive treatment gains.

At both 10-week and 20-week follow-ups, a significantly larger proportion of PASS participants reported that they used skills, learned during treatment, in everyday life situations to cope with pain. This suggested that PASS had the intended effect upon coping strategies and served to enhance self-management skills. The difference was somewhat less apparent at the 20-week follow-up, raising a question about the sustainability of the treatment effect, and warranting studies of long-term effects. The result from Study II indicated that further investigation was needed with regard to whether the treatment procedure i.e. number and distribution over time of treatment sessions, was enough to instill long-term behavioral change. Other studies had indicated a need for longer treatment periods and recurrent check-ups on adherence to training, in interventions which require active patient participation and readiness to adopt new behaviors in everyday life. Despite maintained favorable treatment outcomes in the long-term follow-up, the proportion of participants who used skills acquired through the intervention to cope with pain was smaller at 1 and 2 years than immediately post-treatment at 10 and 20 weeks. Similar findings have been reported by other studies, e.g. in a 3-year follow-up of a physical activity intervention for individuals with neck pain, where the outcome was largely maintained, although adherence to the specific home training program faltered considerably. This raises the question on whether coping skills gradually become integrated behaviors in everyday life and thus are no longer perceived as intentional actions or specific exercises.

Literature has suggested that it might be important to consider differential interventions based on patient characteristics in the management of pain conditions. However, Study IV showed that pre-treatment characteristics explained only a limited proportion of variance in disability post-treatment, and were therefore assumed to be weakly associated with treatment success.
and the long-term outcome. Thus, the results could not support the assumption that pre-treatment characteristics among participants would explain treatment outcome in disability following PASS in this neck pain sample in PHC.

The rationale for the PASS was to apply a treatment approach that combined active pain self-management coping skills training together with education addressing and strengthening self-efficacy beliefs and internal locus of control. The results from the studies in this thesis support the assumption that a multi-component treatment approach that added cognitive and behavioral treatment components targeting psychosocial factors and which contrasted to passive physical modalities and stand-alone treatment approaches, improved physiotherapy management of neck pain. The results support other empirical research that suggests that physiotherapy interventions for pain could be further improved by the addition of cognitive and behavioral treatment components targeting psychosocial factors. This study represents a complex intervention involving several treatment components. When interpreting the results from a complex intervention, it is not possible to evaluate the contribution of each treatment component separately. It is concluded that this specific combination of treatment components yielded beneficial effects on pain control, self-efficacy and disability, but it cannot be determined whether one of the treatment components was more important than the other. Studies that examine each treatment component separately are needed. However, it should be taken under consideration whether multi-component treatment approaches might be preferable when managing persistent pain conditions, i.e. by attending to several dimensions and aspects of the pain experience, as compared to single-component treatments. Studies and systematic reviews suggest that multi-component treatment approaches towards persistent pain have superior effects on several outcome measures as compared to stand-alone treatments. Therefore multi-component treatment approaches might be preferable, and thus the treatment of choice when managing persistent neck pain in PHC physiotherapy.

Methodological considerations

When performing randomized controlled trials, non-pharmacological studies of complex interventions require special methodological considerations in design and thorough execution of procedures. In this intervention special attention was given to allocation concealment and special efforts were made to standardize and administer treatment consistently to all participants. Blinding of participants or the PTs who were delivering the treatment was not possible. The participants knew to what treatment option they were assigned.
assigned and the PTs knew what treatment arm they were delivering. However, the PTs were kept blind as to which of their patients that were participants in the intervention. The PTs treated a mixture of intervention participants together with other ordinary patients at the clinics and the PASS was delivered in groups including both participants in the study and other patients with musculoskeletal pain referred to the PHC centers. It was not possible to guarantee blinding of PTs, but the participants were asked not to reveal to their PTs that they were participating in the study. The initial processing and analysis of data was performed blinded to group assignment.

