When pain remains

Appraisals and adaptation

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*For the ones who had a notion,
a notion deep inside that it ain't
no sin to be glad you're alive. I
wanna find one face that ain't
looking through me. I wanna
find one place...*

Bruce Springsteen, 1978.

Abstract

As the number one cause of sick absenteeism and disability pension, musculoskeletal pain is considered a major health problem in Sweden and many other industrialized countries. Medical findings are often insufficient to explain the pain's intensity or duration, and psychological factors are known to be important in understanding the aetiology and maintenance of pain. The current thesis examines the relationship between non-specific chronic musculoskeletal pain and cognitions, emotions and behaviours. In Study I, chronic pain patients were interviewed about pain experiences and the results indicated that some patients use psychological defences to deal with chronic pain. Study II was an experimental approach set up to study the association between chronic pain and selective memory. In a pictorial memory game, no differences were found between patients and controls in the neutral game. In the pain-related game patients decreased – and controls improved – their performance, a finding discussed in terms of cognitive avoidance. Study III used questionnaire and register data to examine the predictive value of psychosocial variables on sustained pain-related sick absenteeism and the results showed sense of mastery and recovery beliefs to be especially important. The studies are discussed in terms of emotional and defensive coping and it is suggested that defences can be related to excessive activity, which may increase the risk of future relapses. It was suggested that an increased acceptance of pain, at both an individual and a societal level – would favour rehabilitation and return-to-work for those suffering from persistent pain.

Key words: Chronic pain, musculoskeletal disorders, appraisals, coping, cognitive avoidance, identity, cognitive bias, psychological defences, acceptance, sick absenteeism.

Svensk sammanfattning

Muskuloskeletal smärta är den vanligaste orsaken till sjukskrivning och förtidspensionering i Sverige liksom i flera andra länder. Kliniska fynd är ofta otillräckliga för att förstå smärtans intensitet och varaktighet och psykologiska faktorer spelar en framträdande roll för att förklara vidmakthållande av smärta. Syftet med denna doktorsavhandling är att vidare undersöka sambandet mellan psykologiska faktorer och långvarig muskuloskeletal smärta. Studie I baseras på djupintervjuer med personer med erfarenhet av långvarig ländryggssmärta och den kvalitativa analysen visade att vissa personer upplever smärtan som ett hot mot identiteten och att psykiska försvarsmekanismer kan reducera denna upplevelse. Studie II är en kvasi-experimentell ansats som prövar hypotesen att patienter med långvarig smärta har selektivt minne för smärtrelaterad information. Resultatet gav inget stöd för hypotesen utan indikerade tvärtom att smärtpatienter undviker visuell smärtinformation, något som kan tolkas som kognitivt undvikande. Studie III använde enkät- och registerdata för att undersöka om psykologiska variabler kan predicera fortsatt långtidssjukskrivning hos personer med långvariga muskuloskeletal besvär. Resultatet visade att framförallt upplevd bristande kontroll (mastery) samt negativa föreställningar om återhämtning predicerade fortsatt långtidssjukskrivning. I diskussionen betonas förekomsten av emotionell och defensiv coping hos smärtpatienter och i en tentativ modell visas hur dessa aspekter kan reducera möjligheten till återhämtning. En ökad individuell och samhällelig acceptans gentemot smärtproblem förordas för att gynna återhämtning och återgång i arbete för personer som drabbats av kronisk muskuloskeletal smärta.

Nyckelord: Kronisk smärta, muskuloskeletal smärta, föreställningar, smärthantering, kognitivt undvikande, identitet, kognitivt bias, psykiska försvar, acceptans, sjukskrivning.

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In memory of my father

List of publications

Study I

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Study II

Busch, H., Montgomery, W., Melin, B., & Lundberg U. (2006). Visuospatial and verbal memory in chronic pain patients: An explorative study. *Pain Practice*. 6, 179-185.

Study III

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Abbreviations

CBT	Cognitive Behavioural Therapy
CNS	Central Nervous System
GCT	Gate-Control Theory
MSD(s)	Musculoskeletal Disorder(s)
SEMP	Schema Enmeshment Model of Pain

Introduction

Pain is necessary for the survival of all living species. Without the ability to perceive pain, we are in constant danger to ourselves. A few individuals are born with a "...markedly impaired ability to perceive the type, intensity and quality of painful stimuli" (Nagasako, Oaklander & Dworkin, 2003, p. 214). The majority of those suffering from this rare condition of congenital insensitivity to pain have otherwise normal cognitions and sensations and show no detectable physical abnormality. However, the inability to perceive pain places them at an endless risk of harm and premature death due to injuries and undetectable diseases.

Far more common than never perceiving pain is suffering from persistent or recurrent pain. In many of these cases, pain has lost its alarm function and is no longer considered an adaptive response. All that is left is a suffering individual. A psychological perspective can be used to understand the effects of living with constant pain, but psychological variables can do more than so; in fact, they are considered crucial in understanding the aetiology and maintenance of many pain conditions (Linton, 2000a).

Toward a biopsychosocial model of disability

The roots of the biomedical model of health can be traced to ancient thinking, but it has continued to dominate medicine and human thought in modern times as well. Plato was one of the first to propose the dualistic view of body and mind as separate entities, a view later adopted by Descartes and implemented in medicine in the 17th century (Turk & Monarch, 2002). Although the biomedical model has been incredibly successful in identifying diseases and developing medical treatments, it has not been able to deal successfully with many of our modern health problems (Sarafino, 2002).

According to the biomedical model of illness, all diseases and disorders can be traced to disturbances in physiological processes, produced by injury, infections, biochemical imbalances, etc. (Sarafino, 2002). In this view, pain intensity and its unpleasantness are always proportional to the amount of tissue damage. Accompanying signs of a disease such as pain, depression and anxiety or sleep disturbances are viewed as secondary symptoms; thus once the disease is cured, these symptoms will disappear, and if they do not they are treated as psychogenic.

Accumulating scientific evidence has revealed many weaknesses in the biomedical model. For instance, physical abnormalities do not accurately predict pain severity or disability levels (Turk & Monarch, 2002). Further, there is now a large body of research supporting the notion that physiological processes are influenced profoundly by psychological and social factors (Astin, Shapiro, Eisenberg & Forsys, 2003). To account for psychosocial as well as biological factors, the biopsychosocial model of disability was implemented (see Figure 1) in the ICF (International Classification of Functioning, Disability and Health), a step that may reflect a broadening acceptance of the model in rehabilitation (Waddell, 2006). The model is an at-

tempt to treat health and illness holistically, by integrating the complex interactions between biological, psychological and social factors (Sarafino, 2002).

Figure 1. Disability according to the biopsychosocial model, with the related WHO components in right columns (from Waddell & Burton, 2005). Reproduced with permission).

The biopsychosocial model also permits a dynamic perspective, which implies that the impact of the variables differs between and within individuals. Physical aspects may be the primary cause of pain in some individuals, whereas psychological factors may contribute more strongly to pain in others. Further, the relative importance of the variables seems to differ between the stages of the disorder. Physical factors are probably more important at pain onset, whereas psychosocial factors become increasingly important the longer pain persists and are also better predictors of pain-related disability (Linton, 2002; Turk & Monarch, 2002).

Definitions of pain

Pain is defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (IASP, 1986). This widely accepted definition implies that an individual can experience pain with – or without – bodily injury. In medical settings, pain is frequently treated as a symptom of some underlying disease and the patient's description of the pain's quality and location provides valuable clues for making a diagnosis. However, pain is not necessarily a secondary symptom; in many cases pain is *the* disorder (Cousins, 2007). This is especially true for most persistent pain stemming from the musculoskeletal system, where the pain's intensity and duration frequently lacks an association with *sufficient* medical findings (Turk & Monarch, 2002). Such pain was previously believed to be psychogenic, meaning that it is a sign of some underlying psychiatric condition. Today, pain is not considered *either* physical *or* psychological; rather, both aspects are acknowledged as potent contributors to chronic pain.

There is still some debate and disagreement about the definition of chronic pain (Haefeli & Elfering, 2006). Some researchers view pain as chronic when it has prevailed for more than three months (Nachemson & Bigos, 1984) whereas others assert that pain becomes chronic after 6-12 months (Von Korff & Saunders, 1996). It is also recognized that the distinction between acute and chronic pain is an oversimplification that does not reflect the real nature of how musculoskeletal disorders develop (Edwards, Bingham, Bathon & Haythornthwaite, 2006; Linton, 2002). For example, chronicity is frequently preceded by intermittent pain, that is, a mix of symptomatic and problem-free periods, where the pain-free episodes become shorter and less frequent over time, eventually resulting in a chronic pain condition (Linton, 2002; Pincus et al., 2006).

Types of pain

Pain can be categorized differently depending upon the underlying causes. The most common type of pain is *nociceptive*. This pain is caused by tissue damage, which can be due to accidents or diseases. Nociceptive pain occurs when we cut our finger on a knife, touch a hot stove or receive a bone fracture. The pain is acute and disappears when the wound has healed. *Neuropathic* pain often begins with a tissue injury, but continues to be experienced despite wound healing. In these cases, pain stems from an injury in the central nervous system (CNS), which triggers the nerves to continue sending pain messages in the absence of ongoing tissue damage. The term *idiopathic* pain is denoted regarding pain conditions of unknown causes. Finally, there is *psychogenic* pain, where pain is “produced” by some psychiatric disorder.

