THE RELATIONSHIP BETWEEN PAIN AND DISABILITY

How are different aspects of pain associated with disability?

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Abstract

The biopsychosocial model of pain and disability suggests that there are many factors involved in chronic pain and the associated disability. The disability associated with chronic pain impacts on both the individual and society. Disability was traditionally thought to be a direct function of pain. Pain and disability are now understood to be separate but related constructs. Pain intensity is an aspect of pain which is often used to measure the relationship between pain and disability. Pain extent is another aspect of pain which has been previously found to be associated with disability. The overall goal of the present study was to examine the relationship between pain and disability. Participants were 290 chronic pain patients referred to a rehabilitation institute for a functional capacity evaluation, the majority of whom were suffering from back pain or Occupational Overuse Syndrome (OOS). The Oswestry measure of disability, visual analogue scales measuring current, best, and worst pain intensity, pain drawings to measure pain extent, demographic and general information relating to the pain problems was collected. The characteristics of the sample and the back pain and OOS diagnosis groups were examined. Multiple regression analyses were used to explore the relationship between pain and disability and assess the degree to which pain extent might contribute to this relationship. Pain extent was found to be significantly associated with disability but to a lesser degree than pain intensity. Findings suggest that pain is an important aspect of disability, however, it fails to explain it completely. There were several methodological difficulties associated with the present study, particularly the amount of missing data due to inconsistent data collection, and that participants with OOS did not complete the measure of disability. Future research should address these issues and incorporate other factors such as social variables into the analyses.

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There is no conclusion to the study of pain..... It is thus impossible to close the door: to say that pain henceforth means exactly this or that and no more.

Morris, 1991, p 267.

CHAPTER ONE

Introduction

Theoretical Background

Overview

The way in which pain is conceptualised has changed through the ages. At the beginning of this century pain was thought of as a sensory experience directly related to a physical injury. Gradually, theories of pain have evolved that acknowledge the involvement of not only physical but psychological and social factors. Initially, the development of these theories will be discussed and a definition of pain presented. Following this, the concept of disability will be introduced and the relationship between pain and disability explored. The musculoskeletal disorders of back pain and occupational overuse syndrome shall be used to illustrate the impact of chronic pain and disability.

Pain Theories In the Biomedical Model of Health

The biomedical model of health suggests that mental and physical aspects of health be considered as separate (Sheridan & Radmacher, 1992; Brannon & Fiest, 1992). Early this century this model of health was predominant and resulted in conceptualisations of

pain which saw pain as the direct result of physical injury (Gamsa, 1994). Pain was explained as a physiological response to a noxious stimulus, hence psychological aspects of pain were neglected (Merskey & Spear, 1967).

The biomedical model of pain was based on the ideas of Descartes who suggested a direct pathway between the noxious stimulus and pain. Descartes illustrated these ideas in 1644 with an illustration showing an individual responding to the heat of a fire (Wall, 1989). The individual was envisaged as quickly removing their limb from the fire when the pain message travelled along the body and triggered a response. A direct pathway between the noxious stimuli and the brain was implied. In the biomedical model pain was accounted for by specificity theory or pattern theory (Kugelmann, 1997). Specificity theory describes a specific pain system which carries messages from pain receptors in the skin to a pain centre in the brain (Melzack & Wall, 1982). This theory assumes that there is a direct relationship between a noxious stimulus and the pain response.

There are several types of evidence which suggest that there is not a direct relationship between a noxious stimulus and the pain response. For example, Beecher (1959) reported cases of soldiers who did not appear to feel pain even though they were severely injured. He suggested that the meaning of an individual's pain to them influenced the experience of pain. Various theories described as 'pattern theories' were developed to try to explain these phenomena. Pattern theories saw stimulus intensity and central summation as critical determinants of pain (Melzack & Wall, 1982). These

theories proposed that patterns of nerve impulses which evoke pain are produced by the summation of skin sensory input at the dorsal horn cells of the spinal cord.

The Gate Control Theory of Pain

Specificity theory and the pattern theories were each able to explain a number of phenomena associated with pain. However, there was a need to find a theory which integrated these theories and was able to satisfactorily explain all of the phenomena associated with pain. A theory which integrated psychological processes into pain perception and response was needed. In 1965 Wall and Melzack proposed the gate control theory which described how information resulting from a noxious stimuli may be regulated on its journey from the peripheral nerves to the central nervous system (Melzack, 1991; Miller & Kraus, 1990). This theory describes how neural mechanisms in the dorsal horns of the spinal cord act as a gate that can increase or decrease the flow of nerve impulses from the peripheral nerves to the spinal cord cells. This means that information from the nociceptors, the specialised sensory cells of the nervous system that carry pain information, is modulated before pain is perceived. Clinical evidence has since supported the gate control theory (Tyrer, 1992). There have been several control systems discovered which change the response of the dorsal horn cells in the spinal cord. These include descending pathways that allow the brain to influence the transmission of pain at the level of the spinal cord (Wall, 1988).

The gate control theory explains how psychological and social influences may indeed modulate an individual's perception of and response to pain. The gate control theory does not separate the mind and the body, and allows pain to be regarded as more than a

simple physical sensation (Kugelmann, 1997). Pain is rather a sensory and emotional experience modulated by mental, emotional, and sensory mechanisms (Waddell, 1987).

Further development of theory lead to the introduction of cognitive and affective aspects of pain. Melzack and Casey (1968) proposed that sensory, motivational-affective, and cognitive processes interacted together to produce the pain experience. Higher central nervous system processes were thought to have control over the sensory and motivational-affective systems through the gate control mechanism. Evidence of these three dimensions of pain was found in a study by Melzack and Torgerson (1971). Participants were asked to classify a number of words into groups. Three classes of words were identified using a multidimensional scaling method. The three classes described sensory, affective, and evaluative aspects of pain. These descriptive words were then used to develop the McGill Pain Questionnaire (Melzack, 1975).

Models of Pain

The behavioural, cognitive-behavioural, and biopsychosocial models of pain illustrate the recognition that pain is not simply a physical response to a noxious stimulus. These models give considerable importance to not only psychological factors but social factors as well.

The Behavioural Model of Pain

Central to the behavioural model of pain is the concept of pain behaviours (Fordyce, Fowler, Lehmann & De Lateur, 1968). Pain behaviours are the behaviours that an

individual exhibits to reflect the presence of pain. For example, grimacing, crying, and taking medications. Pain behaviours are viewed as operants and are therefore subject to learning processes such as reinforcement, conditioning, and extinction (Fordyce, 1986). Pain behaviours are not only reinforced and shaped by others but also influence and shape the behaviour of others (Keefe, Dunsmore & Burnett, 1992). For example, a parent will console their injured child. The alleviation of the child's pain can be followed by gratitude and relief which is rewarding to the parent giving help. In terms of operant conditioning the pain behaviour, perhaps crying, of the child experiencing pain has been reinforced by parental attention and will perhaps come under the control of the reinforcer rather than the eliciting stimulus, pain. The attention giving behaviour of the parent may also be reinforced by gratitude and a reduction of the child's crying (Fordyce et al., 1968).

There is also evidence that pain behaviours are able to be learned by social modelling or observational learning (Craig, 1978). The importance of social factors in behavioural theories has highlighted the role of the family in the development and maintenance of chronic pain (Turk, Flor & Rudy, 1987). Evidence to support these ideas has been found. For example, there have been several studies which have found an association between spouse solicitous behaviours and patient pain behaviours (Romano et al., 1995; Kerns, Haythornthwaite, Southwick & Giller, 1989). Families have also been included in the assessment and treatment of pain problems (Flor, Turk & Rudy, 1987).

Behavioural based treatment of pain focuses on pain behaviours. Using operant principles maladaptive pain behaviours are identified along with possible environmental

influences (Turk, Meichenbaum & Genest, 1987). Regulation of reinforcement for behaviours ideally results in the increase of adaptive behaviours and the decrease of maladaptive behaviours. Operant programs have been shown to successfully increase activity levels and decrease medication consumption (Linton, 1986). However, Turk, and Flor (1987) suggest that pain behaviours should be only part of a treatment program and the importance of other factors such as the cognitive and affective components of pain should not be ignored.

The Cognitive-Behavioural Model of Pain

The cognitive-behavioural approach has been applied to several types of chronic pain, including back pain and Occupational Overuse Syndrome (OOS) (Peterson, 1982; Keefe & Egert, 1996; Turk & Flor, 1984). Cognitive therapy approaches focus on the meaning of pain to the individual. They acknowledge that cognitive and affective aspects of pain are important (Keefe et al., 1992) by examining how attributions, expectations, beliefs, self-efficacy, personal control, attention, problem solving, and coping, influence the experience of pain (Gamsa, 1994).

Cognitive-behavioural treatment approaches usually include relaxation with imagery, cognitive re-labelling, and reinterpretation of pain related experiences, day to day problem solving, assertiveness training, and systematic desensitisation (Miller & Kraus, 1990). New ways of perceiving and thinking about pain are encouraged along with the development of coping strategies (Peterson, 1982). Findings suggest that cognitive coping strategies, particularly imagery, are effective in controlling pain (Fernandez & Turk, 1989). However, there have been findings which suggest that group cognitive-

behavioural treatment for out-patients may have similar effectiveness as general support from a clinician (Pilowsky, Spence, Rounsefell, Forsten & Soda, 1995). The authors of this study suggest that the findings do not detract from the value of cognitive-behavioural treatment but indicate that a choice of treatments is available and that general support may be helpful in pain management (Pilowsky & Spence, 1996).