There is a risk of contamination between treatment arms when two treatments are delivered at the same clinic. Consequently, the study protocol involved procedures to minimize contamination. Before the study, the rationales, options for and limitations of each treatment arm were thoroughly explained, separately for the PTs delivering PASS and IAPT respectively. Furthermore, fidelity in delivering PASS according to the protocol was ensured in several ways; by a course, a detailed written manual and follow-up sessions with the researcher. Adherence to the manual was checked after the study by reviewing the patient records. PTs delivering IAPT were not restricted regarding treatment modalities, but were expected to deliver treatment in the same ways as provided to other patients not participating in the study. A limitation might be that the PTs delivering PASS were somewhat inexperienced in that treatment approach, while the PTs delivering IAPT were working according to methods and modalities with which they were familiar and confident and had practiced professionally for several years. One would expect that such a difference in experience between the deliverers should more likely reduce the difference in treatment effects rather than inflate them.

IAPT treatment was provided in accordance with current practice and ordinary procedures at the clinics. A non-standardized procedure delivered by several therapists could have been a limitation, but was more likely a strength, as it ensured similarity to authentic treatment conditions and controlled for non-specific treatment effects, e.g. contact with therapist, and events external to the study over the 2-year follow-up period.

Attendance at group-sessions among PASS participants was high; of eight sessions offered, participants attended an average of seven, in the full-scale intervention (Study II-III). IAPT participants received an average of 11 sessions i.e. a slightly higher number of treatment sessions. In summary, completers in both treatment arms attended a similar number of treatment sessions, thus the “dose” can be considered comparable across conditions with regard to the amount of therapist contact and context.

This randomized controlled trial had a pragmatic design and resembled real-life conditions by including a population-based sample; i.e. a sample representative of the population with persistent tension-type neck pain seeking physiotherapy in PHC. Thus the results can be considered applicable...
to people with persistent neck pain seeking medical care in PHC elsewhere in Sweden and most likely also in other countries with similar health care organizations and case mix in PHC. The inclusion criteria were wide in order to include the diversity of characteristics exhibited by individuals with neck pain seeking physiotherapy treatment in PHC settings. Since specific pre-treatment characteristics accounted to a limited extent for the outcome in disability, it is suggested that the intervention is feasible for the majority of persons seeking PHC due to persistent tension-type neck pain.

A vast majority of the participants were women, which is in concordance with studies in prevalence of neck pain and studies suggesting that women tend to seek care due to neck pain to a greater extent than men. However, individuals with signs of depression (approximately 10% of those screened for inclusion in study II and III) were excluded from the intervention, which limits the generalizability of the results as well as interpretation of the possible predictive value from depression on treatment outcome. Depression is a common co-morbidity in those with persistent neck pain which calls for further investigation and studies regarding appropriate treatment options for individuals with neck pain and signs of depression.

Due to withdrawals caution should be exercised in interpreting the results. In Study II 40 participants (26%) withdrew from treatment or failed to return one or both of the follow-up questionnaires. In Study III 54 participants (35%) failed to return one or several of the four follow-up questionnaires. It is plausible that there is response bias. However, the drop-out rate is comparable to other studies regarding interventions requiring substantial time and effort from the participants and which rely on mail-administered questionnaires. Findings suggest that the response bias was small: “intention-to-treat” analyses including all randomized participants, revealed the same overall effects as the “per protocol” analysis, and baseline data for withdrawals/non-responders did not differ from completers/responders. However, other studies on self-management interventions have reported that persons experiencing more pain or disability may be more motivated to attend behavioral interventions and that those who initially benefit from the intervention, by improvements in pain and coping efficacy, tend to be less motivated to participate in long-term follow-ups. Completers/responders from both groups reported high satisfaction with care, but it may have been the least satisfied participants who withdrew or failed to return the questionnaires. The studies did not include a measure of treatment expectancy before treatment. Such a measure might have shed light on the possible effect of expectancy on the results and also the reasons for withdrawal.
Clinical implications and future research

The pain and stress self-management intervention (PASS) addresses physiological, behavioral and cognitive aspects of pain coping and pain self-management. These studies direct attention toward the need to incorporate behavioral and cognitive treatment components into clinical practice, in order to address aspects of pain coping and pain self-management which are not sufficiently met by prevailing biomedical treatment approaches for patients suffering from persistent tension-type neck pain. The PASS should be considered an important treatment option in clinical physiotherapy practice, equal in merit regarding pain reduction and superior in regard to increasing pain self-management coping skills and reducing pain-related disability, as compared to individually administered pain-reducing treatments for patients with persistent neck pain.