Musculoskeletal pain can be categorized as specific or non-specific. Specific pain has a distinct and detectable cause, such as an inflammation, a fracture or tumour disease. For non-specific pain, a sufficient underlying pathology is

absent. Although patients with non-specific pain can show anatomical deviations, such as scoliosis or degenerative processes in the discs, such anatomical variations are not necessarily symptomatic and are therefore not regarded as a sufficient explanation for the intensity or duration of pain experienced by the patient (Carragee, Alamin, Miller & Carragee, 2005; Jayson, 1997).

Pain threshold and pain tolerance

Individual differences in pain perception are commonly measured in a laboratory setting. Experimentally induced pain can be of various kinds; thus exposure to cold or heat, muscle ischemia pressure and electric stimulation are all used to induce pain. Perhaps the most popular method is the cold pressor task, which requires the subject to hold the hand in ice-cold water. Different instructions are given depending on the purpose of the study. In investigations of pain thresholds, subjects are asked to report the exact time when the stimulation starts to be perceived as painful, and when pain tolerance is being measured subjects indicate when pain becomes unbearable.

Men and women seem to differ in both pain thresholds and pain tolerance, with women being more sensitive to painful stimulation (for a review, see Wiesenfeld-Hallin, 2005). This difference can be explained partly by biological factors, like variations in hormonal levels or the organization of the nervous system (Filingim & Maixner, 1995). Pain sensitivity is also known to vary with different stages of the menstrual cycle (Hellström & Anderberg, 2003), a finding that supports the role of hormones in pain perception. However, psychosocial factors also contribute to the different pain reports. For instance, the sex of the experimenter is known to influence pain report in men, but not in women. If the experimenter is a woman, men tend to report less experimental pain (Levine & DeSimone, 1991) and show higher pain tolerance (Gijsbers & Nicholson, 2005) than if the experimenter is a man.

Further, manipulating participants' gender-stereotyped expectations of pain in the laboratory can eliminate previously observed differences between men and women (Pool, Schwegler, Theodore & Fuchs, 2007; Robinson, Gagnon, Riley & Price, 2003).

The prevalence of musculoskeletal pain

Musculoskeletal pain is an extremely common condition in industrial parts of the world. In Sweden it is estimated that 70-80% of the population will experience back pain at some point during their lives (Deyo, Cherkin, Conrad & Volinn, 1991; Ihlebaek et al., 2006) and the lifetime prevalence of neck pain approximates 70% (Mäkele, Heliövaara, Sievers, Impivaara, Knekt & Aromaa, 1991). Musculoskeletal disorders (MSDs) are the number one cause of sick absenteeism and early retirement pension in Sweden and in many other countries (Statens beredning för medicinsk utvärdering [SBU], 2003). Persistent pain can have an enormous impact on an individual's quality of life. It is not "only" physical suffering – living with constant pain affects most parts of life; it may restrict one's ability to work or engage in social activities, hence resulting in affective distress and economic and social hardship.

Most individuals (>90%) with musculoskeletal disorders recover within a few months, but those who do not show a significantly slower pattern of recovery and suffer for very long periods of time, often years or decades (Andersson, 1999). Advances in the physical work environment have not decreased the prevalence of MSDs and the conditions are common in heavy as well as in light physical work (Lundberg & Melin, 2002). Musculoskeletal pain is more common in the older age groups, but young people also report a high frequency of such problems. Women are more likely to report and seek help for pain problems, and often report higher pain intensities, than men

(Wiesenfeld-Hallin, 2005; Wijnhoven, de Vet & Picavet, 2006). Biological differences in muscle composition and sex hormones may play a role in women's higher incidence of MSDs, but qualitative and quantitative aspects of men's and women's work situations may be even more important: Not only do women have a higher total workload (paid + unpaid work) than men do, their jobs also tend to involve a higher degree of repetitive and monotonous tasks (Lundberg & Melin, 2002), which are known to increase the risk of MSDs (Bongers, de Winter, Kompier & Hildebrandt, 1993).

Psychological interventions for chronic pain

Extensive literature reviews point to the need to integrate different treatments to improve the physical and psychosocial functioning of patients suffering from persistent MSDs (Bergström & Jensen, 2002; SBU, 2000). Chronic MSDs are acknowledged as a multidimensional problem that is best handled in a patient-centred team of professionals like medical doctors, physiotherapists, psychologists and occupational therapists. Teamwork is an important feature of interdisciplinary interventions, which require a shared treatment ideology by which the patient is encouraged to participate actively in the rehabilitation programme (Bergström & Jensen, 2002). It is believed that effective treatment must consider physical as well as psychosocial aspects of pain. Psychological interventions are typically designed to improve the patient's sense of control over the effects of pain, and this is achieved mostly by cognitive means (Turk & Monarch, 2002). Systematic literature reviews have demonstrated that cognitive behavioural therapy (CBT) is effective treatment for many who suffer from chronic MSDs (Ostelo, van Tulder, Vlaeyen, Linton, Morley & Assendelft, 2005). CBT contributes to enhanced quality of life for patients suffering from chronic MSDs and can contribute to a reduction in medication and health care utilization, while increasing work ability and physical activity (Linton, 2000b). CBT uses a

combination of cognitive and behavioural techniques to explore and challenge patients' cognitions (appraisals, beliefs, expectancies) about pain as well as pain-related behaviours, and aims to help patients manage their disorder more effectively. Identifying and breaking vicious circles of negative thoughts, emotions and behaviours is also crucial. For instance, patients who fear painful sensations may rapidly feel overwhelmed by pain and often have very low expectations about their ability to manage pain. This fear may easily result in excessive avoidance of activities and movements believed to increase pain, which may be devastating to their health. In such cases, CBT can be an effective method for restructuring dysfunctional cognitions and behaviours by confronting the patient's beliefs and smoothly helping patients engage in feared activities.

The sensory-discriminative dimension of pain

Some basic pain physiology

To understand how psychological factors can influence the experience of pain, a discussion of some basic pain physiology is necessary. Pain signals are transmitted from receptors called nociceptors, which are free-nerve endings, located in most parts of the body. Many nociceptors, especially those imbedded in the muscles, signal first when the tissue is damaged or when there is a threat of such damage (Hansson, 1997).

There are two types of peripheral nerves that transmit pain impulses: Pain signals travelling through Alpha-Delta fibres reach the brain first since these nerves are covered with myelin. The pain sensation from these fibres is sharp, distinct and well localised. The subsequent pain sensation is more aching, diffuse and hard to localise and is the result of activation of C-fibres, which lack a myelin cover and therefore transmit pain signals at a lower speed.

Pain signals enter different parts of the brain through the dorsal horn of the spinal cord: The ascending reticular formation prepares the higher regions of the brain to receive the pain message, and the thalamus organises the sensory input and directs them to appropriate brain areas (Smith, 1993). The hypothalamus activates the autonomous nervous system; activity in the limbic system gives rise to an emotional response and the primary somatosensory cortex acts to localise the pain site. The primary somatosensory cortex is organised as a “body map”, where every part of the body is represented.

The cortical representations are proportional – not to the size of the actual body part but to the amount of sensory information it conveys and how often it is used. It was previously believed that these "body maps" were permanently fixed after early childhood but it is now known that they can change in response to injuries as well as new experiences (Flor, 2002).

The Gate-Control Theory

Alpha-Beta fibres do not conduct signals of pain but transmit information on pressure, touch and vibration. Experimental research and clinical observations have repeatedly demonstrated that stimulating these nerves can modify pain perception, by either an inhibition of pain signals in the spinal cord or a reduction of pain activity in the pain fibres caused by the release of endogenous opioids. The fact that stimulation of these nerves can block out, or modify, pain perception is frequently utilized in medical settings, when techniques such as acupuncture, massage or transcutaneous electrical nerve stimulation (TENS) are applied. The mechanisms behind this phenomenon are elegantly explained by the Gate Control Theory (GCT), a model that also accounts for how psychological factors can alter pain perception. According to the model, nociceptors can activate both "pain nerves" (Alpha-Delta and C-fibres) and "touch nerves" (Alpha-Beta fibres). However, all information cannot enter the brain simultaneously; thus the CNS must do some prioritization. Melzack and Wall (1965) proposed that the dorsal horn in the spinal cord has a neural "gate" that can be opened or closed to varying degrees, controlling which sensory messages reach the brain. The GCT postulates that the amount of pain experienced is dependent upon (1) the activity in the pain fibres, (2) the activity in other peripheral nerves and (3) descending messages from the brain. Thus, rubbing our aching back makes us feel better because rubbing increases activity in the touch nerves while inhibiting pain sensations from reaching the brain. However, the most innovative notion of

the GCT was the assumption that pain was not merely the result of peripheral nociceptive activation but that descending information from the brain could affect pain perception by either amplifying or inhibiting nociceptive input in the spinal cord (Vlaeyen & Crombez, 1999).

Melzack and Casey (1968) made a distinction between three systems that all are related to pain processing. These systems are (1) sensory-discriminative, (2) motivational-affective and (3) cognitive-evaluative, and all contribute to the subjective experience of pain. The way pain is evaluated can have an enormous impact on the pain experience. A negative interpretation of pain elicits negative emotions such as sadness, irritability or anxiety and it is generally believed that negative emotions open the neural “gate”, making us more susceptible to incoming pain information. On the other hand, positive or neutral evaluations of pain are associated with positive emotions, which may close the “gate” to incoming pain messages.

The effects of cognitive evaluations also explain phenomena like the placebo effect. The placebo effect is due to our expectations of recovery and occurs when we respond positively to a simulated treatment, and was previously believed to be a disturbing element in treatment evaluations, since it interfered with “real” treatment effects. However, research has revealed that placebo operates at the same sites as the “true” pharmacological treatment, indicating that the psychosocial environment of treatment may be as important as the treatment itself (for a review, see Colloca & Benedetti, 2005).