The Biopsychosocial Model of Pain

The biomedical model explains health in terms of biological variables (Engel, 1977). In recent decades medicine has been moving away from this model towards a more integrated model of health (Kugelmann, 1997). Based on general systems theory the biopsychosocial model of health postulates that biological, psychological, and social factors are implicated in all stages of health and illness (Taylor, 1990; Sheridan & Radmacher, 1992). The gate control theory of pain provided the physiological basis for applying the biopsychosocial model to pain.

Figure 1 shows the most recent and sophisticated version of the biopsychosocial model of pain which was proposed by Waddell, Newton, Henderson, Somerville, and Main (1993). It is a further development of already suggested models, the Glasgow illness model (Waddell, Main, Morris, Di Paola & Gray, 1984) and a model of pain components proposed by Loeser (1982). The biopsychosocial model integrates the components of these models. The term 'biopsychosocial' lists the factors which the model takes into consideration. Biological factors are the physiological basis of pain. Psychological factors are the individuals cognitive processes and affective dimensions. Social factors are also important in the experience of pain interacting with the illness

behaviours of the individual. These factors are not mutually exclusive and interact with each other.

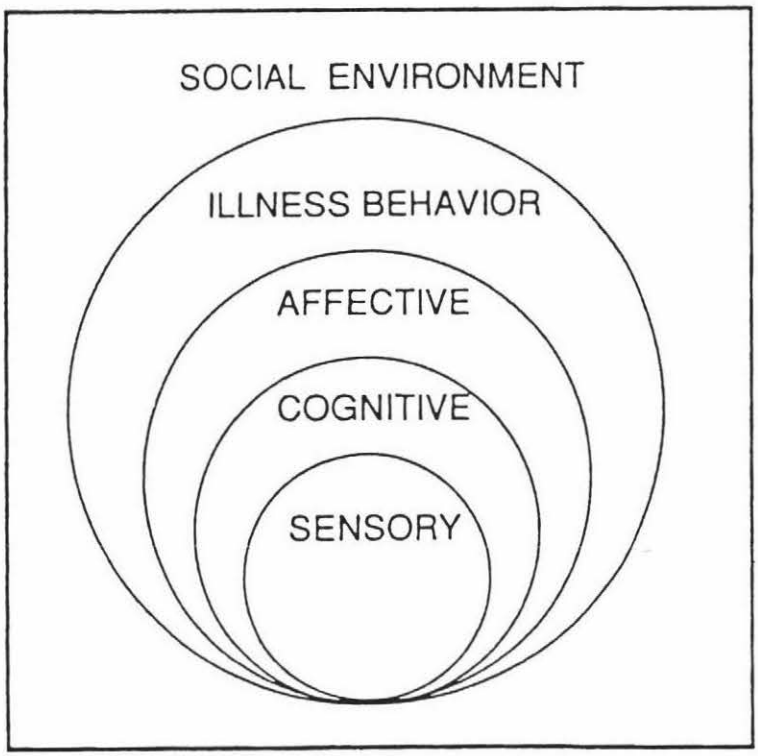

Figure 1. The biopsychosocial model of pain and disability.

(Waddell et al., 1993).

In keeping with the biopsychosocial approach to pain, comprehensive systems models which include behavioural and cognitive factors have been developed to understand pain behaviours. Included in these models are biologically controlled reflex responses, environmentally controlled verbal and motor behaviours, and psychologically controlled self-management and problem solving. The biological, environmental, and psychological factors are seen as interacting and regulating each other (Keefe &

Lefebvre, 1994). The development of a theory which contains many factors and interactions furthers the trend which acknowledges pain is not a simple construct and can not be analysed without taking into consideration the many factors which influence it.

The acceptance of the biopsychosocial model of pain which acknowledges that there are many factors involved in pain is reflected in the multidimensional treatment approaches which have been implemented (Aronoff & McAlary, 1988). Unlike treatment approaches in the biomedical model of health these approaches attempt to address the physical, psychological, and social contributions to the pain problem.

Definitions of Pain and Disability

Pain

A dissatisfaction with treatments for pain which only address physical factors and recognition that pain is a complex interaction between many factors has meant that the medical community has widened its understanding of pain from the traditional one based on specificity theory (Turk et al., 1983).

A recent definition of pain from the Subcommittee on Taxonomy of the International Association for the Study of Pain illustrates this point.

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

(Merskey & Bogduk, 1994, p 210).

This definition of pain includes both emotional and aversive qualities, the emotional aspect of pain is seen as integral to the definition. Pain is no longer seen as only a sensory response. Another important aspect of this definition is that it is recognised that it is not necessary for there to be tissue damage to experience pain. This is quite different from traditional definitions of pain which saw pain as the direct result of tissue damage.

Chronic and Acute Pain

The nature of the experience of pain seems to alter as pain persists. Acute pain is of short duration and is generally considered to be affected by sensory experience, although the meaning of the pain is able to alter the experience, as demonstrated in Beecher's (1959) study. Chronic pain is of longer duration and is usually understood to be pain which persists past the normal time of healing (Merskey & Bogduk, 1994). This time varies depending on the nature of the pain. However, there are conditions which are treated as chronic pain even though healing would not be expected to occur, for example, rheumatoid arthritis or migraine. Chronic pain can be the result of malignant conditions such as cancer, or non malignant conditions such as back pain.

There is evidence to suggest permanent changes in the central nervous system of chronic pain patients (Elton, Stanley & Burrows, 1983; Wall, 1989). These central nervous system changes may cause the continuation of pain after usual healing time. However, the physiological mechanisms of chronic pain are not as well understood as those of acute pain. Because medical treatment approaches are based on changing physiological responses acute pain is generally able to be controlled by the medical

profession using analgesics (Gibson, 1982). Attempting to combat chronic pain using medical management has not been as successful.

The biopsychosocial model of pain suggests that trying to understand the development of chronic pain by only examining physiological findings will not be very successful. As argued by the comprehensive models of pain such as the biopsychosocial model there is evidence that there are many psychological and social factors involved in the development of chronic pain (Turk, 1997). A number of these factors will be presented in Chapter 2. It is important to acknowledge that chronic pain is likely to be influenced by the environment more than acute pain because there is more time for an individual's behaviour to be influenced by factors other than physiological ones.

Impairment and Disability

Often it is assumed that a particular kind of impairment results in a certain level of pain and disability. Indeed, pain, impairment, and disability are related but they are seen as separate constructs. The definition of pain has already been discussed. The following definitions of impairment and disability are from the World Health Organisation.

"Impairment: abnormality of structure, appearance, and/or function at the end organ level."

"Disability : inability to perform an activity because of an abnormality of the person as a whole."

(Scheer & Weinstein, 1992 , p 356).

Impairment refers to the physical injury while disability refers to limitation of function of an individual. Sullivan and Loeser (1992) suggest that disability is the inability to meet the expectations of a certain role. An impairment such as the loss of a limb may result in disability in some roles but not others. Appreciating the differences between pain, impairment, and disability is important because individuals with the same injury or impairment may have different levels of pain and disability.

The proposed relationship between pain, impairment, and disability is shown in Figure 2 (Waddell, 1987). This diagrammatic representation shows how these three constructs are interrelated. In light of the biopsychosocial model of pain which applies general systems theory it is proposed that there is not a straight forward cause and effect relationship between pain and disability. The proposed relationship suggests that pain contributes to disability but that there are many other factors involved in disability.

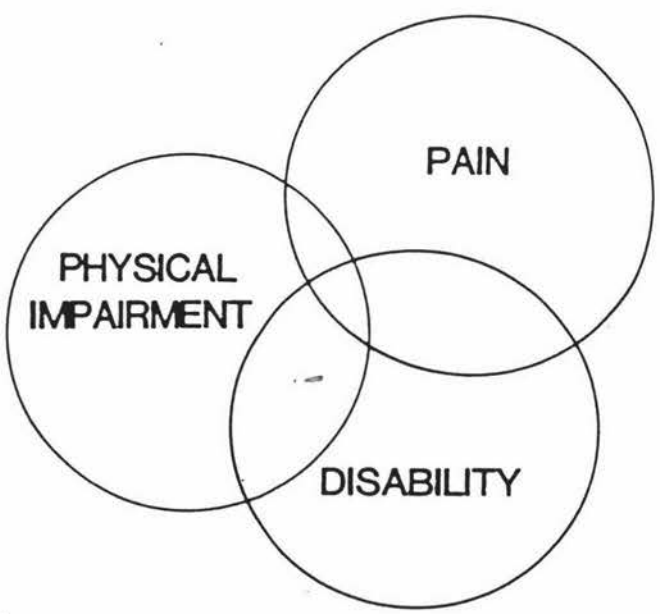

Figure 2. The relationship between pain, disability, and impairment.

Waddell (1987).

