Health Problems and Treatment Effects in Patients with Non-specific Musculoskeletal Disorders

A comparison between Body Awareness Therapy, Feldenkrais and Individual Physiotherapy

by

Eva-Britt Malmgren-Olsson
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Fakultetsopponent: Professor Charlotte Ekdahl, Institutionen för rörelseorganens sjukdomar, Sjukgymnastik, Lunds Universitet, Lund
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ABSTRACT
Persistent non-specific musculoskeletal pain disorders are an increasing health problem in primary care causing suffering for the individual and a burden for the society. Appropriate and effective treatments for these patients have been hard to find. The aims of this thesis were to get an extensive description of patients with non-specific musculoskeletal disorders and to evaluate the effects of different physiotherapeutic treatment modalities in primary care. The design was a clinical, quasi-experimental comparison with measurements at three time-points; before the interventions, and follow-ups at six months and at one year. A total of 78 patients, 64 women and 14 men, were consecutively recruited to the three modalities; Body Awareness Therapy (BAT), Feldenkrais (FK) and individual physiotherapy (TAU). The outcome variables included different pain dimensions as well as physical, psychosocial and health-related aspects.

The results showed that the patients were a very heterogeneous group and had different problem profiles. Nearly half of the patients reported severe psychological problems probably due to both present living conditions and to negative previous life events. In comparison to two reference groups of healthy individuals these patients were more psychologically distressed and had a more negative self-image. Both the patient group with non-specific musculoskeletal disorders and a patient group with whiplash associated disorders showed significantly poorer balance than a healthy control group on clinical balance tests.

An overall result was that all treatment groups (BAT, FK and TAU) showed significant improvements over time on several outcome variables but there were few significant differences between the groups. Calculating the outcome as effect-size values showed that the group treatments achieved larger effects than the individual treatment group.

The identification of three distinct subgroups revealed more obvious differences in outcome patterns and magnitude of effect-size values. Two of the subgroups achieved a positive treatment outcome, and one subgroup was associated with a zero or negative outcome. A logistic multivariate regression analysis showed that the only explanatory factor for treatment outcome was which treatment modality the patients had been given. The chance of achieving a positive treatment outcome for patients with non-specific musculoskeletal disorders increased 6.6 times with Body Awareness Therapy and 4.1 times with Feldenkrais compared to individual physiotherapy.

Key words: Non-specific musculoskeletal disorders; treatment effects effect-size; Body Awareness Therapy; Feldenkrais; Individual Physiotherapy; primary care
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Umeå 2002
"The great art of life is sensation, to feel that we exist, even in pain"

Lord Byron

(1788-1824)

To Tommy, Erika, Ida and Daniel
To my parents and sister
RESULTS

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  Prevalence of symptoms
  Prevalence of problem areas
  Correlation analysis
  Dimension 1: Psychological well-being
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Balance performance (Paper II)

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Positive and negative outcome patterns

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ABSTRACT

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I Malmgren-Olsson E-B, Armelius B-Å.
Physical and psychological health and social relations in patients with prolonged musculoskeletal disorders.

II Brännström H, Malmgren-Olsson E-B, Barnekow-Bergkvist M.

III Malmgren-Olsson E-B, Armelius B-Å, Armelius K.
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Physiotherapy Theory and Practice 2001; 17:77-95.

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Non-specific musculoskeletal disorders in primary care – Subgroups of patients with different outcome patterns. Submitted.
Persistent pain syndromes are a common health problem in the western world causing considerable suffering for the individual and a heavy economic burden for society. In particular pain from the musculoskeletal system is a frequent reason for encounters in primary care (Andersson et al., 1993). In most cases of musculoskeletal pain disorders no underlying disease can be established and the causes of the complaints remain unknown. These disorders are often called non-specific since it is difficult to find causative organic factors due to anatomical or neurophysiological or other diagnosed diseases behind the pain disorders (Waddell, 2000). Data from the World Health Organisation study of the prevalence of persistent pain in primary care show that it varies between 6 and 40 % in the different countries involved (Gureje et al., 2001). In an Australian prevalence study, 17% of males and 20% of females reported chronic pain (Blyth et al., 2001). In a Swedish population-based study, a prevalence rate of chronic pain was found to be as high as 55% (Andersson et al., 1993). The large variation in prevalence rates of musculoskeletal disorders can probably be explained by the use of different definitions of pain. There seems to be a strong consensus in the literature that pain syndromes due to non-specific musculoskeletal disorders are to a great extent related to psychological and social factors (SBU, 2000a, 2000b). It might be useful to find other classification systems or subgroup descriptions that could be of more value in the assessment and rehabilitation of multidimensional pain disorders.

Several systematic review reports have been made of treatments for persistent musculoskeletal disorders but the effectiveness of available interventions has been hard to demonstrate (Beckerman et al., 1993, van Tulder et al., 1996). This may depend on diagnostic problems in that the aetiology of the disorders seldom can be established, but it can also be explained by the poor quality of the studies performed (Kjellman et al., 1999, Karjalainen et al., 2000a, 2000b). Another problem is that musculoskeletal disorders involve both back and neck pain as well as pain from other parts of the body, and Kjellman has shown that back and neck pain seem to have a different clinical course over time. Patients with neck/shoulder disorders experienced a higher degree of discomfort and more long-standing symptoms than patients with back pain disorders in a 12-year perspective (Kjellman et
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al., 2001). Other long-term studies of chronic back pain have shown that the course of back pain problems is characterized by variability and change rather than predictability and stability (Von Korff and Saunders, 1996). In general, research has shown that any single physical treatment intervention, such as massage, electrotherapy or acupuncture, has few or no long-term effects for patients with persistent musculoskeletal disorders (SBU, 1999a, 1999b, van Tulder et al., 1999). It has been hard to demonstrate differences in outcome between different treatment approaches such as chiropractics or physiotherapy, as well as differences in outcome between specific physiotherapeutic methods (Skargren and Öberg, 1998, Kjellman and Öberg, 2000). However, despite lack of evidence regarding different treatment interventions, especially for neck pain disorders, there is a consensus in the literature that the multidimensional nature of persistent pain disorders needs a multidimensional perspective in both assessment and treatment of these patients. (Laerum et al., 1998). Some studies have indicated that multidisciplinary rehabilitation interventions including cognitive and behavioural theory approaches seem to be slightly superior to many other treatment interventions for persistent pain disorders (Grahn et al., 1999, Becker et al., 2000). However, it is still unclear which type of behavioural treatment is the most effective (van Tulder et al., 2000). Usually such rehabilitation is carried out in specific rehabilitation centres or pain clinics, and probably costs a good deal more than rehabilitation in primary care. Considering the fact that a large proportion of the population suffers from non-specific musculoskeletal disorders it is of vital importance to evaluate treatment possibilities, that are effective, cost-efficient and available in primary care. The main focus in this thesis is to evaluate and compare group treatment approaches such as Body Awareness Therapy and Feldenkrais with individual conventional physiotherapy, offered in primary care for this patient group.

Definition and classification

IASP (International Association for the Study of Pain) defines chronic pain as "pain that persists beyond the normal time for healing" (IASP, 1994). Pain is also regarded as a subjective and an emotional experience associated with suffering and anxiety. The increasingly widespread acceptance of defining pain as a perception
that is individualized and subjective has led to the development of different systems of pain classification. Duration and variation of pain over time, location, intensity and functional consequences have been used to grade pain. The division of pain into an acute, a subacute and a chronic phase is frequently used (Taub et al., 1998). However the boundary between them is not distinct and related to the expected natural course of a painful stimulus. Usually, a time limit of three or six months has been used to define chronic or persistent pain. Chronic pain always involves psychological and behavioural responses. Most authors agree that the process of developing chronic pain syndromes is one in which pain is no longer a symptom of tissue injury; instead the pain behaviour is dominated by different pain expressions and secondary symptoms such as anxiety, depression and inactivity. Loeser (1982) uses a pain model which describe the development of pain from a core of nociception leading to pain, suffering and pain behaviour. In acute pain, there is a straightforward relationship between nociception, pain suffering and pain behaviour which is not always present in chronic pain.

A classification system based on pathophysiology, incorporating nociceptive, neurogenic, psychogenic and unknown genesis is important in clinical work but provides less information about affective disorders and does not easily allow accurate study of epidemiology, prognosis and treatment of pain (Taub et al., 1998). Within this system the term somatoform pain is applied to chronic pain conditions. Somatoform pain implies the presence of physical pain symptoms that are not fully explained by a diagnosable medical disorder.

Other classification principles, according to which pain is divided into local, regional and generalized or widespread pain, have often been used in epidemiological studies (Andersson et al., 1996). For physiotherapists, the disablement process model (Verbrugge and Jette, 1994) is often used because this model elucidates consequences of pain on both a bodily function level and an activity of daily life level. The model includes the components active pathology, impairment, functional limitation and disability. Also the current ICIDH –2 classification is valuable for physiotherapists as it allows functioning to be described in different dimensions at the same time, thus offering a multidimensional approach to functioning, activity and participation (Soukup and Vollestad, 2001). However, because of the
multidimensional nature of pain, all classifications may both overlap and contradict one another and are in some way inadequate for capturing all aspects of pain.

Efforts have also been made to identify different subgroups or subpopulations of pain patients, which may show homogeneous traits of pain experience. A review article revealed differences in the prevalence of specific pain syndromes based on gender (Unruh, 1996). In most of these studies women report more severe levels of pain, more frequent pain and pain of longer duration than men. Women also have a higher degree of widespread pain and more depression and psychosomatic symptoms than men (Andersson et al., 1996). Other subgroups have been identified according to coping and pain behaviour (Bergström et al., 2001). Individuals using more active coping strategies seem to have a better pain disability prognosis than those relying on passive coping strategies (Klapow et al., 1995).

However, chronic pain conditions may be viewed as an expression of a given cultural epoch and understood as a societal illness. Signs and symptoms of non-specific musculoskeletal disorders constitute one of many unexplainable syndromes in society, such as chronic fatigue syndromes, fibromyalgia and during recent years burnout syndromes (Ax et al., 2001, Rylander and Nygren, 2001).

In this thesis the definition of non-specific musculoskeletal disorders includes many different pain syndromes with duration more than three months and without any known organic cause, and where psychological and social factors probably play an important role for the genesis, duration and prognosis of the pain disorders. Another objective of this thesis is to examine how physical, psychosocial and health-related factors are related to pain and how these factors can predict treatment outcome.

**Physical factors**

Long-lasting pain and tension may lead to disturbances in various body structures and functions, such as muscle stiffness and circulation disturbances as well as reduced range of motion and muscle strength. These impairments may in particular affect bodily co-ordination and lead to disturbances of balance and postural control mechanisms.
The term balance is often used in association with terms such as postural stability or postural control and in the literature there is no clear distinction between them (Pollock et al., 2000). Balance or postural control is defined as the ability to maintain the body in equilibrium both at rest and in motion (Shumway-Cook and Woollacott, 2001). Patients with musculoskeletal disorders may have impairments of the afferent and efferent physiological mechanisms, which control balance. To maintain balance during normal activities, a constant interaction is required between central and peripheral components of the nervous system, including visual, vestibular and somatosensory information (Shumway-Cook and Woollacott, 2001).