The neuromatrix in the brain

Although some revisions have been made to the physiological parts of the GCT, the model has proved to be very robust and can incorporate most new scientific findings (Turk & Monarch, 2002). In 1999, though, Melzack extended the GCT by integrating it with Hans Selye's (1956) stress theory and introducing the neuromatrix theory (Melzack, 1999). There are three main features of the neuromatrix theory. First, the brain is assumed to possess a neural network – a body-self neuromatrix – that activates a characteristic pattern of nerve impulses to produce the complex experience of pain. The body-self neuromatrix is unique to each individual and is the determinant for the pain experience, but also serves as a basis for explaining observed individual differences in pain (Melzack, 1999). Second, the neuromatrix is hypothesized to have a genetic component, but is also shaped by sensory experiences and learning activities. The third facet of the neuromatrix theory is that pain sensations are assumed to be produced either by peripheral sensory stimulation or centrally, by the CNS. Centrally activated pain is believed to explain puzzling pain phenomena, such as phantom limb pain and several cases of chronic pain syndromes (Flor, 2002; Melzack, 1999). Studies of phantom limb pain have shown that the brain is able to reorganise itself after amputation (Flor, 2002). Research indicates that similar cortical changes can contribute to the maintenance of more common conditions of chronic pain as well. For instance, it has been found that patients with chronic low back pain – but not pain-free controls – have enlarged representations of the back region in the primary somatosensory cortex (Flor, Braun, Elbert & Birbaumer, 1997). Alterations in the primary somatosensory area are not necessarily pathological; they can also appear as a result of extensive training. One example of how training influences the brain was reported by Elbert, Pantev, Wienbruch, Rockstroh and Taub (1995), who found professional string players to have larger representations of the fingers in the primary somatosensory area as compared to non-string players.

The cognitive-evaluative dimension of pain

Cognitive appraisal and the stress response

Cognitive appraisal is the conceptualization of what we do every time we face a new demand: we first judge the situation (what does this mean to me?) and then our ability to deal with that particular situation (what can I do about it?). Or, in other words, “cognitive appraisal is a mental process by which people assess two factors: (1) whether a demand threatens their physical or psychological well-being and (2) the resources available for meeting the demand” (Sarafino, 2002, p 72). In the context of pain, the individual first tries to make sense of the experience. Pain can be perceived as relatively neutral (“it’s not harmful, I will soon be better”), positive (“I don’t have to work today”), or negative (“it’s a sign of serious illness”). Appraisals are highly subjective and are shaped by a number of internal and external factors such as personality, motivation, intellectual ability and previous experiences or the timing, ambiguity and controllability of the situation (Sarafino, 2002).

If the demand is appraised as taxing our resources, we experience “stress”. The stress response is produced by a wide range of physiological alterations in vital bodily systems. For an illustration, sympathetic nerves stimulate the adrenal medulla to secrete catecholamines, which trigger a host of physiological alterations such as increased blood pressure, heart rate and respiration. Blood clotting is enhanced and the blood vessels in the skin constrict, natural painkillers (endorphins) are released and the activity of the immune system is altered (McEwen, 2000). In later stages of the stress response, the hypothalamus triggers the release of “stress hormones” such as cortisol that

enhance the level of blood sugar, increase metabolism and decrease the activity of the immune system.

The healthy stress response is rapidly activated in the face of a demand and rapidly deactivated as the demanding situation is controlled, whereas the unhealthy stress response is characterized by a prolonged activation of vital bodily systems and relates to a broad range of illnesses (McEwen, 2000). Prolonged stress triggers the breakdown of muscles and skeletal bones and can contribute to the development of different pain conditions (Turk & Monarch, 2002). A bodily trauma such as an injury is always a stressor, and the interpretation of the injury may fuel – or dampen – the stress response. Stress is also likely to cause frequent muscle contractions, which in turn exacerbate pain via different pathways (Lyskov, 2003). It is also suggested that prolonged activity of single muscle fibres, caused by relatively light but monotonous movements, can contribute to the development of musculoskeletal disorders (Hägg, 2003).

Coping

Coping can be broadly defined as all those cognitive and behavioural activities we engage in to eliminate the source of stress or to regulate our emotional responses to stress (Lazarus, & Folkman, 1984). Commonly, coping refers only to *effortful* attempts to manage stress. However, adaptation to stress involves more than conscious processes, and a number of prominent stress researchers argue that including unconscious processes like defence mechanisms would improve the quality of coping research (Cramer, 2000; Lazarus, 2000; Somerfield & McCrae, 2000). In the pain area, research has been criticised on the same grounds, that is, if only purposeful attempts to deal with a stressful pain condition are considered, a substantial number of pain patients' behaviours will be missed (McCracken & Eccleston, 2003).

Conventionally, coping strategies are dichotomized, assuming that people tend to employ either problem-focused or emotion-focused coping strategies. Whereas problem-oriented people try to eliminate the source of stress, emotion-focused individuals concentrate on dealing with their emotional responses to stress. Although this division is useful in describing different patterns of coping, it is also misleading if it is treated as two opposing ways of dealing with stress (Lazarus, 2006). Actually, it has become increasingly evident that the strategies are co-ordinated and complementary, and that describing them as competitive “distort(s) the way coping actually works” (Lazarus, 2006, p. 23). For instance, the presence of problem-focused strategies seems to increase the likelihood of the occurrence of emotion-focused strategies as well. In a study of coping in patients suffering from rheumatoid arthritis, it was found that the likelihood of emotion-focused strategies appearing was 4.4 times higher on a day when problem-focused strategies had been employed than on a day without problem-focused coping (Tennen, Affleck, Armeli & Carney, 2000). The authors concluded that when instrumental efforts of influencing pain are unsuccessful, people start trying to adapt to the situation by employing emotional regulation.

There are several ways to deal with pain. Overt behavioural responses to pain can include relaxation, resting and using medication or supportive equipment, whereas covert behaviour involves cognitive strategies such as distracting oneself from the pain, using positive self-statements, praying or hoping (Turk & Monarch, 2002). Although no researcher has been able to identify the “best” coping strategy, strategies in which the individual tries to function in spite of pain are usually related to better psychological and physical functioning, whereas passive strategies like restricting activities or relying on others are linked to greater pain and emotional distress (Turk & Monarch, 2002). Further, since there is no ultimate way to cope, effective

stress management may be more about flexibility, whereby a greater diversity of pain coping strategies seems to be associated with better psychological adjustment in patients with chronic pain (Blalock, DeVellis, Holt & Hahn, 1993; Haythornthwaite, Menefee, Heinberg & Clark, 1998).

Self-efficacy

Self-efficacy is closely related to both appraisals and coping. Self-efficacy beliefs “determine how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences” (Bandura, 1977, p. 194). High pain self-efficacy may refer to (a) the belief that one can *control* pain or (b) the perception that one can perform daily activities *despite* pain, both being related to positive outcomes (Asghari & Nicholas, 2001). For example, high self-efficacy beliefs correlate with low levels of disability (Woby, Roach, Urmston & Watson, in press) and are predictive of fewer avoidance behaviours among chronic pain patients (Asghari & Nicholas, 2001). Further, self-efficacy can relate to perceptions of recovery or work ability. For instance, patients who expect slower recovery or show greater uncertainty about recovery have longer periods of sick absenteeism as compared to more optimistic patients (Cole & Mondloch, 2002; Hazard, Haugh, Reid, Preble, MacDonald, 1996; Heijbel, Josephson, Jensen, Stark & Vingård, 2006; Linton & Halldén, 1998; Marhold, Linton & Melin, 2002). In contrast, individuals who expect a rapid work return start working earlier than others (Heymans, de Vet, Knol, Bongers, Koes, & van Mechelen, 2006).

Attention to pain

Individuals suffering from chronic pain frequently engage in activities or thoughts to drive attention away from the pain. Theoretically, attention is assumed to be a limited resource, meaning that all stimuli compete for it. When focus is placed on something else, the capacity to process pain is believed to be reduced. Distracting from pain is often considered a beneficial response, and enhancing this ability is an important target in many psychological interventions of chronic pain (Morley, Eccleston & Williams, 1999).

The empirical investigation of attention to pain often involves either inducing experimental pain to pain-free individuals or using questionnaire data to study spontaneously occurring pain coping strategies as they are reported by chronic pain patients (McCracken, 1997). As previously mentioned, experimental pain can be induced in a number of ways and in studies on attention, subjects are instructed to distract themselves from pain in various ways, for example by attending to a competing task or stimulus.

Studies have demonstrated that distraction enhances pain tolerance (Petrovic, Peterson, Ghatan, Stone-Elander & Ingvar, 2000) and that attention to pain is linked to more distress and higher pain ratings (McCracken, 1997). However, it is unclear whether individuals who suppress thoughts of pain succeed in the long run (McCracken, 1997). For instance, in a lifting task, patients reported no effect of distraction on pain intensity, but signalled worse pain immediately after the task was completed (Goubert, Crombez, Eccleston & Devulder, 2004). Further evidence comes from anxiety research, showing that thought suppression is likely to exacerbate and maintain, rather than minimize, distress (Harvey & Bryant, 1998). There are several explanations for these differences. First, pain may be appraised differently among individuals (Goubert et al., 2004). For instance, experimentally induced pain (such as putting one's hand in ice-cold water) is hardly perceived as a per-

sonal threat and distraction may work well during such circumstances. Second, for fearful individuals, pain can be difficult to disengage from (Goubert et al., 2004); thus distraction may be more useful for individuals who are less afraid of pain, whereas monitoring may be a better coping strategy for highly fearful individuals (Roelofs, Peters, van der Zijden & Vlaeyen, 2004). Third, distraction and monitoring may be differently effective depending on the duration of the painful stimulus (McCaul & Haugtvedt, 1982). Fourth, the nature of the distracting task is likely to influence the outcome; thus the distraction task should optimally be emotionally relevant, so that attention can be easily captured and maintained (Eccleston & Crombez, 1999).