There have been conceptual definitions constructed separating nociception, pain, suffering, and pain behaviours (Loeser, 1982; Fordyce, 1988). Suffering is seen as a negative affective response due to pain or other emotional situations (Loeser, 1982). Pain behaviours are not seen as being the direct consequence of nociception, pain, and suffering. Fordyce (1988) suggests that suffering and pain behaviours are subject to environmental influences and that this subsequently influences disability. These ideas suggest that understanding the development of pain behaviours will increase our understanding of disability. As previously mentioned, pain behaviours are thought to be the result of many biological, psychological, and social factors (Keefe & Lefebvre, 1994).

The example of low back pain gives an illustration of the differences between impairment, pain, and disability. Waddell (1987) examined the duration of temporary disability from low back pain in the United Kingdom. He found an increase between 1960 and 1980 in the duration of temporary disability from low back pain but no change for other conditions. There was no evidence to suggest that the severity of back injuries had increased. Waddell suggests that high levels of disability associated with low back pain have come about in western society due to the assumption that pain indicates physical harm. Also, Waddell, Somerville, Henderson, and Newton (1992) found no identifiable physical basis for the disability associated with low back pain. It was suggested that there was a functional limitation rather than permanent physical impairment.

The devastating impact of the disability associated with chronic pain on the individual and those surrounding the individual cannot be underestimated. Some typical characteristics of chronic pain patients illustrate this point (Gallagher & Wrobel, 1982). Chronic pain patients have been suffering for long periods of time. Often they have tried numerous treatments and possibly operations. After many consultations with various professionals they feel frustrated. Commonly they are experiencing family problems due to their pain, reduced social interactions, and sleep problems. The cost of chronic pain to society as a whole, with respect to lost work hours, medical, and compensation claims, is also important to consider (Peate, 1994).

Musculoskeletal Disorders

Musculoskeletal disorders are a good example of the impact which chronic pain has on the individual and society. They have been found to be the most frequent causes of disability in working age populations (Peate, 1994). This is often due to comorbidity, individuals experiencing more than one pain complaint, and the association of musculoskeletal disorders with the work place (Parniapour, Nordin, Skovron & Fankel, 1990). Back pain and Occupational Overuse Syndrome are examples of musculoskeletal disorders which will be described and compared.

Back Pain

Back pain is the most common musculoskeletal disorder. The incidence of back pain is very high, approximately 80% of people experiencing an episode some time in their lives (Steinberg, 1982). Because back pain is so common it has been suggested that it

should be regarded as a normal part of life (Fordyce, 1988). Fortunately most episodes of back pain are mild and it has been found that only about one in four individuals with a back pain problem consult a doctor (Von Korff, Dworkin, La Resche & Kruger, 1988). Recovery is usually rapid, of those who experience an episode of back pain 50% recover within two weeks and 90% within three months (Lander, 1996). Fewer than 5% of patients with acute back pain go on to develop chronic back pain. Seventy five percent of those who suffer from an acute episode of back pain return to work within the first month. Of those who are left it is unlikely that they will return to work if they are off work for more than three months (McNaughton, 1996).

In spite of the high probability of recovery, because of the high incidence of back pain it is very expensive in terms of medical and compensation costs. The estimated total medical cost of this condition was $61 million in 1994 (Lander, 1996). However, there is also a large amount of money spent on compensation such as income replacement. In the 1994/1995 year back injury claimants received $367 million, representing about thirty percent of all Accident Compensation Corporation (ACC) claims (McNaughton, 1996). Chronic back pain accounts for 85% of the total cost of back pain (Lander, 1996).

The etiology of back pain is poorly understood. Terms such as lumbar disc disease, lumbosacral strain and spondylosis are used to describe back pain. However, these terms are often used to describe the symptoms of back pain rather than the cause (Flor & Turk, 1984). As few as 20% of back pain patients have a specific organic cause for their pain diagnosed (Kirwan, 1989). Although sophisticated diagnostic techniques,

such as magnetic resonance imaging scans, have proven to be of some assistance, it has been found that spinal abnormalities are present in individuals with and with out back pain (Jensen et al., 1994).

Traditional treatments for chronic back pain based on the biomedical model appear to have exacerbated the problem (Townsend, 1994). For example, medical treatment approaches for chronic back pain include medication, surgery, physical therapy, and bed rest have little support from controlled trials ("Acute low back problems", 1994). These approaches also ignore the importance of psychological and social factors involved in chronic back pain and the associated disability. It appears that treatment orientated towards minimising disability, based on the biopsychosocial model of pain, are the most useful for chronic back pain sufferers (Waddell, 1996). Appropriate treatment thus includes behavioural and cognitive interventions. For example, encouraging activity increase, limiting expectations of medical care, and prescribing bed rest and medication on a time contingent rather than pain contingent basis (Von Korff, 1994).

The prevention of the development of a chronic pain problem is important in the treatment of acute back pain. Treatment for acute back pain now discourages bed rest and encourages returning to usual activities as soon as possible (Kendall, 1997). This is in order for the patient to maintain a level of functioning which will lessen the impact of the pain on their life, and hasten their recovery. There is evidence that this type of approach reduces the amount of time on sickness leave (Indahl, Velund & Reikeraas, 1995).

Occupational Overuse Syndrome

OOS is a term used to describe overuse of musculo-tendinous structures associated with the performance of forceful or repetitive movements and/or the maintenance of constrained postures (Stone, 1987). OOS is a world-wide problem reported in both developed and third world countries. In other countries other terms are used such as Repetitive Strain Injuries (RSI) and Cumulative Trauma Disorder. As is implied by the title OOS, disorders are seen as being caused, or significantly contributed to, by occupational factors. In New Zealand OOS is seen as a general term and definitions of specific disorders have been developed. These can be classified into three groups, localised inflammations, compression syndromes, and pain syndromes (Patterson, 1996; Slappendel, 1996). In New Zealand it is now necessary for general practitioners to diagnose an injury more specifically than just labelling it OOS for ACC compensation to be gained (Patterson, 1996).

Like back pain, OOS is expensive to the sufferers and to society as a whole. In New Zealand the incidence of OOS has been growing for some time. New claims for OOS increased from 3234 in 1994 to 5817 in 1995 (Patterson, 1996). About 3% of ACC claims are OOS related, in 1994 they cost $11 million (MacFie, 1995). Very recently the number of new claims and the cost of claims has dropped by 18% between the 1995/1996 year and the 1996/1997 year ("Big Drop", 1997). ACC reported that these changes are due to employers preventing problems in the first place, by improving the workplace, and by supporting employees who develop OOS. However, it has been suggested that the stricter regulations mentioned above, regarding the specific diagnosis

of OOS disorders before a claim is accepted, may also be responsible for this decrease (Johnson, personal communication, November, 1997).

The etiology of OOS injuries is also not well understood (Sola, 1989; MacFie, 1995). The observation that the incidence of OOS is not directly related to the type of task being undertaken suggests that it is not sufficient to only look as far as biomechanics in the development of OOS and that psychological and social factors need to be taken into consideration (Mullaly & Grigg, 1988). For example, work organisation has been found to be related to OOS (Smith & Carayon, 1996).

Comparison Between Back Pain and Occupational Overuse Syndrome

There are a number of similarities between back pain and OOS. There is often no identifiable organic cause for back pain or OOS. Psychological and social factors are thought to be involved in their development and maintenance (Waddell et al., 1993; Mullaly & Grigg, 1988). Chronic back pain and OOS have not been successfully treated by the application of only medically based treatments (Waddell, 1996; Reid, Ewan & Lowy, 1991).

Both of these conditions cause disability, often resulting in loss of employment and a reduction in ability to be able to complete daily activities (Bammer & Blignault, 1988). Fordyce (1996) suggests that because back pain and OOS have become accepted diagnoses, which suggest injury and justify medical interventions, this has increased the levels of disability associated with both of these conditions. Feuerstein et al. (1993) compare OOS patients with low back pain patients suggesting that through clinical

observation many similarities between them have been noted. These include high perceived disability, loss of function, and distress.

There have been several similar risk factors identified for developing a back pain or OOS problem. In particular work factors such as stress, low job satisfaction (Magnusson et al., 1990; Hopkins, 1990), and high work pressure (Green & Briggs, 1990), have been found to be associated with these conditions. Further details of these findings shall be given in Chapter 2.

CHAPTER TWO

Literature Review

As mentioned, pain behaviours and disability were traditionally thought of as direct functions of pain. However, as theories of pain have developed, the way in which the relationship between pain and disability is conceptualised has changed. Disability is no longer thought of as a direct function of pain. Although this is not to say that pain does not contribute to disability. The following literature review overviews areas of research which examine the nature of the relationship between pain and disability and the factors that might contribute to them. These studies cover a wide range of biological, psychological, and social factors, in keeping with the biopsychosocial model of pain. To begin with, risk factors of developing a pain problem will be looked at. Then literature examining the relationship between pain and disability will be reviewed. Finally studies focusing on pain intensity, pain extent, and disability will be described.