In addition, this pain self-management intervention sheds light on a complex intervention involving several treatment components. It is suggested that multi-component treatment approaches might be preferable and the treatment of choice when managing persistent neck pain in PHC physiotherapy. As yet such multi-component treatment approaches are sparsely investigated in the context of PHC physiotherapy. Future research is needed to explore different treatment combinations and procedures.

The constructs of “control”; in literature expressed either as a sense of personal control or internal locus of control, and “self-efficacy”; conceptualized by Social Cognitive Theory as self-efficacy beliefs and self-confidence in performing activities interfered with by pain, were important theoretical underpinnings and treatment targets in this pain self-management intervention. The results from these studies emphasize that “perceived pain control” should be considered an equally important clinical treatment target as “pain intensity” in persons with disabling persistent neck pain and, as such, an equally important primary outcome variable in studies regarding pain interventions. The importance of self-efficacy beliefs for pain coping is highlighted by the results from these studies. It is suggested important to address and strengthen self-efficacy beliefs in regard to pain coping efforts, in order to reduce disability and enhance pain self-management strategies in the treatment of neck pain. Furthermore, studies concerning pain interventions need to incorporate outcomes that go beyond pain intensity and address the consequences of pain, e.g. pain-related disability, and in addition explore mediators for such outcomes.

The result shows that it is achievable for PTs to learn, apply and deliver a treatment approach which includes psychological components and also to incorporate a biopsychosocial perspective into a predominantly biomedical area, thus optimizing self-management of pain. A further incorporation of knowledge and skills aimed at behavior modification is warranted for the
physiotherapy profession to justify and extend the contribution of PTs in pain management interventions.

Pre-treatment characteristics explained only a limited proportion of variance in disability post-treatment, and were therefore assumed to be weakly associated with treatment success and the long-term outcome. Accordingly, the PASS is concluded feasible for the vast majority of those seeking PHC due to persistent tension-type neck pain. Thus suggesting that PASS is an appropriate treatment modality to provide in a PHC setting for patients with persistent neck pain. Future research should explore whether the self-management approach could also be feasible in regard to other pain conditions appearing in PHC. Depression is a very common co-morbidity in the pain population, which calls for further investigation and studies regarding appropriate treatment options for persons with persistent neck pain and signs of depression.
Summary and conclusions

This thesis evaluated the treatment effects of a multi-component pain and stress self-management group intervention on patients with persistent tension-type neck pain, in a PHC setting, and explored plausible predictors associated with treatment success in terms of reduced pain-related disability.

It is concluded that the multi-component pain and stress self-management group intervention (PASS) had better effects than individually administered physiotherapy (IAPT) for patients with persistent tension-type neck pain, regarding coping with pain, in terms of patients’ self-reported ability to control pain, self-efficacy for performing activities interfered with by pain, pain-related disability and catastrophizing, over the 20-week follow-up period. The treatment effects were largely maintained over a 2-year follow-up period. It is also shown that post-treatment scores in disability, self-efficacy and pain intensity were associated with long-term outcome in pain-related disability two years post-treatment. Pre-treatment characteristics explained only a limited proportion of variance in disability post-treatment, and were therefore assumed to be weakly associated with treatment success and the long-term outcome. Accordingly, the intervention is considered feasible for the majority of persons seeking PHC due to persistent neck pain.

The results show that key components for enhancement of long-term efficacy in pain self-management coping efforts were adequately targeted in the intervention, and support the assumptions and rationale for the pain self-management program.

The results highlight differences in effects between the two treatment strategies and suggest that the components included in PASS were superior in their effect on important behavioral and cognitive aspects of pain coping and pain self-management. However, the magnitude of the observed effect sizes and differences between groups, were in some cases small, which limit conclusions concerning clinically meaningful changes.