The effect of pain on balance and postural control in patients with persistent musculoskeletal disorders has not been extensively studied because it is not routinely evaluated in physiotherapy (Casimiro and Sveistrup, 2000). Some studies on chronic back pain patients have shown that the patients concerned had worse balance than healthy controls when balance was assessed on platforms (Nies Byl and Sinnot, 1991, Alexander and Kinney LaPier, 1998). Also patients with neck pain disorders have shown similar results (Karlberg et al., 1995, Koskimies et al., 1997). One possible explanation for disturbed postural control and balance dysfunction in these patients might be an altered proprioception resulting in deficiencies in the somatosensory system (McPartland et al., 1997). The interruptions in the balance control system may also lead to a feeling of instability or unsteadiness. Also psychological factors, such as anxiety and depression, which are common in patients with musculoskeletal disorders, might influence the balance function. Yardley (1998) found that a community-based group of patients with dizziness was more typically characterized by psychological dysfunction, particularly symptoms of anxiety and depression, than by neurological disturbance. However the link between psychiatric dysfunction and dizziness is critically discussed (Moss-Morris and Petrie, 1999) and it is assumed that psychological distress may be a sufficient but not a necessary factor in the development of dizziness and other balance disturbances.

Another group of patients that often suffer from dizziness or impaired balance are those with whiplash-associated disorders (WAD). Whiplash injuries are commonly caused by the acceleration-
deceleration mechanism of energy transferred to the neck, which may lead to soft tissue damages, artery injuries and trauma to the vestibular organs (Bring, 1996). About 5-10% of acute WAD patients develop severe chronic consequences (Nygren et al., 2000), but the proportion of individuals with remaining complaints varies considerably between different studies (Sterner, 2001). Also WAD patients have shown greater postural sway than healthy individuals. (Rubin et al., 1995, Karznia et al., 1996). Thus there is some evidence that both patients with non-traumatic chronic pain disorders and traumatic pain problems associated with whiplash injuries may have balance deficits. In this study the aim was to investigate whether these two patient groups differed in balance performance in comparison to a healthy control group by using simple clinical balance tests, which are considered to be valid and reliable and easy to use in the work of the clinic.

**Psychological factors**

Several cross-sectional studies have shown that there is a longitudinal relationship between pain, psychological disorders and disability (Ruiz Moral et al., 1997, Dyrehag et al., 1998). In particular anxiety and depression symptoms are highly related to long-lasting pain but the direction of causality is contradictory. Previous longitudinal research in primary care has shown that depression predicted the onset of specific pain complaints (Von Korff et al., 1993), while later research indicated a symmetrical relationship between pain and psychological disorders and that disability is an important link between the two (Gureje et al., 2001). Some researchers have hypothesised that patients may actually avoid major depressive symptoms by means of somatization. The resulting condition is referred to as “masked depression” (Gamsa, 1990). However neuroendocrinological research may form a link between biology and psychology; it has been shown that chronic stress may lead to biochemical imbalance, which in turn may lead to psychological distress (Pruessner et al., 1999, Rosmond and Björntorp, 2000).

Research into the connection between specific personality traits and pain is even more contradictory. A study using MMPI, a multidimensional instrument of personality assessment, has shown a relationship between depression, hysterical and hypochondriac
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personality traits and chronic back pain (Sivik et al., 1992). Other studies do not support such relationships (Linder et al., 2000). Nor is there any evidence to support the existence of a specific “pain-prone” personality, but individuals who are very absorbed in their pain symptoms may be at risk for later disability (Jensen et al., 1994).

What may be an important area to study is the relation between a person’s self-image and experience of pain. Self-image or self-identity is considered to be a result of early important relationships where an individual learns to treat her/himself as she/he has been treated by significant others (Benjamin, 1974). The basic idea is that if primary goals of achieving love and acceptance and a sense of self-value have not been met because of shortcomings in early parenting, the results will be adult interpersonal and intrapsychic problems. Traditional psychiatric symptoms such as depression, anxiety and somatization are often embedded in interpersonal patterns. One hypothesis might be that a person’s experience of pain may also be associated with how the person views her/himself, i.e. the person’s self-image or self-identity. This means that a negative self-image may be more associated with a high degree of pain than a positive self-image. In this study the interest is to focus on both psychological symptoms and self-image as outcome measures since they might play an important role in the rehabilitation of patients suffering from pain disorders. Subjective experience of symptoms and a person's self-image might be expected to show varying susceptibility to change, since symptoms are often more sensitive to changes expected as a result of treatment, while self-image might be thought of as a more stable psychological entity that is more difficult to change.

Social factors

The social differences in perceived health between different socio-economic classes are still considerable and have not diminished during the last twenty years (Folkhälsorapporten, 2001). However, gender-related differences in health seem to have increased during the last decade. Both severe pain and aching from the musculoskeletal system and psychological distress, such as anxiety, depression, fatigue and sleep disturbances have increased, especially for women (Folkhälsorapporten, 2001). The severe economical decline of the 1990s that caused organisational changes in workplaces has meant
that work tempo and time pressure have increased. These changes have particularly affected women in the health care sector and the teaching profession (Marklund, 2000). Studies have shown that women have increased the amount of paid work they do, but still have the major responsibility for home and family. There is also a tendency for younger adults to report ill health to a greater extent than previously (Folkhälsorapporten, 2001). This might be a reflection of the fact that more people had to work overtime during the late 1990s and consequently stress-related syndromes such as burnout symptoms have become more and more common today.

The relationship between work-related factors and musculoskeletal disorders is well documented. Many studies have found that heavy manual labour and monotonous tasks combined with work-related psychosocial factors, such as high demands, low control and poor support are strongly related to musculoskeletal symptoms in both men and women (Karasek and Theorell, 1990, Theorell et al., 1991). In the opposite situation, long periods of unemployment or sick-leave have also shown strong associations with both musculoskeletal disorders and various psychosomatic symptoms (Janlert, 1992, Ekberg and Wildhagen, 1996). However, the focus of interest has mainly been on work-related factors and what are less studied are how non-work-related factors, such as leisure time and family relations in the private arena, may have an impact on musculoskeletal pain disorders in men and women. Hall et al., (1992) found a more complex relationship between home stress and psychosomatic strain in women than in men, which may be a reflection of gender-related differences in interaction effects between work and home life. That women in general report higher levels of psychological distress than men may still depend on their multiple primary role responsibilities resulting from childcare, or care for elderly parents, household management and paid employment (Kilbom et al., 1998, Folkhälsorapporten, 2001).

Early childhood socialisation and learning may determine how an individual in adult life perceives painful stimuli and responds to physical symptoms (Fordyce, 1976). To study family patterns of pain and illness may be of importance for the understanding of pain experience and pain behaviour (Hasvold and Johnsen, 1996). Chronic pain syndromes are often found in families with a higher prevalence of both pain problems and other family problems and conflicts
(Schanberg et al., 1998). It is not unusual that an individual reports pain problems in the same body area as has another family member. The support from the family can have a positive or a negative effect on pain development depending on whether the support reinforces a health related behaviour or a sick behaviour. It has been argued that social modelling and social reinforcement may be responsible for both cultural and individual differences in pain perception.

Research has shown that there is a relationship between traumatic or stressful life events during childhood and somatization and depression in adult life (Portegijs et al., 1996, Leserman et al., 1998). In particular physical and sexual abuse have been associated with a higher prevalence of musculoskeletal disorders and different psychosomatic symptoms in women and have also been found to be the strongest predictors for the development of physical and psychological illness (Linton, 1997). Linton has also put forward the idea that abuse may affect pain by altering perception and the ability to cope with pain in an effective way. Some studies have confirmed that female patients with a history of abuse are at much greater risk of gastrointestinal disorders and pelvic pain (Leserman et al., 1996). Other negative life events, such as deprivation or loss of parents in early childhood have also shown associations with somatization, depression and anxiety disorders (Portegijs et al., 1996). However, despite these relationships most authors agree that critical life changes are not very good predictors of illness by themselves, but that the predictions are greatly improved by information on coping or related factors (Theorell, 1992).

Health related factors

As a contrast to examining different "pathological" factors that are associated with persistent pain, it may be of greater interest to look at factors which may be possible predictors of health or indicators of good coping capacity. The salutogenic model, developed by Antonovsky, is a concept that could be regarded as a mediator for successful coping with stressors and a high quality of life (Antonovsky, 1979). His concept sense of coherence (SOC) focuses on the origin of health where health is defined as a continuum between ease and dis-ease rather than health or pathology. Several studies have shown correlations between SOC and other health-
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related concepts such as general well-being (Feldt, 1997), personality traits (Langius et al., 1992), locus of control and emotional-focused coping strategies (Cederblad et al., 1994). According to Antonovsky (1987), SOC is assumed to be a relatively stable personality trait in adulthood. On the basis of the theory, an individual’s SOC is fully developed and stabilized around the age of 30 years. Thereafter SOC is thought to have considerable stability over time and situations. However, SOC is primarily a social construct and emphasize the impact of environmental factors on health (Antonovsky, 1994). Individuals with a high SOC tend to perceive demands as challenges, worthy of engagement, rather than as threats or stressors. One hypothesis in this study was that high SOC would be associated with a lesser degree of pain and perhaps be a possible predictor of outcome.

Another term considered to be a health-related factor is self-efficacy belief. Self-efficacy expectations are defined as a personal belief about how successfully one can cope with different situations (Bandura, 1977). Mastering a difficult situation gives a positive experience, which increases self-efficacy and thereby increases confidence in the ability to master future situations. Individuals with high self-efficacy expectations are considered to be more persistent in difficult situations than people with low expectations. In patients with whiplash associated disorders it was found that self-efficacy was a better predictor of long-term symptomatology than initial assessment, physical measures or pain intensity (Söderlund et al., 2000). Self-efficacy has also been proposed as an explanatory factor for positive adaptation to chronic pain (Jensen et al., 1991). A high self-efficacy also seems to be related to an internal locus of control. It means that the patient’s behaviour in a situation is dependent upon her/himself and not on external factors such as contingencies, luck, fate or other people. It was found that chronic pain patients with an internal locus of control use active coping strategies to a greater extent than those with an external locus of control (Crisson and Keefe, 1988). Also motivation is closely related to self-efficacy beliefs, being viewed as the internal process that effects the direction, persistence and strength of an individual's goal-directed behaviour (Smith, 1993). In a prospective study of chronic pain patients it was found that motivation at baseline was a predictor of long-term changes in perceived health, working ability and total cost of rehabilitation (Grahn, 1999).
These concepts, sense of coherence, self-efficacy, locus of control and motivation may play a major role in how individuals perceive their quality of life. The term quality of life has been used interchangeably with other related themes or concepts such as life satisfaction, morale, happiness and psychological or subjective well-being (Lau, 2000). These concepts agree with WHO's definition of health as a state of complete physical, mental and social well-being, and not merely the absence of disease or "infirmity". The assessment of quality of life has increasingly become accepted as providing important information in many areas of health research, e.g. population surveys, evaluations of health policies, estimation of the subjective burden of various chronic conditions, and in comparisons of the benefits of alternative treatments. Self-rated health has been found to be a strong predictor of long-term illness (Frisch, 1998). As a consequence of this development, there are now a multitude of different instruments to choose from. These measurements can be roughly divided into two types: the generic and the diagnosis-specific. The generic types are intended to assess health concepts that are relevant for all individuals irrespective of age, sex, health status, type of disease/disability or type of intervention. Although most questionnaires define health in several domains, it has been empirically verified from that most of the variance in generic health questionnaires is accounted for by two major dimensions - physical and mental health respectively (McHorney et al., 1993). It has also been shown that physical conditions tend to have greater impact on the physical components of the perceived health, while psychosocial conditions tend to have most impact on the mental components. Chronic musculoskeletal disorders are conditions that often have a great impact on an individual's functioning and well-being (Mårtensson et al., 1999). In a study of QOL in patients with a variety of chronic diseases, Sprangers et al. (2000) found that those who had musculoskeletal disorders belonged to the group that reported the lowest level of functioning. In this thesis, sense of coherence, self-efficacy and health-related quality of life are not only used as measures of treatment outcome: they are also assumed to be important predictors of pain disability.
Physiotherapy in primary care