Risk Factors of Pain Problems

To be able to prevent chronic musculoskeletal pain from developing, the risk factors involved in the development of musculoskeletal disorders and the progression to chronic musculoskeletal disorders must be identified (Linton, 1994). There have been studies which have identified the important role of psychological and social risk factors. For example, job stress factors such as perceived work pressure, cognitive demands, and job security, have been found to be associated with musculoskeletal disorders (Hurrell,

Bernard, Hales, Sauter & Hoekstra, 1996). The following studies demonstrate the wide range of risk factors that have been found for the onset of low back pain and OOS. Holmstrom, Lindell, and Moritz (1992) found that the stress index, psychosomatic indices, and various physical factors were associated with increased risk of reported low back pain. Crauford, Creed, and Jayson (1990) found that there was a significant excess of adverse life events before the onset of low back pain without an identifiable organic cause, compared to those with an identifiable organic cause. Personality characteristics, as measured by the Minnesota Multiphasic Personality Inventory (MMPI), have also been found to indicate an increased likelihood of developing low back pain (Bigos et al., 1991). Several risk factors associated with the workplace have been identified. Low job satisfaction has been found to be important indicator of the likelihood of the development of low back pain (Magnusson et al., 1990; Crauford, Creed & Jayson, 1990). Bigos et al. (1991) found that those who 'hardly ever' enjoyed their job tasks were 2.5 times more likely to report a back injury than those who 'almost always' enjoyed their job tasks. Magnusson et al. (1990) found that many complaints of low back pain could not be attributed to poor posture or lifting heavy loads. It was suggested that work place monotony and stress were important in the development of low back pain.

Studies exploring the factors associated with OOS have usually been focused around the work place. Hopkins (1990) found that regardless of the type of work being performed work places with higher levels of OOS tended to be given negative evaluations of stress, boredom, and work satisfaction. Similar findings were found by Smith and Stephens (1996). Work places with lower reported OOS cases were found to have lower ratings

of stress and higher ratings of satisfaction and staff support. Green and Briggs (1990) found that OOS sufferers were identifiable by high work pressure and non-sufferers were identified by good peer cohesion, supervisor support, and autonomy in their job.

For secondary prevention to take place it is important to try and establish the risk factors associated with the development of chronic pain (Kendall, 1997). Turk (1997) reviewed research in this area and found that a wide range of psychological and social factors have been found to predict the development of chronicity. There are often discrepancies between studies in this area because it is unclear whether acute or chronic pain patients made up the sample. Also, the type of pain patient studied in the samples varies. Outcome measures also vary widely, consequently there is a degree of ambiguity surrounding the way in which it is decided whether or not a pain patient has recovered from their pain. Some studies use measures of pain and disability (Linton & Hallden, 1997; Klenerman et al., 1995). Others use return to work as an outcome measure indicating recovery from a pain problem (Cutler et al., 1994). However, return to work is an indication of an individuals level of disability rather than their level of pain. The following are some examples of research which suggest possible risk factors of chronic pain.

Klenerman et al. (1995) assessed outcome in terms of both pain and disability. They found that a fear avoidance model including stress and personality variables predicted outcome during the first two months. A combination of physical and psychosocial variables, such as depression and disability, were the most successful at predicting outcome between two and twelve months. Lehmann, Spratt, and Lehmann (1993)

suggested two factors were important to identify an individual at high risk of long-term disability. These were the perception that low back trouble was work related, and absence from work for more than two weeks. Volinn, Van Koevering, and Loeser (1991) examined the role of socioeconomic factors in chronicity. For both men and women three socioeconomic factors significantly effect the risk of chronicity, age, wage, and being widowed or divorced with no children. Volinn et al. (1991) also reviewed research which examines the relationship between types of occupations and back pain. A number of the studies reviewed found that heavy labour occupations increased the risk of back pain.

Using a sample of both acute and chronic pain patients Main, Wood, Hollis, Spanswick, and Waddell (1992) described a series of measures which were given to patients to develop a method of risk assessment. Risk of poor outcome was examined in terms of subjective pain, disability, and work status. Measures included in the risk assessment method were the Modified Somatic Perception Questionnaire, the modified Zung Depression Index, and assessments of distress and inappropriate illness behaviour. The risk assessment method used was successful in identifying types of patients which exhibited degrees of risk of poor outcome. The importance of psychological factors when assessing risk was demonstrated.

Linton and Hallden (1997) used pain and function as measures of outcome to classify a sample of musculoskeletal pain patients as recovered or not recovered six months after initial assessment. Pain intensity, sleep, and the number of pain sites were found to

predict functional status, while the number of pain sites, the belief that pain increases with physical activity, and the frequency of pain, were found to predict levels of pain.

Several studies have examined the factors which may predict return to work for those suffering from low back pain. Using a sample of acute low back pain patients Gatchel, Polatin, and Kinney, (1995) found three factors to be important in differentiating between low back pain sufferers who returned to work within six months, and those who failed to do so. These factors were self-reported pain and disability, the presence of a personality disorder, and scores on the hysteria scale of the MMPI. Another study using a sample of acute low back pain patients developed a measure which included items on job characteristics, previous back problems, and perception of fault (Hazard, Haugh, Reid, Preble & MacDonald, 1996). This measure was found to be relatively successful in predicting work status at a three month postinjury follow up. Lancourt and Kettelhut (1992) examined demographic, family, job, and stress related factors with respect to predicting return to work. Depending on the time already off work different factors significantly predicted return to work. For example, previous injuries, and stability of family living arrangements were among the significant predictors for those off work for more than six months but not those off work for less than six months. Greenough and Fraser (1989) examined how compensation influenced individuals with low back pain. They found that those receiving compensation had an increased rate of unemployment and a prolonged time off work. Those receiving compensation also reported more pain and disability. Lacroix et al. (1990) assessed a group of low back pain patients three to six months after their injury and then again after about 13 months.

They found that the accuracy of the patients understanding of their medical condition predicted return to work.

The Relationship Between Pain and Disability

There are several methods which have been used to examine the relationship between pain and disability. Some studies have examined the levels of pain and disability in various populations. Others assessed correlations between pain and disability. Several studies examined the way in which factors other than pain were associated with disability. Each type of study gives additional information about the nature of the relationship between pain and disability. In the following sections examples of each of these types of studies and suggested models of the development of disability are presented.

Levels of Pain and Disability

The following studies examined the levels of pain and disability in samples of chronic pain sufferers. The findings of these studies show that high levels of pain do not directly translate to high levels of disability. They also illustrate the importance of psychological and social factors in coping with pain.

Several attempts have been made to classify chronic pain sufferers according to various psychological and social factors. Jamison et al. (1993) used measures of activity interference, emotional distress, pain intensity, and emotional support to obtain three patient profiles. Adaptive copers exhibited lower levels of activity interference and pain

intensity. Dysfunctional patients had comparatively higher levels of activity interference and pain intensity while interpersonally distressed patients had low levels of social support. The three patient profiles have been applied to a range of chronic pain populations including fibromyalgia patients (Turk, Okifuji, Sinclair & Starz, 1996).

Another classification system was developed by Klapow et al. (1993) using a sample of chronic low back pain patients. Measures of pain, impairment, and depression were used to obtain three clusters of patients. The first group 'chronic pain syndrome' exhibited high levels of pain, depression, and disability. The second group 'positive adaptation to pain' exhibited high levels of pain, but low levels of depression and disability. The third group 'good pain control' exhibited low levels of pain, depression, and disability. Further research by Klapow et al. (1995) using these classifications has shown that those in the chronic pain syndrome group reported greater life adversity, passive avoidant coping strategies, and less satisfaction with social support networks. The positive adaptation to pain group reported less life adversity, relied more on passive/avoidant coping strategies, and had more satisfactory social support networks. The good pain control group reported less life adversity, less passive avoidant coping strategies, and more satisfaction with social support networks.

Roderick, Ashton, and Stewart (1994) conducted a cluster analysis using a sample of chronic low back pain patients. Three distinct patient groups were revealed, patients who were in control, patients who were depressed and disabled, and patients who were active copers with high denial. The 'depressed and disabled' group had high disability

scores and average pain intensity scores, while the 'active copers with high denial' group had low disability and high pain intensity scores.

A study with a sample of amputees reported that those with a high level of pain reported higher levels of disability than those with lower levels of pain (Marshall, Helmes & Deathe, 1992). It was suggested that the type of pain problem was important to take into consideration when examining levels of pain and disability. A study in Great Britain conducted by Astin, Lawton, and Hirst (1996) has reported that out of a sample of disabled adults just under one third said that pain severely affected their level of disability. Not all disabled adults with severe pain said that it interfered with their level of disability. As one might expect however, it was concluded that pain was an important contributing factor to disability.

Correlational Evidence

There have been many studies which have found only moderate positive correlations between pain intensity and disability. As one might expect, the way pain and disability are measured appears to influence the size of the correlations.

A correlation of .31 between pain severity, as measured by a visual analogue scale, and disability, measured by self-reported disability in activities of daily living, was reported by Waddell et al. (1993). Gronblad et al. (1993) reported a correlation of .62 between disability measured using the Oswestry and pain intensity measured by a visual analogue scale. Another study which used the Oswestry measure of disability and a visual analogue scale to measure pain intensity found a correlation of .50 (Bolton &

Christensen, 1994). Patrick and D'Eon (1996) found a significant correlation of -.66 between pain severity and an objective measure of physical performance - a stationary bicycle. While general activity levels were not found to be significantly correlated with pain severity. It is suggested that the lack of relationship between physical abilities and general activity levels means that rehabilitation aimed solely at increasing physical functioning may not effect the patient's level of disability.