Psychological defence mechanisms in chronic pain

In the infancy of coping research, psychological defence mechanisms were the core phenomenon under study (Aldwin, 1994; Lazarus, 1993; Somerfield & McCrae, 2000). However, unconscious processes are by nature extremely difficult to assess in a reliable and valid way, and the early empirical evidence of defensive processes was weak (Somerfield & McCrae, 2000). Therefore, the assumption of unconscious processes was rejected within academic psychology for several years. Today we witness a growing empirical interest in – and evidence of – the existence of unconscious processes (for a review see Cramer, 2000). Defence mechanisms are no longer considered solely a counterforce to instinctual drives but are seen as an important mechanism for maintaining self-esteem and protecting self-organization (Cramer, 2000).

Denial of illnesses is a frequently observed phenomenon in medical settings. Traditionally, denial is considered a primitive or pathological defence (Juni, 1997), though several studies have demonstrated its usefulness in dealing with various illnesses such as coronary heart disease (Levine et al., 1987),

cancer (Kreitler, 1999) and chronic low back pain (Strong, Ashton & Stewart, 1994). However, defences may not be beneficial throughout the disorder; rather, the effects tend to be phase-specific. For example, denial can speed up recovery in the early stage of a disorder, but can interfere with recovery later (Levin et al., 1987).

The fear-avoidance model of pain

Although most people interpret painful sensations adequately and are confident in their ability to cope with pain, some individuals perceive pain as horrible and unbearable, and feel very helpless and pessimistic about their ability to cope with it (Edwards, Bingham, Bathon & Haythornthwaite, 2006). As illustrated in Figure 2, the fear-avoidance model of pain (Vlaeyen, Kole-Sniders, Boeren & Eek, 1995) postulates that such catastrophic interpretations lead to an exaggerated fear of pain and a gradual avoidance of activities or movements believed to cause or increase pain. On the other hand, people with less catastrophic tendencies experience less fear and are more willing to confront painful sensations, which may promote recovery.

Although avoidance behaviours such as resting and using medication or supportive equipment can reduce ongoing pain, passive management strategies can interfere strongly with later recovery if they are used in *expectation of* pain instead of as a *response to* pain (Vlaeyen et al., 1995). Whereas avoidance means fewer opportunities to correct erroneous beliefs about the relationship between activity and pain, sustained physical inactivity is thought to cause a reduction of muscle strength and physical mobility, which can give rise to the so-called “disuse syndrome” (Bortz, 1984). Moreover, withdrawal from social activities may contribute to psychological distress, such as loss of self-esteem and depression (Vlaeyen et al., 1995).

Figure 2. The fear-avoidance model of pain (Vlaeyen et al, 1995). Reproduced with permission.

Generally, with exception of the “disuse syndrome” (Verbunt et al., 2003), the separate constructs of the fear-avoidance model and their relation to chronic MSDs are supported by research and are assumed to contribute to the development and maintenance of pain in a *subgroup* of patients (for a review, see Leeuw, Goossens, Linton, Crombez, Boersma & Vlaeyen, 2006).

Cognitive bias

Another important implication of the fear-avoidance model is that it proposes that pain-related fear – like any other fear – will interfere with cognitive functioning so that fearful individuals will show a hypervigilance towards threatening (pain-related) information and be less able to divert attention from such information (Vlaeyen & Linton, 2000).

Cognitive bias towards threatening information is frequently observed in patients suffering from a wide range of disorders, such as anxiety (Mogg, Bradley, Williams & Mathews, 1993) and depression (Segal, Gemar,

Trunchon, Guirguis & Horowitz, 1995). Recently, researchers have started to explore cognitive bias in individuals with chronic pain syndromes. So far, research indicates weaker and inconsistent evidence for attentional bias in chronic pain but more robust evidence for memory and interpretation bias (Pincus & Morley, 2001). The number of studies on cognitive bias in chronic pain is yet limited, and it is possible that the absence of attentional bias is due to methodological shortcomings (Pincus & Morley, 2001). For instance, most of the studies on attentional bias have employed a modified version of the emotional Stroop task to assess bias but it is unclear whether this test measures attentional or response bias (MacLeod & Matthews, 1988). Another explanation is that patients do not attend to pain-related information more than neutral information, but that they have greater difficulty disengaging from such information once it has come into focus (Roelofs, Peters & Vlaeyen, 2002). Recall bias is frequently assessed by measuring recall or recognition of verbal material, and within this paradigm chronic pain patients are found to recall more pain-related adjectives than do pain-free controls (Edwards, Pearce, Collett, & Pugh, 1992; Pearce, Isherwood, Hrouda, Richardson, Erskine, & Skinner, 1990).

As compared to pain-free individuals, pain-related information is more important and relevant to those suffering from chronic pain. Moreover, it is likely that pain-related information is more emotionally charged in the pain population than it is for healthy individuals. Emotionally loaded material is known to be associated with memory alterations (Cahill & MacGaugh, 1995). Cognitive bias is also found to predict patients' future health utilization, increased pain intensity and relapses (Pincus & Newman, 2001).

The Schema Enmeshment Model of Pain

To account for memory bias in chronic pain patients, Pincus and Morley (2001) have developed the Schema Enmeshment Model of Pain (SEMP). The model builds upon the theory of cognitive schemas. A schema is a mental framework, an organised body of knowledge about some aspect in life. Schemas are assumed to be crucial to how we interpret ambiguous information and how the material is encoded and retrieved from our long-term memory. Once formed, the basic properties of the schemas are assumed to be relatively stable, but their content does change in response to new experiences.

The self-schema is the most important schema. The self organises the perceptions, beliefs and emotions we have about ourselves, and is thus crucial for how we understand ourselves in the world (Rogers, 1951). The self develops through experiences from early childhood and can continue to be modified during adulthood as well. However, since the self is our guiding light, there is a strong need for stability and self-verification. Self-verification can be obtained by self-consistency (harmony among our self-perceptions) and congruence (balance between our perceptions and experiences). Experiences that are incompatible with our self-concept are perceived as threatening and elicit anxiety. Most individuals respond to such anxiety by altering their self-concept so that it can encompass the new experiences. If a modification of the self-concept does not take place, experiences that threaten the self-concept must be denied or distorted to remove incongruence and anxiety. Such distorted perceptions may lay the ground for psychological problems (Rogers, 1951).

Figure 3. The Schema Enmeshment Model of Pain (Pincus & Morley, 2001). Reproduced with permission.

According to the SEMP, the psychological functioning in chronic pain patients is dependent on the self-schema, but also on the pain and illness schemas. The degree to which a person becomes distressed by chronic pain corresponds to the amount of overlap between these three schema structures (see Figure 3). The self-schema prioritises among information by processing information that is important and relevant to the self. The notion that pain information is closely linked to the self-schema in chronic pain patients is

supported by some empirical studies showing that memory bias is more pronounced as the material to be remembered is encoded in reference to the self than if it is processed in reference to others (Koutantji, Pearce, Oakley & Feinmann, 1999; Pincus, Pearce, McClelland, & Turner-Stokes 1993). Further support comes from studies on experimentally induced pain, which have failed to detect pain-specific biases in healthy subjects (Pearce et al., 1990; Roelofs et al., 2002). Experimental pain is transient and escapable and is therefore probably unrelated to the self-schema, at least in healthy individuals (Koutantji et al., 1999).

Pain-related distress and cognitive bias occurs when the self-schema is invaded, or enmeshed, by the pain and illness schemas. This is because the self appraises behaviour, feelings and thoughts and determines one's self-worth. In contrast, persons who adapt to chronic pain without giving up their self-worth or future goals show relatively little emotional distress and cognitive bias.

The affective-motivational dimension of pain

How emotions affect health

Pain is accompanied by emotions, such as anger, irritability and sadness. Emotions tell us something about the quality of the pain experienced, but can also play a crucial role in the development and maintenance of chronic pain. Although acute pain evokes emotions, it does not cause psychological problems. However, while living with the constant discomfort produced by persistent pain is mood altering *per se*, chronic pain can also cause disruptions in social roles, making it difficult to work or be an active family member and such changes likely enhance affective distress (Gatchel & Dersh, 2002).

All emotions have a physical correlate and can affect health through several pathways, either directly or indirectly. Direct influences are caused by changes in the cardiovascular, endocrine and immune systems, whereas the indirect pathways go via diverse health behaviours, such as compliance with medical regimens and physical activity (Kiecolt-Glaser, McGuire, Robles & Glaser, 2002). Depression and anxiety are frequently observed in chronic pain patients (Demyttenaere et al., 2007). These conditions are related to both increased and decreased production of proinflammatory cytokines, protein substances that act to promote inflammation, which is a reaction that is beneficial at early stages of infection and injury but can fuel declines in physical function, leading to frailty and even disability if it continues. For instance, it has been found that proinflammatory cytokines may lead to slower muscle repair after injury and accelerate muscle wasting (Kiecolt-Glaser et al., 2002). Anger is also a common emotion in chronic pain pa-

tients that may stem from a number of different sources, such as frustration related to persistence of pain and repeated treatment failure (Fernandez & Turk, 1995). Anger may exacerbate pain directly by increasing autonomic arousal. Further, anger and other negative emotional states are often linked to enhanced muscle tension, and prolonged secretion of the stress hormone cortisol is known to have adverse effects on the musculoskeletal system. Emotions can also influence health indirectly through behaviour. Negative appraisals and emotions are related to poorer health habits and coping skills, which further affect the physical state negatively (Kiecolt-Glaser et al., 2002). For instance, depressed people tend to exercise and sleep less, smoke more and have poorer diets than non-depressed people (Olf, 1999). On the other hand, non-depressed pain patients perceive greater control over pain and report a greater ability to function despite pain (Turk & Monarch, 2002). Further, in a negative emotional state people may continue a fruitless search for a cure that will eliminate pain and feel less motivated to adopt a recommended self-management approach.