Physiotherapy in primary care is commonly offered as treatment to patients with signs and symptoms of musculoskeletal disorders, and in recent years an increase in referrals to physiotherapists has been observed. In a Danish study it was found that patients referred to physiotherapists had more poorly defined diagnoses and a lower level of mental health than those with well-defined diagnoses who were more seldom referred (Jörgensen et al., 2001). A major reason for psychological distress being under-recognized is that 40% to 80% of patients with psychological distress only report physical symptoms. Within physiotherapy there are several different treatment modalities that can be used for patients with musculoskeletal disorders. Besides traditionally biomedical methods aimed at reducing pain and restoring functioning on an impairment level, such as increasing joint motion and muscle strength, there has been a shift towards more patient-active treatment modalities such as physical training, self-exercise, group treatments with neck- and back pain schools and treatments including cognitive and behavioural approaches. Especially during recent years when there has been an explosive increase in stress related disorders and severe pain problems, the need for more holistic physiotherapy approaches has increased.

Body and mind approaches

Two treatment modalities that are increasingly used in primary health care for patients with chronic musculoskeletal disorders are Body Awareness Therapy (Mattson, 1998) and Feldenkrais (Grönblom, 1996). Both offer a broad treatment perspective on patients with pain conditions (Rosberg, 2000). The common core elements in these methods are body and movement awareness, and they focus on the experience of body-as-a-whole rather than specific human movements. Both Body Awareness Therapy and Feldenkrais are based on a framework of the interaction between body and mind, and are aimed at activating health resources in the individual. The two methods use different body awareness techniques and both hold that increased experience and consciousness of body functioning will lead to changes in psychological and social functioning. As the body is regarded as a part of the identity, changes in health-related quality of life can be seen on both a physical and an emotional level.
Body Awareness Therapy

Body awareness therapy has been developed within the field of Swedish psychiatric physiotherapy by Roxendahl (Roxendal, 1985), and the method is widely recognized in the Scandinavian countries. Roxendal was inspired by the French movement therapist and psychotherapist Dropsy (Dropsy, 1975, 1988), whose work was influenced by Eastern philosophy and existentialism. The exercises in BAT were developed by Dropsy on the basis of the Chinese movements T'ai Chi and Zen meditation, but Roxendal has taken these exercises further and developed her own method and approach within physiotherapy practice (Lundvik Gyllensten, 2001).

As a psychiatric method Body Awareness Therapy also has its roots in psychoanalytic traditions. Theories about the body ego were first formulated by Freud and Roxendahl has developed the concept to involve the importance of body experiences for total self-identity. She considers that the body ego is the expression of the personality in the body. Stability in postural function and freedom in movement and breathing are considered to be important aspects of the body ego (Roxendal and Nordwall, 1997). Another strong influence comes from the theories of Reich, a German psychoanalyst, who is particularly famous for his character analysis theory (Downing, 1996). He proposed that stress and emotional conflicts are transferred into bodily reactions such as muscle tension, body stiffness and breathing problems and that these bodily reactions are specific to each individual.

The aim in Body Awareness Therapy is to increase sensory motor awareness and locomotor control by working with body ego functions such as grounding, stability in the centre line, centering, breathing and flow. The emphasis is particular on the development of the mental presence and awareness that underlies everything that is practiced in the movement modality (Dropsy 1975, 1988). In several studies Body Awareness Therapy has been considered as a useful intervention for patients with various pain conditions as well as for patients with personality disorders in psychiatric care (Friis et al., 1989, Lind et al., 1993, Mattson et al., 1998, Grahn, 1999, Klingberg-Olsson et al., 2000, Lundvik Gyllensten, 2001).
Feldenkrais

The Feldenkrais method is based on the work of Moshe Feldenkrais (Feldenkrais, 1972, 1977, 1985), which is a pedagogic method, called somatic education, that emphasises the learning process of the individual's own experience and consciousness of body and movement. The method is based on neurophysiological principles aimed at changing unfavourable ingrained movement habits that cause pain and dysfunction and promoting in their place free and harmonious ways of moving. According to Feldenkrais individuals become accustomed to habitual movements that sometimes are stereotyped and not well-suited to external realities. To change habitual movement patterns the individual must be re-educated and learn new body patterns. Feldenkrais uses self-image as a central concept, just as the concept of body ego is central to Body Awareness Therapy. According to Feldenkrais, self-image consists of four elements: movements that are involved in every action, sensation, feeling and thought. Feldenkrais believed that the way in which we move, talk and act is based on our self-image. He maintained that by working with body exercises and exploring new ways of moving and acting, the changes experienced will also lead to changes in the self-image.

The Feldenkrais method is used worldwide, especially in the U.S.A, Germany and Australia (Wildman, 1990). There is a great deal of literature about the Feldenkrais method but according to two review articles, the research relies heavily on case reports and observations and there is no clear evidence regarding the effectiveness of the method (Ellis, 1995, Ives and Shelley, 1998). Recently one randomised controlled study on patients with neck-shoulder complaints has been published, in which the Feldenkrais method was found to have significantly better treatment results in comparison with a group-based physiotherapy intervention (Lundblad et al., 1999).

The differences between Body Awareness Therapy and Feldenkrais might be found in the use of different movement patterns and positions where the movements are learned, and in the guiding techniques of the instructor. In BAT the movements are based on those used for daily living with a specific movement form such as standing walking, sitting and lying in combination with breathing. The
same movements are preferably practiced every day individually but also in group sessions. Sometimes different massage techniques can be used either by the leader or in pair exercises in the group. The FK method emphasizes the variation and exploration of new body patterns to change incorrectly used movement habits. There are special combinations of movement patterns for different parts of the body involving both the trunk and the extremities, and they are mostly trained in lying position where force of gravity is diminished. In FK, the techniques of guiding the patient’s movements and increasing sensory awareness with the help of the instructor’s hands are of great importance.

In the present study conventional physiotherapy, labelled “Treatment As Usual” (TAU), implies all kinds of individual physiotherapy methods extensively used in primary care for this patient group, but without any elements of Body Awareness Therapy or Feldenkrais. To our knowledge no studies have been carried out comparing these three approaches.
Aims

AIMS

The general aim of the present thesis was to get an extensive description of patients with non-specific musculoskeletal disorders and to evaluate the effects of different treatment approaches in primary care for this patient group.

The specific aims were

♦ to describe and analyse the relationship between physical and psychological health, employment and social relations in patients with prolonged musculoskeletal disorders (Paper I)

♦ to evaluate balance performance using clinical tests in two different groups of patients – one with traumatic WAD and one with non-traumatic PMSD and compare these two groups with a group of healthy individuals (Paper II)

♦ to compare the effects of three different treatment approaches – BAT FK and TAU- in patients with non-specific musculoskeletal disorders on change in psychological symptoms, pain and self-image (Paper III)

♦ to explore the relationship between self-image, psychological symptoms and pain and to identify possible predictors of outcome (Paper III).

♦ to compare the effects of BAT, FK and TAU on changes of health-related quality of life (HRQL), self-efficacy and sense of coherence (SOC). (Paper IV)

♦ to explore the relationship between SOC, HRQL and self-efficacy and to find out whether SOC could be a predictor of outcome (Paper IV)

♦ to examine if there are subgroups of patients with different outcome patterns and to find possible factors that can explain differences in outcome patterns between subgroups (Paper V)
METHODS

Subjects and procedure

Paper I, III, IV and V

An overview of the sampling procedure is shown in Figure 1. Patients with different kind of pain syndromes diagnosed as non-specific musculoskeletal disorders with a duration time of more than three months, were recruited consecutively during a period of nine months to the three treatment models. Three healthcare districts in Sweden were involved. The districts were chosen according to where BAT and FK were extensively used and where interested physiotherapists and Feldenkrais pedagogues were willing to participate in the study. The BAT group and the TAU group were carried out in a district in the northern part of Sweden and the FK group was carried out in two districts in the southern part of Sweden. Inclusion and exclusion criteria are listed in Table I.

Table 1. Inclusion and exclusion criteria of the patient sample.

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Patients born in Scandinavia with non-specific musculoskeletal disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Duration more than 3 months</td>
</tr>
<tr>
<td>Exclusion criteria</td>
<td>Musculoskeletal disorders having a clear organic cause due to tissue damage or herniated discs</td>
</tr>
<tr>
<td></td>
<td>Disease of rheumatological, neurological or endocrinological origins</td>
</tr>
<tr>
<td></td>
<td>Diagnosed fibromyalgia</td>
</tr>
</tbody>
</table>
Figure 1. Overview of samples and number of subjects in the five papers.
Methods

A total of 78 patients, 64 women and 14 men, were found to fulfil the inclusion criteria. The aim was to study 30 patients in each treatment model, 20 women and 10 men. Due to practical realities, the recruitment of patients had to cease when there were 26 patients in each model. During the intervention seven patients dropped out, four patients from the BAT group and three patients from the FK group. Seventy-one patients participated during the whole study and consisted of 17 women and 6 men in the BAT group, 18 women and 4 men in the FK group and 25 women and one man in the TAU group. Background variables in the three treatment groups are presented in Table 2.

The study started in 1997 and the data collection was finished in 1999. Since the different treatment groups started at different time points, the time point for the follow-ups varied between the groups. The author met each patient individually three times; before the intervention, at 6 months and at one year. These meetings consisted of both interviews and measurements and were conducted at the health care centre to which the patient belonged.