Factors Associated with Disability

Waddell et al. (1993) found that physical impairment accounted for less than one half of the variance in disability. Findings such as this suggest that there are psychological and social factors also involved in disability. The following studies examine a range of factors involved in disability. These factors include cognitive, behavioural, emotional, and personality factors.

Cognitive coping strategies refer to when an individual uses their thought processes to help cope with pain (Fernandez & Turk, 1989). For example, they may place their attention on something other than their pain. Several different cognitive coping strategies have been found to be associated with pain and disability. Hadjistavropoulos and Craig (1994) separated chronic low back pain patients into two groups. The first with signs and symptoms congruent with underlying pathology and the second with signs and symptoms incongruent with underlying pathology. Higher levels of disability, catastrophising cognitions, stronger emotionality, and passive coping, were found to be characteristic of patients with signs and symptoms incongruent with underlying pathology. The coping strategy of catastrophising, when individuals accentuate the

worst aspects of a situation, has also been examined by Keefe, Brown, Wallston, and Caldwell (1989). They found catastrophising to be positively correlated to pain ratings and disability in a sample of rheumatoid arthritis patients. Other coping strategies of chronic pain patients, such as ignoring pain and using coping self statements, have been found to be related to their well-being and activity levels (Jensen & Karoly, 1991). In a sample of chronic pain patients, Lenhart and Ashby (1996) found that the general coping mode of avoidance and the cognitive coping strategy of helplessness could predict a small but significant amount of variance in disability.

Several studies have found that peoples beliefs about pain are associated with pain and disability. In a sample of chronic low back pain patients there has been a significant positive correlation found between the belief that disability and impairment are attributable to pain, and disability levels (Rainville, Ahern & Phalen, 1993). Similar findings were found by Riley, Ahern, and Follick (1988) using a sample of chronic pain patients. They found that the belief that pain necessarily implies disability was associated with levels of disability independently of subjective pain intensity ratings. Jensen and Karoly (1991) found that pain beliefs in personal control over pain were related to the well-being and activity levels of pain patients. The belief that pain is a mysterious and poorly understood phenomena has been found to be significantly correlated with disability in a sample of chronic low back pain patients (Strong, Ashton, Cramond & Chant, 1990)

Three psychological problems found to be associated with disability are depression, anxiety, and social phobia. Strong, Ashton, and Large (1994) found a high correlation

between disability and depression in a sample of chronic low back pain patients. In another sample of chronic low back pain patients the prevalence of major depression was found to be 64% (Polatin, Kinney, Gatchel, Lillo & Mayer, 1993). In a sample of musculoskeletal pain patients anxiety was found to be significantly correlated with disability (Kuch, Cox, Evans, Watson, Bubela, 1993). Social phobia has been found to be over represented in disabled workers with chronic musculoskeletal pain (Asmundson, Jacobson, Allerdings & Norton, 1996). It was suggested that although social phobia was not associated with levels of pain it may elevate levels of disability.

The following findings are in keeping with the idea that pain and disability behaviours are influenced by family members. Pollard (1985) found a significant positive correlation between disability and the incidence of pain conditions in the families of pain patients. Several findings have been congruent with behavioural theory which describes pain behaviours as operants influenced by reinforcement. Spouse solicitous responses to patient pain behaviours have been found to be associated with more pain behaviours and disability among chronic pain patients (Romano et al., 1995). An association between pain severity and the frequency of pain contingent attention from spouses has been found (Kerns et al., 1989). Also, a significant correlation has been found between spouse emotional support and physical performance in chronic low back pain patients (Patrick & D'Eon, 1996).

Suggested Models of the Development of Disability

Millard, Wells, and Thebarge (1991) examined the relationship between pain and disability, developing alternative models describing the relationship. The model which

saw disability as the direct consequence of pain was not supported. A symptom perception model, which suggests that individuals differ in their response to and reporting of physical symptoms because of cognitive differences, was suggested to be a more appropriate model. Waddell et al. (1993) suggest that fear-avoidance beliefs play an integral part in the development of disability. In their study little direct relationship was found between pain severity and disability in activities of daily living. Pain severity as measured using a visual analogue scale only explained 14% of the variance. Fear-avoidance beliefs about physical activities explained additional proportions of variance. Possible cognitive, affective, and behavioural pathways between low back pain and disability were suggested. Neither of these two studies found support for a direct relationship between pain and disability.

Summary

These studies suggest that pain is associated with disability but that it fails to explain it completely. A range of psychological and social factors which may contribute to disability in addition to pain have been found. The suggested models of the development of disability emphasise these points by acknowledging that pain does not directly translate to disability and the involvement of other factors. These findings are in keeping with the model of pain and disability proposed by Waddell et al. (1993) which sees pain and disability as related but separate constructs.

Pain Extent and Disability

Although there are factors other than pain involved in the development and maintenance of disability, pain is an important aspect of disability that deserves continued recognition. Exploring the relationship between pain and disability is complicated by the fact that the measurement of pain is difficult because pain is a personal experience (Chapman et al., 1985). There are various ways of measuring pain. Often a visual analogue scale is used to assess pain severity or intensity. Although visual analogue scales have considerable utility they are a limited way of assessing pain because they only address one aspect of pain and lack spatial and temporal qualities. A more comprehensive assessment of pain can be obtained by using pain drawings to measure pain extent. This means that the spatial information is included. The four studies described below examine pain intensity and disability and use pain drawings to measure pain extent. Each of the studies shall be briefly summarised.

Studies of Pain Intensity, Pain Extent, and Disability

Using pain drawings Krause, Tait, and Margolis (1989) examined the way in which pain extent and location were related to pain severity. The participants were chronic pain patients, mainly low back pain sufferers. A pain drawing scoring system, developed by Margolis et al. (1986), which divides the front and back body outlines into a total of 45 segments was used. Participants with a larger pain extent were found to have higher pain severity, as measured on the McGill Pain Questionnaire, and pain of a longer duration. Pain location was not found to be related to pain severity.

Using a sample of chronic pain patients, Toomey et al. (1991) conducted a similar study finding a relationship between more extensive pain and pain related disability. The pain drawing scoring system of Margolis et al.(1986) was also used in this study. Pain drawing scores were used to divide participants into high and low pain extent groups. Participants in the high pain extent group reported more interference with function and were more likely to report a pain related job change. Also, they reported their least pain level as higher and scored higher pain severity scores on the McGill Pain Questionnaire. Those in the high pain extent group also reported more frequent and continuous pain. The authors of this study suggest that using a large patient sample and multivariate statistical procedures would be useful to further examine the contribution of pain extent to disability.

Tait, Chibnall, and Margolis, (1989) examined the degree of association between pain extent and a number of psychological factors in a sample of chronic pain patients. The pain drawing scoring system developed by Margolis et al. (1986) was used. Disability, as measured by the Pain Disability Index, and pain duration were significantly correlated with pain extent, .24 and .12 respectively. The McGill Pain Questionnaire was used as a measure of pain severity. A significant correlation of .27 was found between pain severity and pain extent. Three measures of psychological state which were significantly correlated to pain extent were the Quality of Life Scale, the Psychosomatic Symptom Checklist, and the Beck Depression Inventory.

Bolton and Christensen (1994) used a computer interview system to gather their data. Computerised versions of the Oswestry and St Thomas measures of disability, a visual

analogue scale for rating pain severity, and pain drawings were used. Participants indicated in which areas they experienced pain on a homunculus on the computer screen. However, the exact nature of the computerised pain drawings was not stated by the authors. The participants of this study were back pain sufferers, not general chronic pain patients. They were split into three groups, those with back pain only, those with back pain and leg pain above the knee, and those with back pain and leg pain that extended below the knee. The group with pain below the knee had significantly higher pain severity and disability. The correlation between disability, as measured by the Oswestry, and pain severity was .5 in the back pain only group and was less in the other two groups. There was a moderate significant correlation between disability, as measured by the Oswestry, and pain extent (r =.2). Similarly, there was a slight positive correlation between pain extent and pain severity (r = .29). The authors suggest that pain distribution rather than pain extent is associated with disability and pain severity. However, the two groups with back pain as well as pain above or below the knee were very small, making firm conclusions difficult.

Summary

These four studies have provided evidence to suggest that there is an association between pain extent, measured using pain drawings, and disability. Significant but weak correlations between pain extent and disability have been found (Bolton & Christensen, 1994; Tait et al., 1989). An association between pain extent and disability is also suggested by findings showing chronic pain sufferers with higher pain extent scores had higher levels of disability (Toomey et al., 1991). It appears that pain extent is associated with disability but not to a large degree. The findings of these studies also

suggest that there is an association between pain extent and pain severity measured by both the McGill Pain Questionnaire (Krause et al., 1989; Tait et al.,1989; Toomey et al., 1991) and a visual analogue scale (Bolton & Christensen, 1994). An association was also found between pain extent and pain duration (Krause et al., 1989; Tait et al., 1989). Pain extent appears to be a valid aspect of pain which is related to several measures of pain and disability.