Pain in a social context

Returning to the biopsychosocial model of disability, an individual's chronic pain cannot be fully understood without considering the social context in which it appears. Whereas physical and psychological aspects may be the most important contributors to painful sensations, social factors may be the most crucial when it comes to pain-related disability. A multitude of social factors have been investigated and linked to chronic pain; thus in this section only factors of immediate relevance to the thesis will be considered.

Systematic reviews show that social factors influence pain but the evidence is weak, probably due to the difficulty in designing high-quality studies on such complex phenomena as social interactions (Waddell & Waddell, 2000). Monotonous work, high perceived workload and time pressure are all related to musculoskeletal symptoms, as are low control and low social support at work (Bongers, de Winter, Kompier & Hildebrandt, 1993). A more recent review supports the relationship between poor social support at work and the incidence of musculoskeletal problems, but the mechanisms behind this relationship remain unclear (Woods, 2005). Although good social support is far less researched, it is hypothesized that a supportive workplace may help the injured worker to cope better with pain and allow her/him to continue working (Haahr & Andersen, 2003).

Only a few studies have investigated the impact of the patient-doctor relationship. However, a few intriguing studies show that medical staff can alter or reinforce the patient's perception of her/his disorder. Physicians differ widely in the recommendations they give to pain patients regarding work

and physical activity (Rainwille, Carlsson, Polatin, Gatchel & Indahl, 2000). Physicians who hold a belief that physical activity can cause pain seem to reinforce patients' fear-avoidance beliefs (Linton, Vlaeyen & Ostelo, 2002), and these doctors are more likely to recommend passive coping strategies such as resting or to prescribe sick leave (Coudeyre et al., 2006). However, beliefs can also be influenced positively. Dasinger, Krause, Thompson, Brand and Rudolph (2001) found that a positive recommendation to return to work was associated with a higher return-to-work rate in patients with more than 30 days of sick absenteeism.

Summary and general aim of the thesis

There is ample evidence indicating the importance of psychological and social aspects of chronic pain. These aspects may be important as early as at the onset of pain, but their magnitude increases with the duration of the disorder, and they are especially important in explaining pain-related disability. However, there are also important gaps in the research literature, especially when it comes to appraisal processes in chronic pain. The general aim of the present thesis was to investigate what role cognitive appraisals play in chronic non-specific musculoskeletal pain and how they relate to emotional and coping processes.

The empirical studies

In this thesis, the research problems have been approached using three different methodologies. The rationale is that different methods tend to capture different aspects of a research problem while allowing for different levels of interpretations and generalisations. Further, both pain and coping research have been criticised for relying too heavily on survey designs (Lazarus, 2006; Linton, 2000). An unbalanced use of research tools sets the limit for what information can be obtained and what conclusions can be drawn. Using a mix of different measurements implies that the problem is approached from different angles and that the weakness of one method is compensated for by the use of another.

All research methods have weaknesses and strengths. Qualitative designs can yield an in-depth understanding of human behaviour, capture dynamic aspects of a process or explore new research topics. The problem with qualitative methods is that they cannot be generalised to a broader population, and a common criticism is that qualitative designs lack validity and reliability. Internal validity and reliability are better controlled in experimental research and this design meets all the requirements to address questions of causes and effects. However, in many studies participants cannot be randomly assigned to the conditions; thus such quasi-experimental methods have weaker explanatory power than do true experiments. Further, in many experimental designs, the external validity may constitute a considerable problem. Experiments are artificial situations that may not reflect the reality one tries to capture. For instance, one cannot assume that coping with experimentally induced pain resembles the way people deal with clinical pain. Survey de-

signs can include a substantial number of participants and many variables. The drawback of this design resembles that of qualitative methods: They cannot establish causal relationships between the variables of interest, and are thus often descriptive in nature. However, surveys can be improved by implementing a prospective design by which the participants are followed during a period of time, and by linking outcomes to baseline data.

Study I

Appraisal and coping processes among chronic low back pain patients

Background

Psychological aspects like pain beliefs seem to influence the development of chronic low back pain, and in cognitive psychology concepts such as appraisals and coping are of foremost importance in understanding the maintenance of pain. Developmental aspects of appraisals and coping are largely neglected in pain research. However, considering the frequency of repeated medical visits among chronic low back pain patients, it seems unlikely that either appraisals or coping would remain constant across different experiences.

Aim

The aim of the current study was to examine the development of pain-related appraisals, coping and well behaviours among chronic low back pain patients.

Method

The current study was guided by grounded theory, an inductive research approach used to develop theory that is systematically generated from data (Glaser, 1978). Using theoretical sampling, 22 outpatients (15 women, 7 men) of working age were interviewed about past and present experiences of chronic low back pain. Theoretical sampling refers to the simultaneous and mutual process of collecting and analysing data. The semi-structured inter-

views were read and coded by the author and an independent analyst. Data analysis started with open coding – sentence by sentence – but when the basic social process was found the analysis became more selective and investigated the relationship between the found codes and categories to develop a theory that integrates those concepts.

Results

Chronic low back pain was frequently appraised as a threat. Catastrophic thinking was most common among participants who appraised pain as a physical threat, whereas those who perceived pain as threatening their identity responded to pain by psychological defences. The defence protected the patients' self-concept and reduced emotional discomfort, although it did not seem to promote recovery. Prolonged periods of chronic low back pain tended to weaken the defence, a decline linked to positive outcomes such as enhanced sense of responsibility for pain management and a readiness to change behaviours contributing to pain.

Conclusion

Acceptance of chronic low back pain favoured rehabilitation and helped subjects adopt a self-management approach to the disorder.

Study II

Visuospatial and verbal memory in chronic pain patients: An explorative study

Background

As we experience pain, information related to pain tends to receive more attention and is more readily memorized than are other types of stimuli. In experimental settings, memory bias is frequently assessed by measuring recall of verbal material. Pain patients are found to recall more pain-related words compared to pain-free controls (Edwards et al., 1992; Pearce et al., 1990), a tendency that becomes more evident as the material is encoded in reference to the self (Pincus et al., 1993). However, pain experiences are often difficult to verbalise and words may only capture a small proportion of the patient's whole experience. Although recognizing pain in others likely involves both imagination and self-referent mechanisms, surprisingly few studies have used pictorial stimuli to assess cognitive bias in chronic pain patients.

Aim

To test the hypothesis that pain patients perform better than pain-free subjects in pain-related experimental conditions using a newly developed pictorial memory game and a conventional word-recall task.

Method

Twenty-eight female chronic neck pain patients and 28 pain-free women (controls) were included in a quasi-experimental design and tested in all

conditions in a counterbalanced order. The memory game was a computerized simulation of the card game “Concentration” and each game was composed of 12 pairs of images. In the experimental condition, images of pain behaviours were used, whereas the control condition contained pictures of nature. Subjects were also presented with two different word lists and were tested for word recall. The data were analysed using a mixed 2x2 ANOVA design for repeated measures.

Results

Patients and controls performed equally well in the neutral pictorial memory game, but differed in the pain memory game. Whereas controls enhanced their performance, patients did worse. The interaction between group and performance in the pain memory game was significant ($F_{1,54}=5.65, p<0.05$). There were no significant differences in the word-recall task.

Conclusion

In comparison to verbal material, pain-related pictures may be a more self-referent and emotionally charged stimulus. As a result of perceived threat, some patients may respond by cognitive avoidance, in which pain pictures are processed at a slower speed. Cognitive avoidance can be viewed as a coping strategy by which one tries to ignore or distract oneself from the pain.

Study III

Self-efficacy beliefs predict sustained long-term sick absenteeism in individuals with chronic musculoskeletal pain

Background

Over the past decade, sick absenteeism has increased dramatically in Sweden. The major cause for sick absenteeism in Sweden, and most industrial countries, is musculoskeletal disorders (SBU, 2003). Although symptoms may begin with an injury, the development of disability is due more to psychosocial than medical factors. Recovery beliefs are known to predict rehabilitation outcomes and return-to-work in various clinical conditions, but are less frequently studied in musculoskeletal disorders.

Aim

To test the hypothesis that recovery beliefs constitute a risk factor for sustained long-term sick absenteeism in men and women suffering from non-specific chronic musculoskeletal disorders.

Method

233 subjects with a recent or ongoing experience of long-term sick leave were included in a prospective design. Subjects answered a baseline postal questionnaire and their work status (sick absent/not sick absent) was fol-

lowed up via register data for one year. Multivariate logistic regression analyses were performed to predict work status.

Results

Multivariate logistic regression analyses indicated that subjects with negative recovery beliefs (OR: 2.41; CI: 1.22-4.77), low sense of mastery (OR: 2.08; CI: 1.27-3.40), perceived high mental demands at work (OR: 1.77; CI: 1.05-2.99) and prior experiences of long-term sick absenteeism (OR: 1.86; CI: 1.02-3.37) had an increased probability of receiving sickness benefits at follow-up.