Paper II

In this study the aim was to compare balance performance between patients with traumatic and non-traumatic pain disorders and a healthy control group. For comparison with the study group in Paper I (PMSD), a patient group with whiplash-associated disorders (WAD) was used. These patients were referred to the department of rehabilitation medicine within one year of accident and were suffered WAD grade I-III according to Quebec Classification of Whiplash-associated disorders (Spitzer, 1995). The group of healthy individuals were subjects with no history of neurological and orthopaedic diseases, injuries or balance impairments including symptoms of dizziness. They were informed about the project and were invited to participate in the investigation through local advertising. Subjects over 55 years were excluded since previous research has shown that balance performance in healthy individuals deteriorates around the age of 60 (Ekdahl et al., 1989). A total of 151 subjects participated. The WAD group consisted of 24 women and 11 men (mean age = 33 years, range 19-53).
<table>
<thead>
<tr>
<th>Variables</th>
<th>BAT n = 26</th>
<th>FK n = 26</th>
<th>TAU n = 26</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age total group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>26</td>
<td>100</td>
<td>26</td>
<td>100</td>
</tr>
<tr>
<td>Men</td>
<td>19</td>
<td>73</td>
<td>20</td>
<td>77</td>
</tr>
<tr>
<td>Education (Year)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compulsory and secondary school</td>
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<td>17</td>
<td>6</td>
<td>13</td>
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<tr>
<td>Higher Education</td>
<td>19</td>
<td>73</td>
<td>19</td>
<td>73</td>
</tr>
<tr>
<td>Education (Year) (cont.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/cohabitant</td>
<td>20</td>
<td>77</td>
<td>19</td>
<td>73</td>
</tr>
<tr>
<td>Divorced</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Single</td>
<td>3</td>
<td>11</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Widow/widower</td>
<td>13</td>
<td>50</td>
<td>18</td>
<td>69</td>
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<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sick leave/pension part-time</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Sick leave/pension full time</td>
<td>3</td>
<td>12</td>
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<td>Workers</td>
<td>12</td>
<td>46</td>
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<td>58</td>
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<tr>
<td>Employees</td>
<td>14</td>
<td>54</td>
<td>11</td>
<td>42</td>
</tr>
</tbody>
</table>
Methods

The PMSD group, which was the same patients as in Paper I, but excluding patients with an age more than 55 years, consisted of 59 women and 11 men (mean age = 40.5 years, range 22-55 years) and in the healthy control group there were 28 women and 18 men (mean age = 36 years, range 18-55 years).

Instruments

The instruments used in this study aimed at evaluating different pain dimensions as well as physical, psychological and social factors. Another aim was to find out whether some of the instruments were stable and could serve as predictors of treatment outcome, or if they mainly measured changes due to the interventions. A third purpose was that the instruments measured factors on both impairment and disability level. An overview of the data collection methods is presented in Table 3.

Table 3. Methods of data collection in Paper I - V.
Description dimension

Symptom list

In Paper I, the patients were provided with a list of twenty symptoms and were requested to rate the prevalence and intensity of each one of these symptoms using a 100 mm long visual analogue scale (VAS) ranging from the end-points none to maximum (Huskisson, 1974). The list consisted of both musculoskeletal symptoms from head, maxillary joint, neck/shoulder, back, joints, actual pain and different bodily and psychosomatic symptoms such as heart and stomach symptoms, dizziness, tinnitus, fatigue, sleep disturbances, memory and concentration problems, feelings of sadness and anxiety. In this study the ratings on VAS before the intervention was used to describe the actual prevalence of symptoms in the patient group.

Health problem areas

A semi-structural interview instrument called the Addiction Severity Index (ASI) was used to obtain an extensive description of patients with non-specific musculoskeletal disorders. The ASI interview was devised by McLellan in USA and has been widely used in psychiatric and drug abuse research (McLellan et al., 1980, Johnson et al., 1999). A project group at the Centre for Evaluation of Social Work has developed the Swedish version of the ASI-interview (Socialstyrelsen, 1996). The ASI instrument examines the patient’s perceived problems in different areas: physical health, psychological health, employment and financial support and family and social relationships. Each problem area is explored by means of approximately 20 questions. Within the problem area of employment and financial support, there are questions about education, employment and the threat of unemployment. Questions within the problem area of family and social relations, concern both close, long-lasting relationships and serious conflicts with family and other important people during lifetime and during the past 30 days. Questions about physical, sexual and emotional abuse are included. The psychological health problem area, describes the prevalence of different psychiatric symptoms during lifetime and during the past 30 days. Within the problem area of psychological health there are questions about the use of medication and how somatic disorders have interfered with daily life.
Methods

At the end of each problem area, the patient is asked to rate its severity on a scale of 0 to 4 and a second rating, on a similar scale, was made concerning the need for further treatment regarding this problem area. In Paper I, the whole ASI-interview was used for the total patient group to describe the relation between different health problem areas, and in Paper V, the concluding ratings rating of the four problem areas were used to make comparisons of initial health problems between the three cluster groups.

Physical dimension

Balance performance

Balance performance was measured with clinical tests (Graybiel and Fregly, 1966, Shumway-Cook and Horak, 1986, Stones and Kozma, 1987, Harding et al., 1994, Suni et al., 1996). Dynamic balance was measured by walking twenty steps, heel to toe with eyes opened on a 1-cm thick line. The time to perform the test was measured in seconds and one or more faulty steps were recorded as a failure. The static balance tests were Sharpened Romberg with eyes opened and closed, Standing on leg with eyes opened and closed, Standing on a foam with eyes opened and closed and with eyes open turning head from side to side. Three trials were performed if the subjects did not succeed to stand 30 s in the first trial. Either success (yes) or failure (no) was recorded. In Paper II, these tests were compared between the PMSD group from paper I, a WAD group and a healthy control group. In Paper V, the dynamic balance test was used for comparisons between the cluster groups.

Pain dimension

Pain drawing

Each subject marked the pain distribution and pain characteristics on a pain drawing (Ransford et al., 1976). The percentage of body area marked as painful was calculated according to a method suggested by Margolis et al. (Margolis et al., 1986). In this method the body area is divided into 45 anatomical areas. To score the drawings, weights were assigned to body areas equal to the percentage of body surface that they covered.
Methods

Multidimensional Pain Inventory

The Swedish version (Bergström et al., 1998) of the West Haven Yale Multidimensional Pain Inventory (MPI) was used to assess physical and psychosocial aspects of chronic pain. The MPI instrument comprises three sections, with a total of nine empirically derived scales. Four subscales of MPI was used; the Pain Severity scale (PS), that assess the perceived severity of pain, the Pain Interference Scale (PI), that assess the extend to which chronic pain interferes with the patient's life, the Life Control scale (LC), that assess the degree to which patients perceive they have control over pain and life problems and the Affective Disorder Scale (AD), assessing mood and level of anxiety and irritation during the past week. In Paper III the four subscales were compared between BAT, FK and TAU and in paper V, the comparison was done between the cluster groups.

Psychological dimension

Psychological distress

The Symptom Check-List-90 (SCL-90) is a 90-item self-report symptom inventory designed to reflect the psychological symptom patterns of patients on a number of different subscales (Derogatis and Cleary, 1977). The check-list consists of ten primary symptom dimensions: somatization, obsessive-compulsive disorders, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism and an additional scale. In this study the three global indices or subscales of distress, GSI, PSI and SSI were used in order to estimate overall symptoms. The mean of all 90 items constitutes the Global Severity Index (GSI) which is considered to be the best single indicator of the current level of distress. The Personality Severity Index, (PSI) is an index for personality disorders based on the mean score of the subscales' interpersonal sensitivity, hostility and paranoid ideation (Karterud et al., 1995). The State Symptom Index (SSI) is an index of mood-related symptoms consisting of the mean of the subscales for anxiety, depression, obsessive/compulsive and somatic symptoms). In addition to estimate overall symptoms according to the three global scales, the subscales of anxiety, depression and somatization was used to access specific symptom dimensions. SCL-90 is used in Paper III and Paper V.
**Methods**

Self-image

As a measure of self-image, the introject version of the Structural Analysis of Social behaviour (SASB), developed by Benjamin (Benjamin, 1974), was used. The SASB model consists of two basic dimensions: affiliation (love-hate) and interdependence (spontaneity-control). In the SASB model the two basic dimensions are combined in a circumflex model and operationalized as 36 items, which the subjects are asked to rate on a scale between 0 and 100 according to how well the statement describes the person. In a cluster version of the model the 36 items are summarised into eight clusters, describing how an individual treats him- or herself. In the study the mean ratings of the positive clusters “accept”, “love” and “nourish self” were used as a measure of a positive self-image and the mean of the negative clusters “blame”, “reject” and “ignore self” were used as a measure of negative self-image. Cluster 1 expresses the degree of spontaneity of the self and cluster 5 can be seen as the as the opposite to this cluster and measures self-control. A normal self-image according to the SASB model is characterized by high values on the positive clusters (a positive self-image) and low values on the negative clusters (a negative self-image) and a balance between a spontaneous self and a controlling self. SASB has high test-retest reliability and internal consistency (Benjamin, 1974). SASB is used in Paper III and Paper V.

Health-related dimension

Health-related quality of life

A Swedish version of the Medical Outcome Study of 36-item Short Form Health Survey (SF-36) was used (Sullivan et al., 1995). The SF-36 instrument is widely used in health surveys aiming at measuring physical, social and mental aspects of health-related quality of life (Ware and Sherbourne, 1992). It contains 36 items, organized into 8 subscales; Physical Functioning, Role Physical (the impact of physical health on performance of everyday role), Bodily Pain, General Health, Vitality, Social Functioning, Role Emotional (the impact of emotional health on role performance), and Mental Health. In paper IV, the eight scales of SF-36 were used to describe changes within and between treatment groups. In paper V, the two total subscales of physical health dimension and mental health dimension were compared between the cluster groups.
Methods

Self-efficacy of pain and other symptoms

The Arthritis Self-efficacy Scale (ASES) was developed from the concept of self-efficacy, by Bandura (Bandura, 1977). The ASES is a standardized questionnaire with 20 items, measuring an individual’s perceived self-efficacy to cope with the consequences of chronic arthritis or chronic pain (Lorig et al., 1989). The Swedish version of the ASES has been found to have an acceptable validity and reliability for these two patient groups (Lomi, 1992). A five-item subscale that assess self-efficacy perception for controlling pain and a six-item subscale measuring self-efficacy for controlling other symptoms related to chronic pain were used in Paper IV and Paper V.

Sense of Coherence

The Sense of Coherence (SOC) was assessed by the 29-item questionnaire developed by Antonovsky (Antonovsky, 1979, Antonovsky, 1987). It consists of three dimensions: comprehensibility, the sense that one’s internal and external environments are explicable; manageability, the sense that one has the necessary resources available to meet the demands of these environments and meaningfulness, which is the belief that these demands are challenging and worthy of personal investment. In this study the total sum of all three scales was used and the higher the score the stronger the SOC.

Intervention

Both the Body Awareness Training and Feldenkrais groups were contracted to consist of 20 sessions, most of them as group sessions but also a few individual treatments. This number of sessions was based on the results from a pilot study which showed that 10 group sessions were too few to be effective for patients with chronic pain disorders (Malmgren-Olsson and Lampa, 1997). In order to assure consistent use of a treatment model the group leaders within each of the Body Awareness Therapy and Feldenkrais methods discussed and planned the content in their treatment model before the intervention started. In the Treatment as Usual group there was no contract. Instead, each physiotherapist was free to decide how many sessions they thought were necessary for their patient and they were allowed to finish the treatment period when they thought it was the most
appropriate time. They were also instructed to use what they found to be the most relevant treatment in each case.