Except for the computerised pain drawing scoring system used by Bolton and Christensen (1994) these studies used the method of scoring developed by Margolis et al. (1986). This method has been found to be able to be improved (Bryner, 1994). It is possible that using an improved method of scoring pain drawings to obtain a more reliable measure of pain extent may increase the relationship between pain extent and disability, pain intensity and pain duration. Another way in which the relationship between pain extent and disability could be explored is by controlling for the influence of pain intensity on the relationship.

CHAPTER THREE

Justification and Aims

The literature review showed considerable evidence that disability is not a direct function of pain and that many other factors are involved in the development and maintenance of disability. However, pain is associated with disability and is undoubtedly an important factor in the development and maintenance of disability. The data available for use in the present study gave the opportunity to explore the relationship between pain and disability in a large New Zealand sample.

There are many aspects of pain, however, studies often only consider one aspect such as pain intensity. Pain extent is another aspect of pain which has been found to be associated with disability. The present study provided an opportunity to examine the association between pain and disability using measures of both pain intensity and pain extent. It also gave the opportunity to examine the ability of pain extent to explain disability when controlling for pain intensity.

Initially, it was unclear as to the nature and completeness of the data that was available for use in the present study. The overall goal of the present study was to examine the relationship between pain and disability using the different aspects of pain available. Other variables which were available, and the literature suggested may be related to disability, were also included in the analyses. The sample description was conducted for general interest and for the purposes of the Rehabilitation Institute which provided

the data. Because of findings which suggest similarities between the back pain and OOS these diagnosis groups were described and compared.

The aims of the present study were to:

1) Produce a description of the sample including a comparison of back pain and OOS.
2) Examine the relationship between pain intensity and disability.
3) Assess the degree to which pain extent may contribute to the relationship between pain and disability.
4) Assess the association between pain duration, age, sex, and employment status, and disability.

CHAPTER FOUR

Method

Participants

The participants were 290 individuals referred to the Rehabilitation Institute of Wellington. The large majority of the participants, 81%, attended the Rehabilitation Institute of Wellington in 1996. Most of the participants were diagnosed with back pain or OOS (see Table 3) and were being funded by ACC. The minimum duration of pain was 3 months with a mean duration of 50 months.

Males made up 57% of the sample. The range of ages was between 18 and 61, with a mean age of 38 and standard deviation of 9.8. Sixty six percent of the sample were unemployed. In the sample 51% of participants were married, 22% were single, and 23% were divorced, separated or in defacto relationships. The remaining 4% of the sample represents missing data. The mean number of children was 1.7.

Data Collection

Data was gathered from the Rehabilitation Institute of Wellington. Almost all of the participants were referred to the Rehabilitation Institute for a functional capacity evaluation by their ACC case managers. The functional capacity evaluation assesses a wide variety of factors including physical limitations and the ability to carry out daily activities. After a functional capacity evaluation is completed by an occupational

therapist, a report summarising the findings and making recommendations is returned to the ACC case manager. Recommendations usually include undertaking programs such as physical or work conditioning, pain management, and physiotherapy. If the ACC case manager approves the recommendations, the participants may return to the Rehabilitation Institute of Wellington for these programs.

Participants completing a functional capacity evaluation filled in a consent form allowing their information to be used for research, providing they remained anonymous. Around 600 client files were examined to obtain 290 files which included a functional capacity evaluation and a consent form. Information from these files was transferred to data collection sheets (see Appendix A) which were only identifiable by number. This ensured the anonymity of the participants. No information which could possibly lead to the identification of a participant, such as date of birth or address, was collected. The pain drawings were photocopied so that they could be removed from the Rehabilitation Institute for scoring. Once the pain drawings were scored all of the data was entered into a computer data base.

Measures

There were three main measures included amongst the information collected from the functional capacity evaluations. These were the pain drawing, the Oswestry disability questionnaire and a series of visual analogue scales measuring pain intensity.

Pain Drawings

Pain drawings are commonly used to allow a patient to demonstrate the extent and location of their pain. There are a number of different ways in which pain drawings can be scored. These include scoring systems which not only assess the extent and location of pain but also psychological distress (Gil, Phillips, Abrams & Williams, 1990) and the degree of organic and nonorganic pain (Chan, Goldman, Ilstrup, Kunselman & O'Neill, 1993). However, there is evidence which suggests that using pain drawings to assess psychological distress is not a valid use of pain drawings (Parker, Wood & Main, 1995).

Three of the previous studies mentioned in the literature review which used pain drawings to measure pain extent used a scoring system developed by Margolis et al. (1986; Krause et al., 1989; Tait et al., 1989; Toomey et al., 1991). This method uses only forty five grid divisions and evidence suggests that it overestimates pain extent and limits variation in scores (Bryner, 1994). The method chosen to score the pain drawings in the present study was that used by Gatchel, Mayer, Capra, Diamond, and Barnett (1986). A template similar to that used by Gatchel et al. (1986) was produced (see Appendix B). This template was used to divide the front and back body outlines each into one hundred grid divisions. This was thought to allow maximum variation in scores while keeping in mind the difficulty associated with scoring the drawings which were not particularly large.

Procedure for scoring the pain drawings.

The pain drawings consisted of two body outlines representing the front and back of the body. The outlines were approximately one hundred and five millimetres tall and forty

six millimetres wide (see Appendix C). The participants were each given the body outlines and instructed to indicate the location and extent of their pain.

When the template was placed over the pain drawings they were scored by the researcher in the following way. Each of the two hundred grid divisions were assigned a number. For each participant the numbers of the grid divisions in which pain was indicated were recorded. The total number of grid divisions in which pain was indicated was also recorded to obtain a measure of pain extent. The following protocol, similar to that used by Margolis et al. (1986), was followed when scoring. If there was any mark, no matter how small, in a particular grid, pain was recorded as having been indicated. All the grid divisions in areas which were circled by a participant were recorded as having pain present. Marks that were outside the outline of the grid were disregarded. Marks which appeared to direct attention to a particular body area, for example, arrows, were also disregarded. Any writing was disregarded even if written on the drawing. Areas which were included in the pain drawing due to large circles which were clearly not affected by pain were left out.

Psychometric properties of pain drawings.

Pain drawings have been found to reflect different patterns of pain experienced by different pain problems. For example, pain drawing patterns have been found to reflect different types of back pain (Mann, Brown, Hertz, Enger & Tompkins, 1993). This supports the overall validity of pain drawings. Because pain extent is the aspect of pain drawings used in the present study, the reliability and validity of pain extent shall be discussed in more detail.

Using the scoring method of Margolis et al. (1986) the test-retest reliability of pain extent scores over a two hour time span was found to be .80 in a sample of back pain patients (Triano, McGregor, Cramer & Emde, 1993). This level of reliability over such a short time frame is not ideal, however, there is evidence that the test-retest reliability of pain extent may be higher than found in that particular study. Another study using a different scoring system found a test-retest reliability coefficient of .84, over one to two days, in a group of post operative patients and .71, over three to six weeks, in a group of chronic musculoskeletal pain patients (Escalante, Lichtenstein, Lawrence, Roberson & Hazuda, 1996). These are more appropriate levels of test-retest reliability.

The inter-rater reliability of pain extent scores has been found to be very high when using the scoring system used by Margolis et al. (1986) or the system used by Gatchel et al. (1986; Bryner, 1994). The inter-rater reliability of the method used in the present study was assessed by rescoring a random sample of thirty pain drawings. The inter-rater reliability was calculated by dividing the number of divisions in which it was agreed by both scorers that pain was indicated by the number of agreements and disagreements. The mean inter-rater reliability score was .92. However, there was a correlation of .98 between the total pain extent scores calculated by the two scorers. It appears that there was a small amount of discrepancy surrounding the exact grid divisions pain was indicated in, probably due to slight variations in the positioning of the template. However, the total pain extent scores exhibited a very high level of agreement between the scorers.

Pain extent has been found to be associated with several indicators of pain and disability supporting the validity of this aspect of pain. Pain extent scores have been found to be moderately correlated with occupational handicap and absenteeism (Ohlund, Eek, Palmplad, Areskoug & Nachemson, 1996). Pain extent scores have also been found to be associated with pain duration, pain severity and psychosomatic symptoms (Tait et al., 1989). There is evidence to suggest that the pain extent is not sensitive to changes in clinical status (Triano et al., 1993). This is probably due to over estimation of the pain extent due to large grids being used (Bryner, 1995). It is not necessary for the pain extent measure to be sensitive to change over time for the present study. It was also thought that the use of two hundred divisions would increase the validity of the pain drawings.

Appropriateness for the present study.

The reliability and validity of pain extent is dependent on the scoring procedures used. It is thought that the procedure adopted in the present study provided reliable and valid pain extent scores. Photocopying the pain drawings is not thought to have influenced scores.

The Oswestry Disability Questionnaire

The Oswestry was developed for use with people with low back pain (Fairbank, Couper, Davies & O'Brien, 1980). This questionnaire consists of ten sections which relate to activities of daily living which might be disrupted by pain (see Appendix D). These sections are pain severity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and travelling. Each of the ten sections is accompanied by six

statements reflecting varying degrees of difficulty in that activity. The items are easy to understand and are designed to be self administered (Beurskens, de Vet, Koke, van der Heijden & Knipshild, 1995).

Procedure for scoring the Oswestry.