Conclusion

Prolonged sickness absence can be one important pathway to patients' sense of helplessness and low self-efficacy beliefs, aspects that may hinder future work return. To improve work return, patients' maladaptive beliefs should be clarified and challenged early in the rehabilitation process.

General discussion

The unifying thought of the present thesis was the importance of appraising and coping processes in chronic pain patients. Beliefs about pain and its consequences, as well as perceptions of recovery possibilities and sense of mastery, were all related to chronic pain in one way or another. It was also evident that chronic pain is a stressful and multifaceted phenomenon that affects – and is affected by – many parts of life.

The different methodological approaches allowed for interpretations at different levels, from an idiographic to a nomothetic point of view. Study I was an attempt to explore the individual experience of chronic low back pain as well as the development of pain-related appraisals and coping processes, and the result indicated that chronic pain can be perceived as threatening the sufferer's identity. Study II investigated memory for pain-related cues and found that inclusion of threatening material decreased pain patients' mental performance. Whereas the first two studies investigated pain patients from the working population, Study III explored how long-term sick absenteeism can be influenced by psychosocial variables. This study used a population-based sample and a prospective design. Despite the inclusion of variables related to the workplace as well as the health care and insurance systems, the variables that turned out to be the strongest predictors for sustained long-term sick absenteeism were closely linked to appraising and coping.

Although all study participants had suffered from chronic pain for several years, there were marked differences in psychosocial functioning between the samples. With few exceptions, the participants in the first two studies

worked full time, whereas those in the last study were recruited based on their long-term sick absenteeism. Symptoms as well as pain durations were similar across the samples, and if neither medical findings nor pain duration can explain the variations in functioning, the tempting alternative is that the samples differed from pain onset in how they perceived and managed pain, which came to affect their physical and psychosocial status.

Theoretical frameworks

Two theoretical models are especially valuable in explaining variations in functioning among individuals suffering from chronic non-specific musculoskeletal pain. The fear-avoidance model (Vlaeyen et al., 1995; Vlaeyen & Linton, 2000) accounts specifically for the role of negative beliefs, fear and avoidance behaviour in chronic pain patients, and can also predict the occurrence of cognitive bias. However, fear is not a major theme of the current thesis. Rather, at first glimpse, participants' behaviour appeared to be in accordance with the recovery path of the fear-avoidance model: patients showed low levels of anxiety and high levels of pain confrontation. Despite this, recovery did not occur. Possible explanations for this will be analyzed in later sections and, inspired by the fear-avoidance model, a tentative model will be introduced to encompass the present findings.

The Self-Enmeshment Model of Pain (SEMP) (Pincus & Morley, 2001) is also a relevant theoretical framework, although it does not capture all key features of the present thesis. According to the SEM, pain-related distress occurs as experiences of pain and illness invade central parts of the self. Individuals endowed with a resilient self-worth or ability to easily redefine their self-worth, to make it independent of pain and illness experiences, are assumed to be less emotionally distressed by pain (Pincus & Morley, 2002). In this thesis, the assumption of self-development as proposed by the SEM

is supported, but data also indicate that self-enmeshment can be prevented by emotion-focused coping.

Chronic pain implies more than the threat of continued discomfort and disability; it is also a threat directed at the self (Aldrich & Eccleston, 2000; Eccleston & Crombez, 1999). Chronic pain may contribute to substantial changes in social roles, working ability and recreational activities, resulting in individual and social, as well as economic, strain.

In Study I, patients' identities were rooted in a sense of being autonomous and physically and mentally strong, and chronic low back pain threatened this picture severely, but by refusing to acknowledge the meaning and consequences of chronic pain or adjust to the pain, patients were able to maintain a valued self-concept. Arntz and Peters (1994) have reported similar results in a case study of a male building worker who described his self-worth as being grounded in knowing that he could assist other people in very heavy physical tasks, a talent he had developed during childhood and had felt dependent upon since then. As musculoskeletal pain debuted it became impossible for him to carry out such tasks, resulting in an emotional breakdown and excessive avoidance of physical as well as social activities.

Although some researchers have stressed the importance of investigating identity and identity change in chronic pain, there are still very few publications on this issue (Risdon, Eccleston, Crombez & McCracken, 2003). The research that has been conducted in this area generally supports the notion that persistent pain can affect identity. Inspired by the SEMP, a few researchers have investigated the role of discrepancies in pain patients' actual, ideal and ought selves and how this relates to psychological functioning. The results indicate that high discrepancies in how patients perceive that they are, relative to how they would like to be or feel that they ought to be, are related

to enhanced levels of depression and other psychological distress (Morley, Davies & Barton, 2005; Waters, Keefe & Strauman, 2004). Further, there are a number of qualitative studies depicting how chronic pain can interrupt a patient's identity (Aldrich & Eccleston, 2000; Asbring, 2001; Johansson, Hamberg, Westman & Lindgren, 1999). In a recent qualitative study, Miles, Curran, Pearce and Allan (2005) identified a subgroup of chronic pain patients who were able to maintain their "pre-pain identities" by denying the constraints of chronic pain and upholding previous lifestyles and activities although this was associated with increased pain intensities.

Emotion-focused coping

Emotion-focused coping is frequently endorsed for dealing with illnesses and other uncontrollable events. In the first study, pain was disregarded by the use of disavowal, "a process whereby the perceptual image is registered and acknowledged while its affective meaning or significance for the individual is disregarded" (Salander & Windahl, 1999, p. 269). In the second study, threat was avoided by means of cognitive avoidance. Study III did not include any pain coping measures, but the observed low levels of mastery are probably more related to emotion-focused than problem-oriented coping.

Both disavowal and cognitive avoidance are basically defensive processes. Experimental research on defensive coping has demonstrated that defences alter the perception of a stressor (Tomaka, Blascovich & Kelsey, 1992). An effective use of defences can dampen the neuroendocrine stress response, probably by reducing negative affect (Olf, 1999). Further, related studies have shown that positive illusions are associated with lower levels of cortisol at baseline as well as during experimentally induced stress (Taylor, Lerner, Sherman, Sage & McDowell, 2003).

In this thesis, defences are conceptualised as a *response to a distressing pain condition*, a condition that challenges core conceptions of one's current and future self. Thus, pain patients using defences are by no means assumed to be struggling against instinctual drives, but rather as defending an identity and a self worth that chronic pain tries to tear down. In this thesis, defence mechanisms are conceptualised as emotion-focused coping strategies, as suggested by Lazarus (2006) and Olff, Langeland & Gersons (2005).

Defences in chronic pain patients have been reported infrequently in the contemporary research literature. Burns, Kubilus, Bruehl and Harden (2001) found a subset of individuals with a dysfunctional coping pattern who also scored high on repression. Despite high levels of pain severity and disability, these subjects reported low levels of affective distress. Similar findings were reported by Strong et al. (1994), who identified a group of chronic low back pain patients with relatively low control and high pain intensity despite high ratings of repression and use of coping strategies like reinterpretation of painful sensations, diverting attention and positive self statements. The defensive clusters of Burns et al. (2001) and Strong et al. (1994) resemble the defensive patients from Study I. Although Study I did not include standardized measurements, the qualitative analysis revealed a similar paradoxical functioning among defensive patients. These patients acknowledged pain though they neglected its emotional significance.

Inaccurate predictions of pain

It was suggested that distortions of the meaning and consequences of chronic pain enabled pain patients to confront pain in a relatively extreme fashion. Although most research efforts have been devoted to investigating the ef-

fects of over-estimations of pain, some studies show that chronic pain patients – especially those who score low on anxiety – are more likely to under-predict than over-predict pain (Arntz & Peters, 1995; McCracken, Gross, Sorg & Edmands, 1993; Murphy, Lindsay & Williams, 1997). Under-prediction of pain refers to the expectation that a painful stimulus will hurt less than it actually does. Over-estimations of one's physical capacity may also be common in this group and may increase the risk of overexertion, reinjury and persistent pain (Arntz & Peters, 1994; Asmundson, Kuperos & Norton, 1997; McCracken et al., 1993). It is generally believed that “under-predicted pain disrupts more than correctly predicted pain, but does not hurt more” (Arntz & Hopmans, 1998, p. 1121). Further, in experimental settings, under-predicted pain rapidly results in increased estimations of future painful stimulations, and these expectations are relatively difficult to correct. Under-predictions of pain may thus constitute another pathway to pain-related fear and distress, as well as to various avoidance and escape behaviours (Arntz & Peters, 1994), introducing pain patients into the vicious cycle of fear-avoidance. However, it is important to underscore that many of the results reported here (Arntz & Hopmans, 1998; Arntz, van den Hout, van den Berg & Meijboom, 1991; Arntz & Lousberg, 1990) are based on *healthy* volunteers who have been *randomly assigned* to the different conditions; thus the results cannot be directly generalized to the pain population. Studies of pain patients have yielded mixed results, with some studies showing that under-predictions of pain is compensated by over-estimations of future pain (Murphy et al., 1997), whereas other studies show over-estimations of pain to be relatively difficult to correct (Arntz & Peters, 1994; McCracken et al., 1993). It is still unknown why some patients tend to under-predict pain, but as it is related to low anxiety levels, defensive coping might well be involved.