**Body Awareness Therapy group**

The 23 patients in this treatment model consisted of three groups, two groups of women, numbering nine and eight respectively, and one group of six men. Three different physiotherapists with long experience and education in the method of Body Awareness Therapy had one group each. The BAT intervention consisted of 17 group sessions and 3 individual sessions. Each session lasted ninety minutes, in the beginning twice a week and later on once a week. The intervention period was three to four months. The movements in BAT consisted of simple basic movements of daily living such as lying, sitting, standing and walking used to normalize postural control and coordination, breathing and muscular tension. The patients were recommended to do these movements at home. BAT also included special massage techniques that the patients performed on each other during pair exercises. During the individual sessions as well as during the group sessions the patients had the opportunity to talk about their experiences of the movements and to reflect on the interaction between pain and environmental factors.

**Feldenkrais group**

Similarly to the BAT group the twenty-two patients in the FK group consisted of three groups, two groups of women, numbering ten and eight respectively, and one group of four men. Two female Feldenkrais pedagogues led these groups. One of them had two groups, the other one group. The treatment intervention consisted of 15 group treatment sessions, called “lessons”, and five individual sessions. The group part of the intervention was labelled Awareness Through Movement (ATM) lessons and consisted of specific verbally directed movements aimed at increasing the sensorimotor awareness and coordination of different body parts organised around a functional theme. During the lessons time for discussion and reflections on the experiences of the movements was given. The individual lessons, labelled Functional Integration (FI), were aimed at focusing on each patient's individual functional problem by using mostly non-verbal guiding techniques. At the end of the intervention
the patients also received two audio cassettes containing some of the exercises used during the ATM lessons and also a written sheet detailing most of the exercises.

Separating the men and women into different groups in both BAT and FK was recommended by experienced clinicians who had found that it was often more difficult for patients to talk about individual problems in mixed groups.

**Treatment as usual group**

The 26 patients in this group, 25 women and one man, were treated individually by a total of 13 physiotherapists with long experience of chronic pain patients, eight working in six different primary health care areas and five physiotherapists working in four different private practices. The amount of treatments that the patients received in this group differed largely, with a distribution of from five to 45 treatments with a median of 12 treatments at the 6-months follow up. In the TAU group 14 patients continued with treatments to the second follow-up at one year, and at that measurement time, the total median of treatments was 20 (Range 5-90). It was found that massage, hot-pack, acupuncture and TENS were the treatments most often used, in combination with other methods like mobilisation and exercise training as well as information and advice about preventive strategies.

**Statistical analysis**

All statistical analysis was done in the SPSS (Statistical Package for the Social Sciences, SPSS Inc., USA) computer program and SIMCA for Windows, Umetri AB, Umeå, Sweden. A two-tailed significance level below 0.05 was required in all analysis.

**Descriptive methods**

In Paper I, a principal component analysis method (PCA) was used to give an overview of all variables and patients and to see the correlation structure of the data by means of a few latent components.
that express the common variance of all the data. A PCA model consists of a vector of loadings for the variables and a vector of scores for the patients for each component of the model. Plotting the vectors of the first two components, which contains most of the variance, gives an overview of how the variables relate to each other and how the patients are similar or different with respect to their scores on the variable. In Paper III and IV bivariate correlation analysis were used to describe relationship between initial variables at baseline and outcome.

Comparisons of treatment effects

In order to describe changes of treatment effects over time both within and between treatment groups a two-way ANOVA was used – 3 groups (BAT, FK, TAU) x 3 times (before treatment, after 6 months, after one year) with repeated measurements on time. Post-hoc analyses were made according to Bonferroni. In this way too many separate significance tests were avoided. This method was used in Paper III and IV.

Calculation of effect-size

To get a standardised measure of treatment effects the calculation of effect-size was applied. Effect-size is a standard pooling statistic used in meta-analysis (Rosenthal, 1991, Lipsey and Wilson, 2001). Effect-size can be used in different ways. Usually it is computed using Cohen's D, which is written as follows:

\[ \text{Effect Size} = \frac{(X_e - X_c)}{S_c}, \]

where \(X_e\) is the mean of the experimental group and \(X_c\) is the mean of the control group and \(S_c\) is the standard deviation of the control group.

Another way of using effect-size, which was made in this study, is to calculate the changes over time for each treatment group as follows: \(X_c\) is the mean of the outcome variable before the intervention and \(X_c\) is the mean for the same variable at the one year follow up and \(S_c\) is the total standard deviation for the three treatment groups before the intervention. ES-values are always calculated so that a positive change gets a positive value. There are established criteria for what is considered to be a large or a small change of outcome. The most
common criteria are based on Cohen's work (Cohen, 1988), which specifies that values under 0.2 are considered as no effect, values between 0.2 and 0.5 as a small effect, values between 0.5 and 0.8 as a medium effect and values above 0.8 are regarded as a large effect. The effect-size values were compared between treatment groups and cluster groups by using one-way ANOVA. Effect-size values were used in Paper III - V. In additional comparisons of back ground variables between the three treatment groups and cluster groups, or as in Paper II, between PMSD, WAD and controls, one way ANOVA was used on continuous variables and chi-square tests on dichotomous variables or proportions.

**Subgroup analysis**

To detect possible groups of variables with similar outcome patterns a factor analysis was performed with a varimax rotation of the factor solution. A second purpose of the factor analysis was to use the identified factor score for a cluster analysis, in order to find subgroups among the patients. This was performed by using the K-means algorithm.

**Logistic multivariate regression analysis**

In Paper V, a logistic regression analysis was used to find possible predictors of a positive/negative outcome pattern. All explanatory back ground and initial outcome variables with a univariate p-value below 0.2 were entered into the multivariate analysis.

**Ethical Considerations**

All subjects in the project received both oral and written information about the purpose of the project and that participation was voluntary and that they could withdraw at any time. The patients in the different treatment models did not know what the other treatment models were. The subjects were informed that different physiotherapeutic treatment models should be evaluated. They were also informed that the results would be presented anonymously. There was no state of dependence between the author and the included subjects. The author did all measurements and follow-ups and was not involved in any of the treatment models. The project was approved by the Ethical Committee of the Medical Faculty, Umeå University.
RESULTS

Health problems (Paper I)

Prevalence of symptoms

The prevalence of both musculoskeletal symptoms and different psychosomatic symptoms were high in the patient group. The most frequent symptoms were fatigue together with neck/shoulder pain, back pain and headache. Ninety-one percent of the patients had symptoms from more than one body region and 27 % had more general ache symptoms. About one third of the patients reported various psychosomatic symptoms such as stomach trouble, anxiety, sadness and sleep disturbances. Prevalence of psychiatric symptoms from the ASI-instrument showed that 50 % of the patients have had earlier depressions and 27 % have had serious suicide thoughts.

Prevalence of problem areas

The patients’ ratings of problem severity and the need for further treatment for each of the five problem areas of the ASI are presented in Table 3.

Table 3. Percent of patients who experience various degrees of severity of problem areas and need of further treatment. The groups are: No problems/need of professional help (0). Slightly-moderate problems/need of professional help (1-2). Considerable-extreme problems/need for further treatment (3-4). The ratings concern experience of problems during the past 30 days.

<table>
<thead>
<tr>
<th>Problem areas</th>
<th>Severity of problems</th>
<th>Need of further treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0  1-2  3-4</td>
<td>0  1-2  3-4</td>
</tr>
<tr>
<td>Physical problems</td>
<td>0  35  65</td>
<td>3  21  76</td>
</tr>
<tr>
<td>Psychological problems</td>
<td>6  51  43</td>
<td>32  23  45</td>
</tr>
<tr>
<td>Problems of unemployment</td>
<td>64  23  13</td>
<td>73  15  12</td>
</tr>
<tr>
<td>Relationship problems in family</td>
<td>50  35  15</td>
<td>78  12  10</td>
</tr>
<tr>
<td>Relationship problems with others</td>
<td>60  19  21</td>
<td>70  12  18</td>
</tr>
</tbody>
</table>
Results

The patients were placed in one of three groups based on their ratings. As could be expected the main problems were in the physical area but as many as 43 % of the patients experienced severe psychological problems and a high percent of the patients expressed a strong need for further treatment for these problems. A lower percentage of the patients considered the other three problem areas to be severe problem areas.

Correlation analysis

A principal components model

The principal component analysis (PCA) was done on all 99 variables of ASI and VAS. The PCA analysis describes a two-dimensional model with four poles of related variables. Figure 2 illustrates the variables that contribute most to the two components.

Figure 2. Plot of the most contributing variable loadings for principal components PC1 and PC2. The figure illustrates the two-dimensional model with four poles of related variables which have the highest loadings in the PCA model.
Results

Dimension 1: Psychological well-being

The horizontal line (PC1) describes a psychological well-being dimension where psychological distress appears at the one end of the dimension and general life satisfaction at the other. To the left the variables characterise a comprehensive illness pole. The highest loaded ASI variables are psychological problems and depression during the past 30 days. These variables are related to many of the VAS symptoms such as sleep disturbances, anxiety, sadness, pain and stomach trouble. In addition, musculoskeletal symptoms of the neck-shoulder, back and general joint ache are representative of this area. Symptoms of a more general character such as fatigue, memory and concentration problems are related to this problem profile. The variable “sickness benefit” belongs to this multitude of symptoms. To the right, at the opposite end of the PC1, the variables describe quite a different picture. The variables of having work and being satisfied with marital status, as well as conditions of living and leisure time are related to variables describing good relationships with mother and close friends. Having a longer education also belongs to this life satisfaction pole.

Dimension 2: Physical vs. relationship problems

The vertical dimension (PC2) characterises at the bottom of the line a dominating physical problem pole, where both sick leave and pension for physical disability are related. Some symptom variables, such as neck-shoulder symptoms, pain, fatigue and stomach trouble are the same as in PC1. At the upper end of the PC2, describes a relation problem pole, which is related to serious psychological symptoms and problems during lifetime. The highest loadings have variables describing relation problems with other people outside the family and conflicts with co-workers during the past 30 days. Present family problems and earlier conflicts with co-workers are also included here. Serious psychiatric symptoms such as thoughts of suicide, depression and anxiety during lifetime and to have experience of both physical and sexual abuse during lifetime are related to this relation problem profile. Of all the patients 27 % have had a history of physical abuse and 14 % have had a history of sexual abuse. When the distribution of the patients were examined in this two-dimensional model the results showed that they were scattered over the whole surface which
Results

means that the model can be used to describe subgroups of patients who have similar problem profiles with regard to the variables included in the analysis (Figure 3).