The Oswestry score was calculated by adding the scores of each section together and then multiplying by two. This gave a score out of one hundred or a percentage. If the sex life item was missing the percentage score was calculated by dividing the total of the other nine sections by forty five and multiplying by one hundred. If any other items were missing the Oswestry score was not calculated and that participant was recorded as having missing data.

Psychometric properties of the Oswestry.

There have been several studies which have confirmed the reliability and validity of this disability measure for use with back pain sufferers. The Oswestry appears to have good test-retest reliability. Triano et al. (1993) administered the Oswestry to patients with two hours between administrations finding a test-retest correlation of .94. Using a longer time span of two days Fairbank et al. (1980) reported a test-retest correlation of .99. Such high correlations are appropriate because there are unlikely to have been any changes in the patients disability levels over such short time durations.

The content validity of the Oswestry is very good. This is possibly because sections were chosen to be most relevant to low back pain patients (Fairbank et al., 1980). However, it is important to note that the content validity is less when a pain patient

other than a low back pain patient is given the Oswestry. This is particularly important to take into consideration in the present study because it means that the Oswestry is not as appropriate for the OOS and other diagnosis groups as it is for the back pain diagnosis group.

There is substantial evidence to support the validity of the Oswestry. Di Fabio, Mackey, and Holte (1995) evaluated the Oswestry as a disability outcome measure for assessing the efficacy of a physical treatment program. Oswestry scores varied for high and low treatment compliance groups and chronic and acute patient groups. There was also a reduction of disability as measured by the Oswestry of about 10% after completion of a rehabilitation program. Another study used the Oswestry to help differentiate categories of low back pain using discriminant analysis (Hass & Nyiendo, 1992). These findings support the validity of the Oswestry, showing it is sensitive to several important clinical factors.

There are several other findings which also suggest the Oswestry is a valid instrument. Oswestry scores have been found to reflect positive health changes in patients (Haas, Jacobs, Raphael & Petzing, 1995). They have also been found to have a moderate positive correlation with pain intensity (Haas et al., 1995; Gronblad et al., 1993; Co, Eaton & Maxwell, 1993). Gronblad, Jarvinen, Hurri, Hupli, and Karaharju, (1994) found that patients on sick leave had significantly higher Oswestry scores than those who were still working. The Oswestry has also been found to be associated with other measures of disability. A high correlation between the Oswestry and the Pain Disability

Index (Gronblad et al .,1993) and a moderate correlation between the Oswestry and St Thomas Disability Questionnaire (Co et al., 1993) has been found.

Appropriateness for the present study.

A recent comparison with other disability measures found the Oswestry to compare favourably with the Roland Disability Questionnaire and the Waddell Disability Index (Beurskens et al., 1995). The only advantage that another measure of disability could offer would be that the content was not designed specifically for back pain sufferers. This would make use in the present sample more appropriate. In conclusion, the Oswestry has good psychometric properties and is very appropriate for the participants in the sample who were suffering from back pain.

The Visual Analogue Pain Intensity Scales

Visual analogue scales have been frequently used to measure pain due to their simplicity and ease of scoring (Chapman et al., 1985). In the present study pain intensity was the aspect of pain being measured by the visual analogue scale.

There were three visual analogue scales so that participants could give a rating of their current level of pain, their best level of pain, and their worst level of pain. The length of the scales was approximately ten centimetres. However, there was also a shorter version which was used in a small number of cases that was about seven centimetres long. Each of the three scales were anchored at zero and ten.

Procedure for scoring the visual analogue pain intensity scales.

The occupational therapist conducting the functional capacity evaluation asked the participants to rate their level of pain between zero and ten after the three visual analogue scales were shown to them. Participants responded verbally or by marking the visual analogue scales. If a mark on the visual analogue scale was used to rate pain intensity a proportional rating out of ten was given.

Psychometric properties of the visual analogue pain intensity scales.

There is evidence to suggest the visual analogue pain intensity scale is both reliable and valid. A visual analogue scale of pain intensity was found to have a test-retest reliability coefficient of .87 over a two hour time interval (Triano et al., 1993). The same study gave evidence for the validity of a visual analogue scale of pain intensity finding it to be sensitive to clinical improvement in a sample of back pain patients. Other evidence of the validity of visual analogue scales for rating pain intensity comes from findings which suggest an association between visual analogue pain intensity ratings and several aspects of pain and disability. A visual analogue scale of pain intensity has been found to be moderately correlated with affective and evaluative dimensions of pain measured by the McGill Pain Questionnaire (Choiniere & Amsel, 1996). Moderate correlations have also been found between visual analogue scales measuring pain intensity and the Oswestry disability questionnaire, the St Thomas disability score (Co et al., 1993), and the Dallas Pain Questionnaire (Haas et al., 1995). A moderate correlation has been found between usual pain intensity measured using a visual analogue scale and pain induced lifestyle changes (Ogon, Krismer, Sollner, Kanter-Rumplmair, & Lampe, 1996).

Appropriateness for the present study.

The use of the visual analogue scale to measure pain intensity in the present study seems to be appropriate. There is unfortunately a lack of information relating to the exact way in which the visual analogue was administered. It is assumed that the variation between the oral and written administration of the visual analogue scale would not have influenced pain intensity scores.

Other Information Gathered

As well as the three main measures a large amount of general information was collected. This included information about the pain problem such as the diagnosis, pain duration, and previous operations. Demographic information such as age, marital status, occupation, and employment status was also collected. Pain duration was calculated to the nearest month, assuming that all months that were recorded contained pain. For example, if the presence of pain was recorded between January and February the pain duration was recorded as being two months.

Data Analysis

The Statistics Package for the Social Sciences was used to conduct the statistical analyses. Descriptive statistics and correlation coefficients were calculated to describe the sample and explore relationships between many of the variables. To enable the examination of the different diagnoses the sample was split into three groups, those with only back pain, those with only OOS, and those with some other diagnosis excluding back pain and OOS.

A series of multiple regression analyses were conducted. The first two multiple regressions were conducted to explore the relationships between pain intensity, pain extent, and disability. The third multiple regression was conducted to assess the contribution that pain duration would make to the prediction of disability. Finally, the demographic variables of age, sex, and employment status were added to the regression analyses to examine their contribution to disability in comparison to the pain intensity, pain extent, and pain duration variables.

CHAPTER FIVE

Results

Sample Description

Demographic Data

The demographic data collected consisted of a number of different variables. Some of these variables such as employment status and occupation were consistently available from the functional capacity evaluation files. However, data for some of the other variables was not consistently available. Sample sizes for variables are given so that inferences from the data can be made while taking into consideration the impact missing data values may have had.

As can be seen in Table 1 the sample had a high level of unemployment. This was to be expected because of the duration and nature of the pain problems. The mean number of months since participants last worked was 31.5 with a standard deviation of 32.9 (n = 210). It appears that not only were the majority of the participants unemployed, they had been so for a considerable length of time. A small number of participants, 9% (n = 233), were self employed.

Table 1

Employment Status of The Participants

Employment Status	Frequency	Percent
Unemployed	194	67
Employed Part Time	31	11
Employed Full Time	7	2
Employed Unspecified	13	5
Off Work Still Employed	29	10
Not Applicable	15	5

Note. Employed unspecified indicates that the client was employed but that it was unclear if they were employed full time or part time. Not applicable indicates that the classification was inappropriate because participants were occupied by such things as study.

Table 2 shows that the majority of participants lived with family members. There were few participants who lived alone.

Table 2

The Living Arrangements of Participants

Lives with	Frequency	Percent
Family	211	73
Flatmates	29	10
Alone	22	8
Missing data	28	10

Table 3 shows that the most common diagnosis was back pain followed by OOS and then neck pain. The "other" category covered a range of problems, commonly injuries to limbs. Often participants belonged to more than one diagnosis group. For example, a participant may have been experiencing back pain and a painful shoulder.

Table 3

The Percentage of Participants with Various Diagnoses

Diagnosis		Percent
OOS		29
Back Pain	Low	36
	General	21
Headache		3
Neck Pain		18
Other		41

General medical information is shown in Table 4. The medication variable was split into three groups; those recorded as taking medication, those not taking medication, and those taking medication available at the supermarket, such as Panadol. There was a large amount of missing data but it is probably safe to assume that being medication free was more likely to be not recorded than taking medication. It appears that a large majority of participants, probably at least 68%, were taking some sort of medication. However, the medication was not necessarily for pain relief.

The previous treatment section is hard to assess because to be referred to the Rehabilitation Institute through ACC it is necessary to have seen a general practitioner. It is likely that the small number of participants who were recorded as not having any previous treatment had at least seen a general practitioner. It appears that the large majority of participants had received previous treatments. This was most frequently some form of physical therapy.

The only operations that information was recorded about were operations or surgery relevant to the main problem that the participant was diagnosed with. The information regarding operations was reasonably complete. It appears that about 30% of participants had undergone at least one operation or surgery for their pain problem.

The information collected regarding illnesses other than the pain problem classified participants as having an illness or not. The information regarding illness was reasonably complete. There were a large number of participants, about one third, who were experiencing an illness other than their pain problem.