Emotional coping: defenses and distraction

Many emotional coping strategies like cognitive avoidance, disavowal and distraction operate by diverting attention from threat cues. Whereas many psychological defences are considered maladaptive, distraction is frequently acknowledged as a functional response to pain. Although some studies indicate that distraction reduces pain perception (for a review, see Eccleston & Crombez, 1999; Petrovic et al., 2000), others show more negative (Goubert et al., 2004) or complex effects (McCaul & Haugtvedt, 1982; Nouwen, Cloutier, Kappas, Warbrick & Sheffield, 2006). Further, as McCracken points out, diverting attention may in fact be a defensive response “that does not free the diverter from the influence of pain in a lasting way but rather maintains that influence” (McCracken, 1997, p. 281). This is in line with other studies indicating that defensive strategies may have adaptive short-term outcomes, but may be related to poorer long-term effects in pain patients (Suls & Fletcher, 1985) as well as those with other disorders (Levine et al., 1987; Warrenburg et al., 1989). Further, data from survey studies often fail to prove that diverting attention actually reduces pain or other unwanted concomitants of pain, whereas experimental research on the phenomena shows conflicting findings and has difficulties with external validity (McCracken, 1997).

Bearing in mind that data do not allow any generalisations between the studies of the present thesis, it is interesting to note that the defensive dimension was present in the second study as well. Based on the literature, it was hypothesised that chronic pain patients would be more vigilant regarding pain-related material and perform better in its presence. However, no selective recall was found in response to the word lists. When the patients played the pictorial memory game significant differences were found, but not in the hypothesized direction. Patients and pain-free controls performed equally

well in the neutral memory game. When pain pictures were presented, controls enhanced their performance whereas patients did worse.

As previously mentioned, the SEMP was developed in an attempt to account for memory bias in chronic pain patients and as Study II did not find any memory bias, the results disagree with the SEMP. However, since pain-related and neutral information were separated, the study does not actually measure memory bias. Further, there may be factors other than cognitive avoidance that can explain pain patients' worse performance in the pain memory game. Debriefing indicated that pain patients perceived the pain pictures as more aversive than did pain-free controls, and heightened affective distress may be indicative of increased preoccupation with pain stimuli, resulting in interference with the task (i.e., remembering the location of the cards). In this context, the results support the notion of cognitive bias and thus the SEMP. However, one important factor challenges this hypothesis; this was the main reason for favouring the cognitive avoidance explanation. Patients in Study II scored very low on catastrophizing (PCS; Sullivan, Bishop & Pivik, 1995), a measure highly related to pain-related fear. Research has found that *fearful* pain patients are more vigilant regarding pain-related information than are less fearful patients (Asmundson et al., 1997; Keogh, Dillon, Georgiou & Hunt, 2001), who are more likely to distract themselves from pain-related material by attending to neutral information (Asmundson et al., 1997).

Defensiveness and the maintenance of pain

Inaccurate predictions of pain and one's physical capacity, accompanied by psychological defences, can be one important pathway to persistent pain (Jamner & Schwartz, 1986), but defensiveness can complicate the pain condition further. Since there is still no "cure" for chronic pain, most chronic pain patients are required to adopt a self-management approach to their disorder. This may be a disappointment to most pain patients, but is extra problematic for defensive patients or those who lack motivation for other reasons. Self-management approaches require patients to make substantial changes in the way they appraise and cope with pain, which places strong demands on patient motivation when it comes to engagement in and maintenance of treatment recommendations (Kerns & Habib, 2004). To help patients adjust to chronic pain some are offered psychological intervention, usually CBT. Although CBT is an effective treatment for a number of pain patients (for a review see McCracken & Turk, 2002), relapses after treatment are common (Turk, 1990). Some studies indicate that the success of CBT varies with gender and that women have the most to gain from psychological intervention (Jensen, Bergström, Ljungquist & Bodin, 2005; Jensen, Bergström, Ljungquist, Bodin & Nygren, 2001). Further, responsibility for pain management develops gradually; thus the readiness to change one's behaviour varies with different stages of the disorder (Kerns & Habib, 2004).

Defensiveness is a well-known complicating factor in rehabilitation, since defensive subjects are less likely to adhere to medical regimens (see Cramer, 2000). The tendency to abort rehabilitation prematurely was commonly observed in subjects in Study I. The tendency was to postpone seeking treatment until the pain was almost unbearable and to discontinue treatment as soon as the pain was relieved, thereafter returning to old habits and functioning. The problem of defensiveness in rehabilitation is frequently acknowledged in other patient groups and has probably been best studied in patients

suffering from serious illnesses such as cancer and cardiovascular disease. According to these studies, it seems that the effects of defences vary between the stages of a disorder. For instance, Levine et al. (1987) found that male patients who suffered from myocardial infarction and who scored high in defensiveness recovered faster than less defensive patients. However, at follow-up, defensive patients had more days of re-hospitalisation than men who did not deny their illness. This negative result is probably due to patients' failure to adjust to their illness by complying with medical recommendations. Similar results were obtained more recently in a Swedish study, which showed that patients denying the early signs of heart failure arrived at hospital later and were less willing to participate in rehabilitation programs as compared to those who showed less denial tendencies (Stenström et al., 2005).

The avoidance-approach model of pain

Undoubtedly, participants in Study III differed in their psychological profiles at pain debut, and hypothetically, a significant number of these patients responded to the first signs of pain in a disadvantageous way and continued to do so for a long period of time. Likely, many of these now disabled patients appraised pain in a catastrophic manner and were fear-avoidant. However, it is also likely that a number of participants used defensive strategies, putting themselves at risk for inaccurate pain predictions, overuse and repeated pain experiences.

As a result of the current thesis, a tentative model (see Figure 4) has been developed to explain and predict how chronic pain may develop in defensive individuals. The model is inspired by the fear-avoidance model of pain (Vlaeyen et al., 1995; Vlaeyen & Linton, 2000) and can easily be incorporated within this model as another pathway to the development of persistent

pain. The new model is conceptualised as the avoidance-approach model of pain and is to a high degree an inversion of the fear-avoidance model of pain.

Figure 4. The avoidance-approach model of pain.

In the new model it is not pain, or fear of pain, that is avoided. Rather, it is avoidance of *cognitive threat* that is assumed to be the underlying process. According to the model, painful episodes are appraised more as a psychosocial than physical threat. However, the threat is neutralised or at least reduced by defensive coping. Conceivably, other coping efforts that operate by diverting attention can also be used. Diverting attention from pain cues

minimises the perceived consequences of the disorder and enhances the possibilities to maintain valued self-concepts and previous lifestyles, including high levels of physical and social activity. Defensive coping also reduces fear and when fear is low, pain is easier to confront. Although pain is approached it does not lead to the recovery predicted by the fear-avoidance model (Vlaeyen et al., 1995; Vlaeyen & Linton, 2000). The reason for this is that pain is persistently under-predicted whereas physical capacity is over-predicted, resulting in overexertion and repeated injuries that may cause intermittent pain to become chronic.

Since defensive individuals seem to tolerate more pain, a neurochemical link is indisputably also involved, although the mechanisms remain unclear. One suggestion is that of differences in the functions of the endogenous opioid system that could act to facilitate the release of endogenous opioids in defensive subjects, making them more tolerant to painful stimulation (Jamner & Schwartz, 1986; Jamner, Schwartz & Leigh, 1988).

Defensive coping in medical settings

Fear-avoidance is recognised as a major risk factor for developing chronic disability. However, the worries and fears of these pain sufferers make it likely that they will soon appear at a medical facility. It can be hypothesised that defensive individuals have the same, or even worse, risk of developing chronic disability. First, if they appear at all, these individuals are more difficult to identify in clinical settings, because they lead us to believe that they do what we want them to do; they remain active. Second, when defensive individuals seek medical assistance, they have probably suffered from pain for a substantial period of time and may therefore present more advanced problems (Jamner & Schwartz, 1986). For instance, the number of pain episodes is frequently found to be a robust predictor of persistent pain and disability

(Bergström, Bodin, Bertilsson & Jensen, 2007; Enthoven, Skargren, Carstensen & Oberg, 2006), and it has been found that recurrent and prolonged pain relates to cortical changes, such as enlargement of the representation of the hurting area in the primary somatosensory cortex and an increased reactivity in this cortical zone (Flor et al., 1997). Finally, because of their defensiveness these patients run the risk of terminating rehabilitation prematurely and being less likely to adhere to medical recommendations.

Psychological interventions for chronic pain are largely designed for fear-avoidant patients and may not capture the needs of defensive patients or other patient groups. The notion of more individually designed interventions has been raised before (McCracken & Turk, 2002; Vlaeyen & Morley, 2005) and it seems likely that rehabilitation efforts must differ in content depending upon *who* is being treated. Psychological interventions, primarily CBT, have become increasingly popular in helping enhance patients' well-being and adaptation to chronic pain. An important goal of traditional CBT is to enhance patients' self-efficacy beliefs, making them feel more confident in their ability to control chronic pain. However, for patients like those in Study III, with more or less permanent pain and disability, control-enhancing strategies may do more harm than good. If pain is an uncontrollable event, attempts to reduce it may only result in even more frustration, distress and preoccupation with pain (Aldrich, Eccleston, & Crombez, 2000; McCracken & Eccleston, 2003), which may contribute to less beneficial outcomes after traditional behavioural and cognitive-behavioural therapy (McCracken & Turk, 2002).

Coping with or accepting chronic pain?

Repeated failures of controlling pain may result in learned helplessness (Jansen, Spinhoven & Arntz, 2004) and may explain parts of the depression observed in many chronic pain patients (Turk & Monarch, 2002). Learned helplessness may also have interfered with return-to-work in Study III. Due to participants' long history of chronic pain and pain-related disability, these individuals have probably experienced several failures when trying to reduce pain and an inability to remain occupationally active.