It is suggested important to address and strengthen self-efficacy beliefs in regard to pain coping efforts, in order to reduce disability and enhance pain self-management strategies in the treatment of persistent tension-type neck
pain, and to induce long-term maintenance of treatment gains in disability, following a pain self-management intervention.

It is proposed that multi-component treatment approaches might be preferable as compared to single treatment approaches, and thus the treatment of choice when managing persistent neck pain in PHC physiotherapy. The conclusion is that it is achievable for PTs to learn, apply and deliver a treatment approach which includes psychological components and to incorporate a biopsychosocial perspective into clinical physiotherapy practice, thus optimizing self-management of pain.

Studier anger att under ett år har uppemot hälften av befolkningen någon gång muskel- och/eller ledrelaterad smärta från nackregionen. Långvariga besvär av muskel- och ledrelaterad smärta från Nacken uppges i studier drabba cirka 20% i befolkningen. Av de personer som har långvarig nacksmärta söker endast en liten del vård. Många av de som söker vård för muskel- och/eller ledrelaterad nacksmärta kommer till och får behandling hos sjukgymnast i primärvården.

Denna avhandling handlar om långvarig smärta som kommer från spända muskler i Nacken och hur man som drabbad av sådan smärta kan lära sig tekniker för att själv behandla/hantera sin smärta och den stress som uppstår av smärten. Det handlar om "egenvård", dvs. om att själv bli den bästa experten på sin sjukdom/skada och skaffa sig en "verktygslåda" med olika färdigheter och strategier att använda utifrån sin egen expertis för att fungera på bästa möjliga sätt inom livets alla områden.

Det övergripande syftet med denna avhandling var att utvärdera behandlingseffekt av ett gruppbaserat smärt- och stresshanteringsprogram på kort sikt, dvs. direkt efter behandling, respektive på lång sikt, dvs. 2 år efter behandling, samt undersöka om det fanns faktorer som förklarade bra behandlingseffekt i form av minskad smärtrelaterad aktivitetsbegränsning,

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för personer med långvarig spänningsrelaterad nacksmärta som sökt vård hos sjukgymnast i primärvård. Avhandlingen består av fyra delarbeten.

**Delarbete I** är en randomiserad kontrollerad pilotstudie. Syftet var att testa genomförbarhet av metod, design och procedurer för att utvärdera behandlingseffekt av ett gruppbaserat smårthanteringsprogram riktat till personer med långvarig nacksmärta som sökt behandling hos sjukgymnast i primärvård. Studien genomfördes på en sjukgymnastikmottagning i primärvården i Land stinget Dalarna under 2002. Ett omfattande självskattningsformulär, som deltagarna fyllde i före behandling och 7 respektive 20 veckor efter behandling, testades för tillämpbarhet och användes för beräkning av tänkbara effekter i en fullskalig studie. Statistisk analys gjordes också för att se skillnader mellan grupperna och skillnader över tid inom grupperna.

**Delarbete II-III** är en randomiserad kontrollerad klinisk studie med korttidsuppföljning, fram till 20 veckor efter påbörjad behandling (**delarbete II**) och med långtidsuppföljning, fram till 2 år efter behandling (**delarbete III**). Syftet var att jämföra behandlingseffekt samt se om behandlingseffekt bibehölls efter 2 år, mellan 1) ett gruppbaserat smårt- och stresshanteringsprogram (PASS), och 2) sedvanlig individuellt administrerad sjukgymnastisk behandling (IAPT), för personer med långvarig nacksmärta som sökt behandling hos sjukgymnast i primärvård. Det var samma patienter i båda delarbetena. Rekrytering av patienter och behandling i delarbete II-III genomfördes på 8 orter och 9 olika sjukgymnastikmottagningar inom primärvården i Dalarna under 2004-2006. Personer med nacksmärta lottades till antingen PASS eller IAPT och fick behandling på sin primärvårds mottagning. Resultatet utvärderades med ett självskattningsformulär som deltagarna fyllde i före behandling, efter 10 veckor, och 20 veckor, samt 1 år och 2 år efter behandling. Självskattningsformuläret innehöll frågor om smärta, smårtlindrande medicinering, sjukvårds konsumtion, upplevelse av att kunna kontrollera och hantera smärta, tilltröna till den egna förmågan (”self-efficacy”) att utföra aktiviteter trots smärta, smårtrelaterad aktivitetsbegränsning, katastrofänkande, smårtrelaterad rörelserädsla, depression och oro/ångest samt vid uppföljningstillfällena frågor om tillfredsställelse/nöjdhet med behandlingen och om man lärt sig något under behandlingen som var användbart för att hantera smärta i dagliga aktiviteter. Statistisk analys gjordes för att se skillnader mellan grupperna och skillnader över tid inom grupperna.