![Figure 3. Patient distribution in the Principal Component model.](image)

**Balance performance (Paper II)**

When balance were compared between the two patient groups, (PMSD and WAD) and the healthy control group, significant differences were found for the following tests: *Standing heel- to-toe position with eyes closed, standing on left leg with eyes open, standing on foam with eyes closed, standing on foam turning the head, time to walk 20 steps along a line and without faulty steps* (Table 4). Further analyses showed significant differences between the WAD and control group, and between the PMSD and control group. None of the tests showed significant differences between the WAD and PMSD group. The test, *standing on a foam turning the head* was significant only between the WAD group and the control group, while the test *walking without faulty steps outside the line* was significant only between the PMSD group
and the control group. Three tests did not show significant differences between any of the three groups (Sharpened Romberg with eyes open, standing on a foam with eyes open and standing on one leg, left and right, with eyes closed). The results of these tests showed almost no variability and therefore no further analysis were performed. The prevalence of reported dizziness/unsteadiness was 63% in the WAD group and 11% in the PMSD group. No significant differences were found in balance performance for any of the balance tests between patients with or without dizziness in either the WAD or the PMSD groups.

Table 4. Prevalence of successfully performed static balance tests and mean values of the dynamic balance test in three groups.

<table>
<thead>
<tr>
<th>Test</th>
<th>WAD</th>
<th>PSMD</th>
<th>Control</th>
<th>WAD-Control p</th>
<th>PMSD-Control p</th>
</tr>
</thead>
<tbody>
<tr>
<td>SREC</td>
<td>60</td>
<td>58.6</td>
<td>100</td>
<td>&lt;0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>SOLEO R</td>
<td>88.6</td>
<td>95.7</td>
<td>95.7</td>
<td>0.361</td>
<td>0.4</td>
</tr>
<tr>
<td>SOLEO L</td>
<td>85.7</td>
<td>90</td>
<td>100</td>
<td>0.021</td>
<td>0.013</td>
</tr>
<tr>
<td>SOFEC</td>
<td>82.9</td>
<td>76.5</td>
<td>100</td>
<td>0.002</td>
<td>0.005</td>
</tr>
<tr>
<td>SOF H T</td>
<td>88.6</td>
<td>95.6</td>
<td>100</td>
<td>0.034</td>
<td>0.031</td>
</tr>
<tr>
<td>WALEO S</td>
<td>94.3</td>
<td>82.6</td>
<td>100</td>
<td>0.002</td>
<td>0.18</td>
</tr>
<tr>
<td>WALEO T</td>
<td>19.4</td>
<td>20.7</td>
<td>13.4</td>
<td>&lt;0.001</td>
<td>0.002</td>
</tr>
</tbody>
</table>

WAD, whiplash associated disorders; PMSD, prolonged non-specific musculoskeletal disorders; SREC: standing heel-to-toe position: with eyes closed. SOLEO R: standing on one leg: right leg with eyes open. SOLEO L: standing on one leg: left leg with eyes open. SOFEC: standing on a foam: with eyes closed. SOF H T: standing on a foam: turning the head from side to side. WALEO S: walking twenty steps (without faulty steps outside the line). WALEO T: walking twenty steps (time in sec); M, mean.

When the analysis were stratified for gender, the differences between the patient groups and the control group remained significant among the women but not among the men in most of the tests. Further, when comparing men and women in all three groups, only one
Results

A significant difference was found between gender, namely that the men performed better results on walking along a line without faulty steps (p<0.02).

**Treatment effects in BAT, FK and TAU (Paper III - V)**

A summary of all effect-size values of outcomes used in Paper III - V, has been compared between the three treatment approaches and is presented in Table 5. To reduce the total outcome variables, only the two main dimensions, Physical health and Mental Health of SF-36, are used. Of SCL-90, the outcome variables are reduced to the three global scales; Global Severity Index (GSI), Personality Severity Index (PSI) and State Symptom Index (SSI).

Table 5. Mean effect-size values of the outcome variables and mean of total effect-size in the Body Awareness group (BAT), the Feldenkrais group (FK) and the individual physiotherapy group (TAU).

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>BAT Mean</th>
<th>FK Mean</th>
<th>TAU Mean</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total body area of pain (%)</td>
<td>0.27</td>
<td>0.44</td>
<td>0</td>
<td>0.257</td>
</tr>
<tr>
<td>Pain intensity (MPI)</td>
<td>0.95</td>
<td>0.52</td>
<td>0.52</td>
<td>0.425</td>
</tr>
<tr>
<td>Pain interference of daily life (MPI)</td>
<td>0.52</td>
<td>0.30</td>
<td>0.12</td>
<td>0.197</td>
</tr>
<tr>
<td>Life control (MPI)</td>
<td>0.66</td>
<td>0.56</td>
<td>0.14</td>
<td>0.259</td>
</tr>
<tr>
<td>Self-efficacy of pain</td>
<td>0.18</td>
<td>0.34</td>
<td>-0.40</td>
<td>0.010</td>
</tr>
<tr>
<td>Self-efficacy of other symptoms</td>
<td>0.43</td>
<td>0.43</td>
<td>-0.17</td>
<td>0.116</td>
</tr>
<tr>
<td>Dynamic balance</td>
<td>0.31</td>
<td>0.83</td>
<td>0.30</td>
<td>0.006</td>
</tr>
<tr>
<td>Global Severity index (GSI)</td>
<td>0.65</td>
<td>0.53</td>
<td>0.31</td>
<td>0.263</td>
</tr>
<tr>
<td>Personality Severity Index (PSI)</td>
<td>0.43</td>
<td>0.33</td>
<td>0.25</td>
<td>0.770</td>
</tr>
<tr>
<td>State Symptom Index (SSI)</td>
<td>0.72</td>
<td>0.57</td>
<td>0.33</td>
<td>0.179</td>
</tr>
<tr>
<td>Physical Health (SF-36)</td>
<td>0.78</td>
<td>0.38</td>
<td>0.30</td>
<td>0.337</td>
</tr>
<tr>
<td>Mental Health (SF-36)</td>
<td>0.30</td>
<td>0.66</td>
<td>0.21</td>
<td>0.232</td>
</tr>
<tr>
<td>Positive self-image</td>
<td>0.29</td>
<td>0.13</td>
<td>0</td>
<td>0.296</td>
</tr>
<tr>
<td>Negative self-image</td>
<td>0.32</td>
<td>0.20</td>
<td>0.43</td>
<td>0.698</td>
</tr>
<tr>
<td>Total effect-size</td>
<td>0.53</td>
<td>0.37</td>
<td>0.18</td>
<td>0.044</td>
</tr>
</tbody>
</table>

Table 5 shows that there were few significant differences between the three groups when comparisons were made on a variable level. Significant differences were found between the treatment groups on.
Results

self-efficacy of pain, dynamic balance and total effect-size. Post-hoc analyses showed that self-efficacy of pain and dynamic balance were in favour for FK in comparison to TAU. BAT showed significantly higher total effect-size in comparison to TAU. Total effect size was calculated on 61 patients. Ten patients were missing due to incomplete data. On most of the outcome variables, the results showed that the two group treatments achieved a higher effect-size value than TAU. This implies that BAT and FK achieve medium to large effect size values on nearly half of the outcome variables, while TAU in general achieve small effect-size values.

An additional analysis of changes in sick-leave reported that the percentage of patients on sick leave in the total group diminished from 38 % before the interventions to 28 % at the one year follow up. The reduction in sick leave was found only in the BAT group while there were no changes in the FK and the TAU group.

Subgroups and outcome patterns (Paper V)

To find outcome patterns of the effect-size values of all outcome variables used in this study, a factor analysis was performed. This factor analysis, which explained 65,4 % of the variance, indicated four dimensions of associated outcomes: a psychological health dimension, a pain and physical health dimension, a self-image dimension and a balance dimension. To identify subgroups of patients with similar outcome patterns a K-means cluster analysis was performed using the constructed four factor score variables. A solution with three subgroups (clusters) gave the most appropriate solution with regard to minimum variance within clusters, maximum difference and relative uniform size of clusters. In order to characterise in more detail the three cluster groups, they were compared with regard to their effect-size values on each of the outcome variables. In Table 6 the mean of the effect-size values of all outcomes are presented and compared between the three cluster groups by using one-way ANOVA.
### Results

Table 6. Mean effect-size values of the outcome variables in the three cluster groups, the psychological effect group (n = 14), the pain effect group (n = 23) and the non-effect group (n = 24).

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Psychological effect group mean</th>
<th>Pain effect group mean</th>
<th>Non-effect group mean</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total body area of pain (in %)</td>
<td>0.26</td>
<td>0.67</td>
<td>-0.10</td>
<td>0.001</td>
</tr>
<tr>
<td>Pain intensity (MPI)</td>
<td>0.44</td>
<td>1.59</td>
<td>-0.11</td>
<td>0.001</td>
</tr>
<tr>
<td>Pain interference on daily life (MPI)</td>
<td>0.50</td>
<td>0.70</td>
<td>-0.22</td>
<td>0.001</td>
</tr>
<tr>
<td>Life control (MPI)</td>
<td>0.70</td>
<td>0.96</td>
<td>-0.29</td>
<td>0.001</td>
</tr>
<tr>
<td>Self-efficacy of pain</td>
<td>0.39</td>
<td>0.40</td>
<td>-0.54</td>
<td>0.001</td>
</tr>
<tr>
<td>Self-efficacy of other symptoms</td>
<td>0.48</td>
<td>0.64</td>
<td>-0.22</td>
<td>0.001</td>
</tr>
<tr>
<td>Dynamic balance</td>
<td>0.32</td>
<td>0.50</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>Global Severity index (GSI)</td>
<td>0.79</td>
<td>0.52</td>
<td>0.14</td>
<td>0.01</td>
</tr>
<tr>
<td>Personality Severity Index (PSI)</td>
<td>0.30</td>
<td>0.37</td>
<td>0.24</td>
<td>0.85</td>
</tr>
<tr>
<td>State Symptom Index (SSI)</td>
<td>0.86</td>
<td>0.55</td>
<td>0.14</td>
<td>0.002</td>
</tr>
<tr>
<td>Physical health (SF-36)</td>
<td>0</td>
<td>1.46</td>
<td>-0.11</td>
<td>0.001</td>
</tr>
<tr>
<td>Mental health (SF-36)</td>
<td><strong>1.38</strong></td>
<td>0</td>
<td>0</td>
<td>0.001</td>
</tr>
<tr>
<td>Positive self-image</td>
<td>0.57</td>
<td>0.18</td>
<td>-0.15</td>
<td>0.001</td>
</tr>
<tr>
<td>Negative self-image</td>
<td><strong>1.25</strong></td>
<td>0.12</td>
<td>0</td>
<td>0.001</td>
</tr>
<tr>
<td>Total effect-size</td>
<td>0.59</td>
<td>0.62</td>
<td>0</td>
<td>0.001</td>
</tr>
</tbody>
</table>

The results of the cluster analysis showed that the three cluster groups had significantly different outcome patterns. Two cluster groups, covering around 60% of the patients, showed positive treatment effects, and one cluster group, with nearly 40% of the patients, showed small or even negative treatment effects. One of the two positive treatment groups achieved large effect-size values on psychological symptoms, mental health and on negative self-image. This cluster group was labelled the **psychological effect group**. The other cluster group with positive treatment effects improved more on pain variables such as pain intensity, life control and physical health and was accordingly labelled the **pain effect group**. The third cluster group with negative treatment effects was labelled the **non-effect group**. Post hoc analysis showed that there were no significant differences between the psychological effect group and the pain effect group on any of the outcome variables except for physical health and a negative self-image. On psychological symptoms (GSI, SSI), self-image and mental health, there were only significant differences between the psychological effect group and the non-effect group. On pain outcomes according to MPI and Self-efficacy both the psychological effect group and the pain effect group showed significant higher
effect-size values than the non-effect group. On pain drawing (total body area of pain in %) and physical health, the pain effect group, showed significant higher effect-size values than the psychological effect group and the non-effect group.