If pain is believed to be difficult to control, helping patients accept pain may be a more relevant target. A number of studies indicate that such strategies are helpful, especially when it comes to reducing affective distress (McCracken & Eccleston, 2003; Van Damme, Crombez, Van Houdenhove, Mariman & Michielsen, 2006). Moreover, as pain is accepted, individuals may initiate a search for a “new”, healthier identity and start to reconsider personal goals (Brandtstädter & Rothermund, 2002), which is in accordance with the SEMP and the results of Study I. Acceptance-based strategies are especially well suited for individuals who are willing to experience, rather than trying to control, unwanted psychological events such as pain (Keogh, Bond, Hanmer & Tilston, 2005). Acceptance of chronic pain is defined as “living with pain without reaction, disapproval, or attempts to reduce or avoid it” (McCracken, 1998). Acceptance implies a realistic approach to pain and the continuation of desired activities (McCracken & Eccleston, 2003). Although acceptance means acknowledging that there is still no cure for chronic pain, it is important to stress that it does not imply giving up (Viane, Crombez, Eccleston, Devulder & De Corte, 2004). The effect of acceptance is that the impact of pain becomes less debilitating, and higher levels of acceptance have been linked to better adjustment to pain, including less affective distress and disability (McCracken, 1998) as well as less pain, higher daily uptime and better work status (McCracken & Eccleston, 2003).

Similar results have also been reported in patients suffering from chronic fatigue syndrome (Van Damme et al., 2006). There are few published articles on the acceptance of pain, but some experimental studies indicate that acceptance moderates negative perceptions of pain (Hayes, Bisset, Korn & Zettle, 1999; Keogh et al., 2005).

Research suggests that acceptance is a distinct way of adjusting to pain and that it is different from coping (McCracken & Eccleston, 2003). Individuals who score high on acceptance pay less attention to pain, independent of pain intensity (McCracken, 1998) and demographic background, but despite this, acceptance is not related to ignoring painful sensations (Viane et al., 2004). In fact, coping strategies such as ignoring or distraction stand in opposition to acceptance because these strategies aim to control pain or its negative consequences (Viane et al., 2004). Instead, acceptance may reduce attention to pain spontaneously by engagement in daily activities (Eccleston & Crombez, 1999), whereas individuals who try to control pain remain preoccupied with, and vigilant regarding, pain-related information (Aldrich et al., 2000; Rothermund, Brandtstädter, Meiniger & Anton, 2002). Acceptance of pain can also be a promising construct that may explain differences in treatment-seeking behaviours and other pain-related behaviours. By definition, patients at pain clinics have not accepted the idea that they have to live with pain (Reitsma & Meiljler, 1997), but hypothetically, those who do not seek medical care may more readily accept pain as a natural part of life.

Acceptance of pain in the work context

The acceptance concept is in agreement with the newer rehabilitation recommendations based on the biopsychosocial paradigm. Instead of searching for a “cure”, clinicians and researchers are encouraged to identify “obstacles to work”. Waddell (2006) argues that rehabilitation of non-specific musculoskeletal conditions must include an acceptance of pain among employers as well as employees. In Study III, the main predictor of sustained long-term sick absenteeism was recovery beliefs, whereby negative beliefs were related to sustained sick absenteeism. Pessimism about recovery has previously been identified as an important hinder to work return (Cole & Mondloch, 2002; Hazard, Haugh, Reid, Preble, MacDonald, 1996; Heijbel et al., 2006; Linton & Halldén, 1998; Marhold et al., 2002). It is possible that both sick absent workers and their managers believe that work return is achievable only when the pain condition is fully “cured”. However, many individuals remain at work despite pain (Aronsson, Gustafsson & Dallner, 2000), thus a goal of accepting “...that non-specific musculoskeletal conditions are an inevitable part of (working) life...” (Waddell, 2006, p. 11) may not be unrealistic. In a systematic review of management of low back pain at work, Waddell and Burton (2001) conclude that there is strong evidence that rapid return-to-work has positive outcomes and that most workers are able to continue working despite pain.

Further, to reduce the number of persons on sick absenteeism or disability pension due to non-specific musculoskeletal pain, it is not enough to restructure cognitive and behavioural processes in pain patients alone; health care, the workplace and society are all in need of “a fundamental shift in the culture of how we think about and manage non-specific musculoskeletal conditions...” (Waddell, 2006, p. 13). However, social inequalities between groups must also be addressed. For instance, the ability to remain at work despite pain may vary with work content and thus with social class. White-

collar workers may have better opportunities to adjust work pace and take necessary breaks than do blue-collar workers, who have less control over their work situation and who often have a higher physical workload. Further, women seem to be more at risk for developing chronic pain conditions and work-related disability. Musculoskeletal pain is far more commonly reported in women, who also are more likely to suffer from multiple pains and more severe pain (Bingefors & Isacson, 2004). There has been a dramatic increase in sick absenteeism in Sweden, particularly among women employed within the public sector. However, the difference is not limited to certain kinds of jobs, because among men and women with similar job positions, women still have more sick days (Feeney, North, Head, Canner & Marmot, 1998; Krantz & Lundberg, 2006). Biological factors are assumed to play an important but minor role regarding these differences. One hypothesis is that men and women differ in health beliefs and focus, with women being more vigilant regarding bodily changes and more willing to report various symptoms (Verbrugge, 1985). However, men and women also differ in total workload and physiological stress profiles. Despite being as active as men in working life, women still carry the main responsibility for household chores, making their total workload substantially higher for women than men, and this gender inequality is also reflected in the release of the stress hormone cortisol with women being exposed to cortisol for longer periods of the day as compared to men (Lundberg & Frankenhauser, 1999). Prolonged exposure to cortisol is identified as a risk factor for a variety of diseases and disorders, including many pain conditions (Turk & Monarch, 2002).

Limitations of the studies

In this thesis, three different methodological approaches were employed to investigate rather complex phenomena of appraising and coping in individuals suffering from chronic non-specific musculoskeletal pain. The use of different methodological approaches and measurements is in many senses a strength, but also makes it difficult to compare and generalise between the studies. In Studies I and II, data was collected at a rehabilitation clinic in Stockholm and these samples may not be representative of the population as a whole. Study III used a representative sample drawn from a national register, but the number of non-respondents was rather high ($\approx 30\%$), and missing-data analysis indicated differences between respondents and non-respondents, which may have affected the result.

Although the legitimacy of qualitative designs has increased, the lack of standardization and objective measurements still triggers some opponents to view qualitative studies as weak or even unscientific. Validity is often the key issue here. As previously mentioned, the small and heterogeneous sample makes the external validity of Study I low. However, the aim of qualitative research rarely concerns finding tendencies that might apply to a “mean population”, but rather to gain new insights or deepen the understanding of a process or phenomenon. To validate the analysis of Study I, three methods were employed. First, interviews were analysed independently by two researchers, both arriving at the same conclusion concerning the basic social process and its main properties. Second, analysis was conducted through the method of constant comparisons, which allows the researcher to stay close to the data, thus reducing the risk of becoming entrapped in interpretations with

no connection to data. Finally, theoretical memos were used to explicate theory development by describing how different concepts were assumed to be related, a strategy that can help minimise the effects of preconceptions, etc. Alternative ways of validating data can be used by triangulation, that is, combining qualitative and quantitative measures in a single study. Although this method may increase validity, it is often difficult to know beforehand what measures to include since qualitative studies only occasionally start with a hypothesis or a specific research question.

Although qualitative designs are criticised for having trouble with internal validity, problems with interpretation bias are not exclusive to qualitative research. Personal interests and ideologies guide data collection and data analysis in both qualitative and quantitative research. The number of interpretations may be limited in quantitative research, but there is surely room for different theoretical evaluations. It is also interesting to note that the qualitative interview and the experimental approach – two research ideologies that are often treated as opposite – share many problems. For instance, the risk of the researcher's preconceptions, wishes and prejudices influencing participants' behaviour is well-known in both qualitative and experimental settings, and both approaches have developed strategies to reduce this undesired influence.

More specific problems related to Study II concern the composition of the control group, which was recruited among psychology students. Researchers of cognitive bias in chronic pain now argue for recruiting a control group that is familiar with the pain vocabulary, such as physiotherapists or nurses, to make the groups more comparable.

Study I and Study II were rather unconventional and may lead to debate as well as new research areas in the field of pain psychology. Defensive coping

is rarely studied in pain patients today, although it is more vividly discussed in studies of other somatic conditions (Vos & de Haes, 2007). When defensive concepts such as cognitive avoidance are described in the pain literature, they are often used to explain an unforeseen failure to find a memory bias (Asmundson et al., 1997; Edwards, 1992). Unfortunately, this also holds true for Study II. However, combining the results from Studies I and II and linking these studies to the existing literature, it seems obvious that defensive processes in chronic pain conditions warrant further scientific interest. Study III was more conventional in design as well as interpretation, but used a unique population-based sample and valid register data to trace the development of long-term sick absent pain patients.

Challenges and future research

In this thesis, a new model was developed (the avoidance-approach model of pain, see Figure 4), which needs to be refined and empirically tested in various groups of pain patients. The prevalence of defensive coping in pain patients also needs to be addressed. Identifying defensive patients is a major challenge. Although there are some questionnaires that can be used to screen for psychological defences in chronic pain patients, questionnaires may be too insensitive to detect defensive individuals, and defences are by nature difficult to observe. Interviews may be better designed to trace defensive patterns, but are very time consuming. One hope is that experimental approaches, such as the memory task used in Study II, can prove to be valid and reliable in detecting defensive tendencies. Such tests are easy to administer and interpret.

The second challenge is to design psychological interventions for meeting the needs of defensive patients. These patients probably need to enhance their motivation regarding treatment and thereafter increase their insight into what pain means to them. Acceptance-based strategies may be appropriate for this group, since they have a natural tendency or willingness to experience pain and distract themselves by continuing their daily activities.

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