**Delarbete IV** är en explorativ longitudinell studie. Syftet var att utforska möjliga prediktorer för bra behandlingseffekt, dvs. faktorer som var associerade med och kunde förutspå minskad smårtrelaterad aktivitetsbegränsning på kort sikt (efter behandling) och på lång sikt (2 år efter behandling), för personer med långvarig nacksmärta som deltagit i PASS. Materialet bestod av de deltagare som lottats till PASS i delarbete II och III. Redan insamlad data från det självskattningsformulär som patienterna fyllde
i före behandling och vid 20 veckor respektive 2 år efter behandling användes. Data analyserades statistiskt med regressionsanalys för att söka förklarande variabler.

I pilotstudien (delarbete I) deltog 37 personer, vilka lottades till antingen smärthanteringsprogrammet (n=18) eller kontrollgruppen som fick sedvanlig behandling på mottagningen (n=19). Resultatet gav vägledning till att upplevelse av att kunna kontrollera och hantera smärta respektive tilltron till den egna förmågan (”self-efficacy”) att utföra aktiviteter trots smärta, var viktiga effektmått att utvärdera i en fullskalig studie.

I den fullskaliga studien deltog 156 personer som lottades till antingen PASS (n=77) eller IAPT (n=79). Resultatet av korttidsuppföljningen (delarbete II) visade att PASS hade bättre effekt jämfört med IAPT på: upplevelse av att kunna kontrollera och hantera smärta respektive tilltron till den egna förmågan (”self-efficacy”) att utföra aktiviteter trots smärta. PASS hade också bättre effekt på: smärtrelaterad aktivitetsbegränsning samt katastroftänkande. Långtidsuppföljningen (delarbete III) visade att det fortfarande var skillnad mellan grupperna och att de uppnådda effekterna i stort kvarstod över 2-årsperioden.

Resultatet av delarbete IV visade att behandlingseffekterna vid 20-veckorsuppföljningen på tre faktorer: smärtrelaterad aktivitetsbegränsning, tilltron till den egna förmågan (”self-efficacy”) och smärtintensitet, var de faktorer som var mest associerade med bra effekt vid 2 år; dvs. minskad smärtrelaterad aktivitetsbegränsning, för de personer som deltagit i PASS. Egenskaper hos personerna före behandlingen förklarade i väldigt liten grad att man skulle få bra effekt; dvs. minskad smärtrelaterad aktivitetsbegränsning, både efter behandling (vid 20-veckorsuppföljningen), respektive på lång sikt efter behandlingen (vid 2-årsuppföljningen). Därför kan denna typ av behandling antas vara lämplig för majoriteten av personer med långvarig spänningsrelaterad nacksmärta som söker sjukgymnast i primärvård.

Sammantaget visar resultaten från dessa delarbeten att PASS tillförde viktiga aspekter av betydelse för upplevelsen att själv kunna behandla och hantera sin smärta, vilka inte tillgodoseddes lika väl med den sedvanliga behandlingen. Det är viktigt att stärka människors tilltro till sin egen förmåga (”self-efficacy”) att utföra aktiviteter trots smärta, för att nå framgång med behandling som syftar till att göra individen till expert på sin egen smärterelaterad aktivitetsbegränsning. PASS var ett behandlingsprogram som lämpade sig väl att levereras av sjukgymnast i primärvård. PASS är ett viktigt behandlingsprogram vid långvarig spänningsrelaterad nacksmärta som kan göra behandling hos sjukgymnast i primärvård ännu bättre än tidigare.
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