The comparison of initial outcome variables between the cluster groups showed that the psychological effect group had a significantly higher negative self-image and a lower mental health status before the intervention, coinciding with where this subgroup reached the highest effect-size values. The pain effect group and the non-effect group showed similar values on several of the outcome variables and small tendencies to differences were found between them.

When the three cluster groups were analysed for their participation in the three treatment approaches - BAT, FK and TAU - a significant difference was found ($p<0.039$). The psychological effect group was more represented in BAT, the pain effect group in FK and the non-effect group in TAU, (Table 7).

Table 7. Numbers and (%) of subjects from BAT, FK and TAU represented in the three cluster groups.

<table>
<thead>
<tr>
<th>Treatment intervention</th>
<th>Psychological effect group</th>
<th>Pain effect group</th>
<th>Non-effect group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 14</td>
<td>n = 23</td>
<td>n = 24</td>
</tr>
<tr>
<td>BAT</td>
<td>7</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>FK</td>
<td>4</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>TAU</td>
<td>3</td>
<td>5</td>
<td>14</td>
</tr>
</tbody>
</table>

**Gender differences (Paper I-V)**

Comparisons between men and women in the total patient group were performed on all initial status variables including background variables as well as outcome variables. No significant differences were found between gender except that the women reported significantly higher initial values on pain severity ($p<0.05$) and Physical Functioning (PF) ($p<0.05$). There were no significant differences in outcome effects between gender.
Predictors of outcome (Paper III-V)

To identify predictors of outcome, the relationship between background variables, initial status variables and outcome calculated in effect-size in the total patient group were examined. It was found that age and gender had no correlation with treatment effects. A higher education showed a positive correlation to improvements of life control and self-efficacy of symptoms.

The results also showed that health-related factors, as sense of coherence, a positive self-image and mental health were positively related to each other but did not predict a better outcome. Instead they were negatively correlated to psychological symptoms at baseline. A general pattern was that there was a positive correlation between a high initial value of a specific variable and the effect-size of the same variable. For example, high pain intensity at pre-treatment was associated with a large effect on pain intensity. Another general pattern was that initial values of pain variables correlated to improvements of psychological symptoms. Furthermore, a longer duration time of symptoms was negatively correlated to improvements of pain interference.

When possible predictors were examined that could explain the different outcome patterns in the three cluster groups or subgroups (Paper V), it was found that a negative self-image and mental health at baseline, differed significantly between the cluster groups, which meant that a large negative self-image and a low mental health predicted large effect-size values on psychological variables. There were no significant differences at baseline, between the cluster group that achieved large effect-size on pain and physical function compared to the cluster group with negative outcome effects. When the cluster groups were analysed for their participation in the three treatment approaches, it was found that significantly more patients in the two cluster groups with a positive outcome had received group treatment. The logistic multiple regression analyses showed that the odds ratio for a positive treatment outcome in BAT was 6.6 and in FK 4.1 compared to TAU.
DISCUSSION

What are the characteristics of patients in primary care with non-specific musculoskeletal disorders? Do they have more health problems than people in general? Does it matter what physiotherapeutic treatment is offered, and is it possible to identify important factors that could predict which patients will benefit from different treatment approaches? These questions were the starting-point for this thesis and will be discussed further on the basis of the results from the included papers.

Heterogeneity of health problems

Patients with non-specific musculoskeletal disorders are commonly encountered by physiotherapists in primary care. Physiotherapists often feel frustrated when dealing with these patients because of diffuse diagnoses and the fact that treatment often shows poor long-term results. The referral details often contain a vague pain and symptom diagnosis without verifiable pathology (Jørgensen et al., 2001). However, the results from study I reveal that there is a great heterogeneity in this patient group and the patients showed a variety of problem profiles.

The multivariate analysis showed that it was possible to characterize the group by means of two dimensions. One was that nearly half the patients had pain disorders related to psychological problems while the remainder seemed to feel well despite pain problems. The other dimension was related to differences in age and employment.

In the group with psychological problems it was possible to identify a sub sample with more severe psychiatric disorders. In this subgroup family relationship problems were related to physical and sexual abuse, suicidal thoughts, depression and anxiety. This cluster of factors may be important predictors of both physical and psychological ill health, which is in accordance with findings in other studies (Finestone et al., 2000). In particular depression has shown to be related to early childhood trauma (Portegijs et al., 1996). In our total patient group, half had experienced one or more previous depression episodes, which is higher than the proportion reported in
the general population (Folkhälsorapporten, 2001). This prevalence of physical abuse is in agreement with other population-based studies in Sweden and in other countries (Finkelhor et al., 1990, Risberg et al., 1999). In the above-mentioned sub sample we also found that mostly all had experienced depression episodes. Patients with such negative life events in childhood are regarded as a category likely to develop chronic problems and may need special help within primary care (Portegijs et al., 1996, Mattson et al., 1998).

The second dimension, related to age and employment, showed that family problems and work conflicts were more common in younger patients, while in the older patients physical problems and sick leave were more common. The older patients also seemed to be more satisfied with their lives than did the younger. Moreover, the only factor that was related to life satisfaction was close social relationships. This difference may however be due to a change in society, in that younger people now speak more openly about emotional and relationship problems. That younger age was associated with more psychosocial problems at home and at work probably reflects the impact of increased stress in society. According to a recent national health report, the perceived health in younger persons gradually decreases while the middle-aged and elderly appear to have a more favourable health development (Folkhälsorapporten, 2001).

Compared to reference groups of healthy individuals, the patients in this thesis showed poor health. As shown in Paper II, significant differences in balance performance were found between the study group and a whiplash group, compared to the group of healthy individuals. The patients also reported significantly higher psychological distress and a more negative self-image than two reference groups (Paper III). The ratings for health-related quality of life seem to be much lower than the reference values of the Swedish population (Sullivan et al., 1994). Other studies have also confirmed that patients with musculoskeletal disorders are a group that have markedly poorer physical and mental health than the general population and even lower than other chronic pain groups with more well-defined diagnoses (Sprängers, 2000, Jörgensen et al., 2001). This implies that more attention must be put on the consultation and the assessment of these patients in primary care.
Discussion

Treatment effects

One main conclusion of this thesis was that all three treatment modalities achieved positive treatment effects over time. However, we also found that the magnitude of the effect depends on which treatment approach is offered. Both Body Awareness Therapy and Feldenkrais achieved larger treatment effects compared to individual physiotherapy, and when the patients were grouped according to outcome patterns, it was evident that a positive outcome was associated with BAT and FK treatment.

A critical question is whether the magnitude of the effect indicates that there is a "specific" treatment effect or simply a result of placebo or non-specific treatments. Bergin and Garfield (1994) have estimated the upper limit of placebo effect-size to be 0.4. Comparing this to our results, it can be concluded that since BAT and FK were above this value they do have some specific treatment effects. There is however almost no support for specific treatment effects above the placebo level for TAU. This does not mean that values below 0.4 may not have clinical importance for the patients - on the contrary, the follow-up ASI-interviews generally indicated that the patients' subjective experience of both physical and psychological problems diminished significantly over time. The magnitude of our effect-size values is similar to a Cochrane Review of behavioural treatments for chronic back pain (van Tulder et al., 2000). In these studies the pooled effect-size varied from 0.35 - 0.62.

Let us speculate briefly on why BAT and FK in general achieved better treatment effects than did TAU. A major difference is that both BAT and FK are more active treatment modalities, focusing on strengthening bodily resources rather than on pain symptoms. Bodily symptoms are viewed as an expression of the total life situation, meaning that they promote a reflecting process of psychological insights and cognitive understanding of bodily problems (Mattson, 1998, Rosberg, 2000, Lundvik Gyllensten, 2001). On the other hand, in TAU, the attention is directed towards the pain and thereby patients may increase pain perception and reinforce pain behaviour. The fact that the patients in TAU group "were treated" by more passive methods may also lead to a "sickness role", which may develop a need for further treatment (Feuerstein and Beattie, 1995, Hope and Forshaw, 1999). This physical focus may also lead to an
Discussion

unrealistic search for those “treaters” who can offer a cure. In our study, we found that some of the patients in TAU were high consumers of treatment. Another difference may be treatment effects as a consequence of group treatment versus individual treatment. Being in a group of patients with similar problems may have several advantages. The patients can acquire new perspectives on their problems, and by supporting one another, can gain an increased self-confidence. There is good evidence of this in other studies (Mannerkopi, 1999).

Positive and negative outcome patterns

Another main conclusion of the present thesis is that not all patients benefit from the treatments offered. We identified three subgroups on the basis of the outcome pattern of all 14 outcome variables. Two subgroups showed positive change and one subgroup showed negative or zero change. Sixty percent of the patients belonged to the two subgroups with positive outcome and as many as 40% of the patients belonged to the negative outcome group. However, the proportions of patients with a positive outcome are quite different in the treatment groups: showing that 79% of the patients in the BAT group, 70% of those in the FK group and 36% in the TAU group belonged to the positive outcome groups.

One subgroup showed more improvements as regards psychological distress than the other two subgroups. As could be expected, BAT was more beneficial for this group since BAT was developed for patients with psychological disorders. The bodily exercises in BAT focus on increasing body stability and thrust in the bodily ability, which is considered to be an important part of self-thrust, and self-identity (Hedlund and Gard, 2000). We found that the only factors distinguishing this outcome-group from the other two groups at baseline were a negative self-image and poor mental health. These two aspects might be valuable ingredients in a screening instrument for patients in primary care.

The other two subgroups were quite similar at baseline and can be considered as healthier psychologically but still suffering from pain problems. The only difference between these two groups is that those belonging to the positive outcome group more often received FK or
Discussion

BAT than TAU, while the opposite was true for those belonging to the negative outcome group. The conclusion therefore might be to recommend FK or BAT to patients with relatively good psychological health but who suffer from pain problems.

Special interest must be paid to the third subgroup of patients that did not seem to benefit from any treatment modality. We were not able to identify any significant predicting factor for this subgroup. However, as the total sample size was small it might be relevant to discuss non-significant tendencies in order to obtain an idea of what might turn out to be predictors of poor outcome. This patient group tended to be older, had less education and a longer duration of symptoms. These factors have been shown to be important predictors of long-term disability and sick leave in several studies (Straaton et al., 1995, Blank and Diderichsen, 1996). These patients also seemed to be well adapted to their life situation. The most plausible explanation might thus be that it is a group with chronic pain disorders probably related to physically heavy and monotonous work and that improvements may not be expected owing to the chronicity of the problems. After all, the main improvements that could be expected for this group are related to the experience of pain and we do not know whether this is at all possible or not.

A more provocative explanation may be that social factors such as the development of a sick-role behaviour and compensation aspects can have a negative impact on treatment results. According to Waddell (Waddell, 2000) all illness involves some secondary gains. Some people do not have the motivation to change or the emotional and social resources to deal with life problems and if treatment fails, illness and secondary gain might be the best solution. Maybe it is not realistic to believe that all patients will improve from interventions no matter what is offered. Treatment results probably depend on a complex interplay between social and individual factors as well as on the kind of intervention that is given.

Predictors of outcome

A large body of research deals with attempts to find out which factors may be the most important predictors of long-term disability in patients with chronic pain. Recent studies have indicated that there is
a greater risk of poor outcome in individuals with neck pain compared to individuals with back pain (Regio et al., 2000, Kjellman et al., 2001). However, in some studies it has been found that individuals with one of these disorders tend to experience the other complaint as well (Coté et al., 2000). Most of the patients in this thesis have a combination of both neck and back disorders related to a high degree of psychosomatic symptoms and this clinical picture has often found to be related to a poor prognosis.

In contrast to other studies, ours did not find that health-related factors such as a positive self-image, high sense of coherence and self-efficacy predicted a better outcome (Johansson, 1999, Söderlund, 2001). One explanation for that may be that these factors were related to a lower level of psychological distress at baseline. However, it is also likely that factors considered to be healthy predictors in an early stage of pain disorders acquire a different significance in a chronic phase (Waddell, 2000). Rather, a higher level of symptomatology of both pain and psychological distress at baseline were more closely associated with a better outcome. This is at first sight surprising, as multiple complaints are usually related to a poor prognosis (Gureje et al., 2001). One interpretation may be that these patients express suffering that makes them motivated to experience changes that reduce suffering and increase well-being (Clarke, 2000).

Another aspect is that patients who feel bad at pre-treatment have a greater span to improve in than those who feel somewhat better, while patients who are well initially have a greater span to deteriorate. This may also be a statistical artefact known as “regression to the mean” in our study, since we used repeated measurements with the same instruments (Whitney and Von Korff, 1992). We found almost no deterioration for patients with initially high levels of predictor variables, which however make this interpretation less likely. In agreement with other studies, higher education was positively related to a better outcome while neither age nor gender seemed to play an important role for the outcome.

The multivariate logistic regression analysis revealed that the only factor of predictive significance was the kind of modality that had been given. The chance of achieving a positive treatment outcome was much higher in the group treatments. It is possible that we could have identified other factors, if for instance motivational aspects had
been included as found by Grahn in a similar chronic pain group (Grahn et al., 1999). Measuring coping strategies and beliefs about pain and pain recovery, particularly fear avoidance behaviour could have been other alternatives (Vlaeyen and Linton, 2000).

**Gender aspects**

Probably because of the small number of male participants in this study, statistically significant differences between men and women were few. The only significant difference was that women reported higher pain intensity and a lower physical health than men before the intervention. However, in most studies of non-specific musculoskeletal pain women are over-represented (Unruh, 1996). The fact that few men fulfilled the inclusion criteria could be because body reactions to stress are different in men and women. Women may be more prone to develop disorders in the musculoskeletal system than men. In childhood and adolescence, a higher prevalence of musculoskeletal and psychosomatic complaints has been found in girls (Koutantji et al., 1998, Berntsson et al., 2001). Gender-specific illness patterns are also reported in general population studies where women have a higher prevalence of widespread musculoskeletal disorders and emotional problems, while men have higher rates of organic diseases and more anti-social problems, such as violence, criminality and drug abuse (Folkhälsorapporten, 2001). To achieve an understanding of the meaning of reported symptoms and illnesses it is necessary to be aware of the patients' gendered concerns and psychosocial circumstances (Johansson et al., 1999). Albeit few differences were found between men and women in this study, gender aspects are important for further studies of this patient group, particularly how paid and unpaid work and leisure time influence women's and men's health (Kilbom et al., 1998).

**Methodological considerations**

There are several methodological aspects to discuss in this thesis. A major problem is the small group sample sizes and the relatively large variability within the treatment groups, which makes it difficult to detect true differences in outcome between treatments. The fact that
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all groups are active treatment groups increases the power problem (Kazdin and Bass, 1989). To detect a true difference of 0.3 in effect-size between the three groups with an 80 % power, nearly 50 patients in each group would have been needed. However, by using statistical methods such as factor analysis and cluster analysis, that reduced variance due to variables and individuals, the possibility to detect significant differences increased.

The quasi-experimental control design with lack of random assignment to groups means that there are threats to the internal validity (Cook and Campell, 1979). A critical question is whether other events than treatments have contributed to the improvements. The study does not provide an answer to this question. Other factors than treatment are also difficult to check for in clinical studies. One relevant question is whether the patients would have improved anyway as a consequence of the natural course of the disease. Most natural improvements occur within three months of the onset of symptoms (Waddell, 2000). Although there might be fluctuations in the patient’s pain problems over time, most research on chronic neck and back pain have shown poor long-term prognosis (Borghouts et al., 1998, Kjellman, 2000). In this study, no patients had had their problem for less than three months and were therefore at risk of developing chronic pain and disability. The fact that all three treatment groups showed improvements at the one-year follow up reinforces the interpretation that the interventions have had some effect.

Another threat is that the results were influenced by the attention given to patients due to the research setting, the testing and interviewing. Thus, the instrumental procedure may have influenced the results in a positive way. This could be part of the explanation for the positive change over time for all treatments (see discussion about placebo vs. specific effects), but cannot account for any differences in outcome between treatments. Here the blinding and allegiance of the investigator who did all measurements is more critical. On the positive side this ensures that the measurement procedure was performed in a similar manner for each patient. However neither the examiner nor the patients were blinded with respect to what treatment they had been offered. The only information the patients had received was that different physiotherapeutic treatments would be compared but they did not know what the other groups were given.
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If the investigator had been a person with no knowledge in the field and with no expectancies regarding results, it could have been a more optimal setting.

The instruments utilized in this thesis are considered to have good reliability and validity. Using several instruments for measuring pain and psychological distress contributes to the conceptual validity of the study. A shortcoming is, however, that the methods are mainly based on self-report instruments. A triangulation with other methods, such as interviews (Lincoln and Guba, 1985), or additional bodily examination instruments, could have strengthened the concept validity by providing different perspectives on the outcome.

The small number of dropouts (9%) must be considered as minor and having little impact on the results. These persons did not differ from the rest with regard to background variables and initial status.

The non-random assignment into groups could have caused selection bias associated with subject characteristics in the treatment groups (e.g. age, gender, education, motivation and initial status). Two strategies that might have increased similarity in the groups were that the information about selection criteria was provided both orally and in written form to all health professionals concerned, and that both physicians and physiotherapists or Feldenkrais instructors examined the patients to make sure that they fulfilled these criteria. The fact that there were no significant differences between groups on either background variables or initial outcome variables except for gender argues against an interpretation based on a selection bias.

The impact of therapist characteristics on treatment outcome might have been unequal in the groups, particularly in the TAU where several therapists were engaged. A variety of therapist characteristics, such as age, gender, level of empathic understanding and amount of experience are aspects that can influence change (Bergin and Garfield, 1994). In a review, it has been suggested that differences in treatment outcome due to therapists’ characteristics are less obvious in studies with experienced therapists using treatment manuals (Crits-Christoph, 1991). All therapists involved in the present thesis were female except for one with long professional experience of treating pain patients in primary care. Treatment manuals were used in the two group treatments, to assure consistent use of these treatment modalities. The
therapists were also contracted to 20 sessions, which was considered to be sufficient to produce change. TAU was however carried out without any contracts or manuals in order to resemble ordinary practice in primary care. The results revealed that there was a great difference in individual amounts of treatment within TAU. As we did not find any strong correlation between amount of treatment and outcome in TAU we think that the great variance in treatment sessions is of minor importance. The use of many therapists in TAU might have contributed to a greater variance in outcome for this group than if few therapists had been used.

Concerning the external validity, the results may be representative for women with non-specific musculoskeletal disorders in primary care, but not for men. As there were so few men in the study they may not be typical of other men with these symptom diagnoses. Factors that strengthen the generalisation to women are that included patients were recruited from different parts of Sweden, they varied in age, and all socio-economic classes were represented even if the greater part consisted of workers and lower-grade employees. One problem is that the definition non-specific musculoskeletal disorders is a vague and unclear term, relying mostly on symptom descriptions and must be considered as a weakness regarding the generalization. In several studies of musculoskeletal disorders there is often a mishmash of both non-specific symptom descriptions and more well defined diagnoses due to organic causes and with specific diseases. In future research, it is of utmost importance to find other more relevant classification systems for this patient group.

The strength of the design lies in that it covers a one-year period with two follow-ups. Since most treatment studies are short-term studies with measurements before and directly after the treatment period, there is a lack of knowledge about long-term clinical courses of different treatment interventions. Recently, some studies have been published on patients with musculoskeletal disorders, which include both a two-year and a three-year follow-up (Grahn, 1999, Waling et al., 2002). However, a problem with long-term studies is the fact that other life events may have an impact on the estimate of treatment effects.
The main conclusion from this thesis is that group treatment modalities with Body Awareness Therapy and Feldenkrais approaches are more beneficial than individual physiotherapeutic treatment for patients with non-specific musculoskeletal disorders. The chance of achieving positive treatment effects increases six times with BAT and four times with FK compared to TAU. The magnitude of the achieved treatment effects was in line with what has been found for cognitive-behavioural treatment. This implies that group treatment modalities such as BAT and FK can be recommended for a large proportion of these patients in primary care.

A negative self-image and poor mental health were good indicators for patients who showed large psychological improvements. Among more healthy patients with pain disorders, we were not able to identify specific indicators for those who improved well as opposed to those who did not improve. The only factor that showed predictive value was which treatment modality the patients had been given.

There was a subgroup of patients that did not benefit from any of the treatment interventions. They can be classified as a chronic pain group. For these patients there might be other alternative interventions than physiotherapeutic treatments. It is possible that some kind of group intervention of a supportive nature, not necessarily organised within health care, might be of value for these patients.

The patients in this thesis proved to be a very heterogeneous group with different health problems due to both present and previous life events. The multidimensional clinical picture indicates that more attention must be paid to the consultation for these patients in primary care. There is a need to find screening and assessment tools that could be useful for health professionals in meeting these patients in order to plan relevant treatment interventions. The ASI-instrument was found to be a valuable tool for obtaining a total picture of the patient's life situation.
The complexity of the problems indicates the need to focus more on multidisciplinary collaboration work in primary care. For patients with more severe psychological problems, additional psychological interventions might be needed.

- More basic research into patients with non-specific musculoskeletal disorders in primary care is necessary. There are many uncertainties about the best way of providing health care for this patient group. It is important to take into account the clinical findings in the individual patient and better differentiate the patients into subgroups according to their specific needs. In future research, it is important to study patients in an earlier stage of pain symptoms and to identify those who are at risk of developing chronic pain and disability. This implies the need to carry out long-term prospective studies including a large sample of patients. Paying more attention to motivational aspects as well as the patient’s expectations about treatment and recovery might provide valuable information for predicting further outcome. When evaluating the effectiveness of different treatment approaches it is also necessary to study additional health care consumption and to add cost-effective analysis.
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