Table 4

Participants General Medical Information

		Percent	n
Medication	Yes	68	213
	No medication	16	
	Panadol, Asprin etc	16	
Previous Treatment	Yes	94	251
Operations	None	69	273
	One	22	
	Two or more operations	9	
Illness other than the pain problem	Yes	36	263

Table 5 presents information about smoking and drinking. Just over one third of the participants were cigarette smokers. It was difficult to classify some of the information regarding alcohol use into either a 'yes' or 'no' category because there were vast differences between some of the 'yes' answers. For example, some participants only drank 'occasionally' while others consumed several jugs of beer several nights a week. Ideally, there should have been another category for participants who drank more than a certain amount. However, this of information was not available.

Table 5

The Percentage of Participants Who Smoke or Drink

	Percent	n
Smoker	38	255
Uses Alcohol	73	255

As can be seen by the small sample sizes presented in Table 6 the information regarding qualifications was very limited. There appear to be more people with trade qualifications than tertiary qualifications, which is likely considering the occupational distributions of the sample (see Table 9). The most useful piece of information regarding qualifications is the mean number of years spent at secondary school. The mean number of years spent at secondary school was 3.1 with a standard deviation of 1.1 (n = 221). These values are sensible considering the legal school leaving age is fifteen, which generally means about three years of secondary schooling.

Table 6

The Percentage of Participants With School Qualifications, Tertiary Education, and Trade Qualifications

	Percent	n
School Qualifications	51	72
Tertiary Education	54	76
Trade Qualifications	83	143

The information collected regarding leisure activities (see Table 7) was quite inconsistent. It appears the information recorded was whatever was most conspicuous. For example, if a participant was a member of a sports club, information regarding interests was not given. The information regarding interests was not very complete. Common interests included reading and gardening. Because the definition of interests only excluded watching television the large majority of participants had some sort of interest. There was a large amount of missing data regarding club membership and sporting activities. Possibly, the percentage values of those who play sport and are club members were inflated because the missing data represented those who did not participate in these activities. There were a number of participants who did participate in club and sporting activities. Also, there was a decrease in the percentage of people engaging in sporting activities after their injuries.

Table 7

Percentage of Participants Engaging in Leisure Activities

	Percent	n
Interests	91	205
Club Membership	42	229
Sports Preinjury	93	183
Sports Postinjury	39	215

Note. Watching television was not regarded as an interest or hobby. Walking was not regarded as a sport because this was commonly recorded and would give an inflated estimate of the number of participants engaging in what is commonly understood as sport.

Comparison Between the Diagnosis Groups

There were three diagnosis groups, participants with back pain only, participants with OOS only, and participants with some other pain problem. The back pain and OOS groups were examined to assess any differences between these two diagnosis groups.

Table 8 presents information regarding the age, gender, and employment status, of the overall sample and the diagnosis groups. It appears that the ages of the back pain and OOS groups are relatively similar. There are more women in the OOS group than the back pain group. The percentage of unemployment was greater in the back pain group than the OOS group. This may be because the duration of the pain problem tended to shorter in the OOS group (see Table 10).

Table 8

The Age, Gender, and Employment Status of the Overall Sample and Diagnosis Groups

		Overall	Back	OOS	Other
n		290	87	75	48
Age	M	38.2	38.6	35.3	39.0
	SD	9.8	9.0	9.9	11.8
Gender	%male	58	79	23	63
	%female	42	21	77	37
%Unemployed		67	68	55	65

As can be seen in Table 9 the largest occupation group was clerical work. This was probably due to the number of OOS cases in the sample, many of whom were in this category. The most noticeable differences between the back pain and OOS groups with regards to occupation is that the back pain group contained more tradespeople and labourers while the OOS group contained a majority of clerical workers.

Table 9

Percentage of Participants by Most Recent Occupation in the Overall Sample, Back Pain, and OOS Groups

Occupation	Overall	Back Pain	OOS
Professional/Technical	8	6	7
Clerical	26	7	60
Storeperson/Packers	2	3	1
Sales/Shop assistants	5	7	1
Agriculture/Horticulture	2	2	0
Drivers	4	6	0
Tradesperson	15	21	6
Process/Factory work	7	9	6
Labourers	13	21	6
Domestic	8	8	4
Other	10	9	10

T-tests were conducted to assess if there were significant differences between the diagnosis groups with regards to disability, pain duration and pain intensity, as presented in Table 10. There was a significant difference in pain duration between the back pain and OOS groups $t(151) = 4.04$, $p<0.01$. Disability was also found to be significantly different between the two groups $t(107) = 4.5$, $p<0.01$. There were no significant differences in current or best pain intensity found between the back pain and OOS groups. However, the back pain group had significantly greater worst pain intensity scores, $t(154) = 2.64$, $p<.01$.

Table 10

Means and Standard Deviations of Disability, Pain Duration, and Pain Intensity for the Overall Sample, Back Pain, and OOS Groups

		Overall	Back Pain	OOS
Pain Duration	M	49.6	53.9	29.7
(mths)	SD	43.4	44.7	29.0
Disability	M	40.2	41.9	27.3
	SD	15.3	14.6	13.7
Current	M	4.6	4.5	4.6
Pain Intensity	SD	2.1	2.0	2.2
Best	M	2.7	2.4	2.5
Pain Intensity	SD	1.8	1.7	1.7
Worst	M	8.4	8.7	8.0
Pain Intensity	SD	1.5	1.5	1.4

Note. There were only 220 completed Oswestries. This meant that the number of participants with a disability score was significantly reduced. Also, participants with back pain were over represented in the sample of those who did complete an Oswestry.

As Table 11 shows, there were several differences in the pain extent scores between the back pain and OOS groups. Firstly, the OOS group had significantly greater pain extent total scores than the back pain group, $t(119) = -2.43$, $p<0.05$. The pain extent scores for the front and back of the body were also examined. While pain extent scores for the back of the body were similar the OOS group had significantly greater pain extent scores for the front of the body, $t(9.7) = -6.47$, $p<.001$.

Table 11

Means and Standard Deviations of Pain Extent Total, Front, and Back for the Overall Sample, Back Pain, and OOS Groups

		Overall	Back Pain	OOS
Pain Extent	M	23.4	19.3	24.9
	SD	15.5	11.0	16.9
Front	M	5.9	1.9	8.9
	SD	7.6	3.9	8.5
Back	M	17.6	17.5	16.1
	SD	12.2	10.0	11.2

The Relationship Between Pain and Disability

Correlations

Table 12 shows correlations between the pain variables when each correlation was calculated separately to maximise the number of participants in the sample.

Table 12

Correlations Between the Pain Variables and Disability

Variables	Disability	Pain Intensity			Pain
		Current	Best	Worst	Duration
Pain Intensity					
current	.47**				
best	.42**	.66**			
worst	.39**	.44**	.34**		
Pain	.33**	.23**	.23**	.30**	
Duration					
Pain Extent	.29**	.32**	.23**	.14	.16*

* $p<.01$, ** $p< .001$

Table 13 shows correlations calculated together, this meant that the participants without a disability score were deleted from calculations. So, table 13 displays the correlations between the variables in the subset of the participants whose data was used in the regression analyses.

Table 13

Correlations Between the Pain Variables and Disability Using the Subset of Participants as Used in the Regression Analyses

Variables	Disability	Pain Intensity			Pain
		Current	Best	Worst	Duration
Pain Intensity					
Current	.46**				
Best	.40**	.65**			
Worst	.38**	.44**	.34**		
Pain Duration	.31**	.22**	.20*	.27**	
Pain Extent	.28**	.32**	.24**	.15	.16

n = 192

*p<.01 ** p<.001

The size of the correlations tended to be slightly smaller when the sample size was reduced. This is probably due to sampling which means that the nature of the sample used in the regression analyses must be taken into consideration when drawing conclusions. Disability is significantly correlated with all of the variables that are to be entered into the regression analyses. Current pain intensity appears to be the variable most associated with disability while pain extent appears to be the variable least associated with disability. There were significant correlations found between pain intensity current, pain intensity best, and pain extent. A significant correlation was not found between worst pain intensity and pain extent. Pain duration was significantly correlated with the three pain intensity variables but not pain extent.

The r^2 values between the pain variables and disability were: current pain intensity .22, best pain intensity .18, worst pain intensity .15, pain extent .09, and pain duration .11. It appears that current pain intensity has the highest proportion of variance associated with disability.

Multiple Regression Analyses

Because of the lack of a disability score for a number of the OOS group participants the proportion of diagnoses in the sample used for the regressions were somewhat different from the proportions of diagnoses in the overall sample. The sample used in the regression analyses was approximately 44% back pain only sufferers, 14% OOS only sufferers, 18% other diagnoses, and 24% comorbid diagnoses.

Assumptions.

The assumptions for the regression analyses shall be discussed together.

With 192 cases the ratio of cases to independent variables was 48:1 with four independent variables, 38:1 with five independent variables, and 24:1 with eight independent variables. These were above the minimum requirements (Tabachnik & Fidell, 1989).

The normality of the variables were examined using the frequencies command of SPSS. The disability scores appeared to be approximately normally distributed. The best pain intensity variable was slightly negatively skewed while the worst pain intensity variable was slightly positively skewed. Considering the nature of these variables this was

appropriate. The current pain intensity variable was more evenly spread. The variable most significantly skewed was the total pain extent variable which was skewed negatively.

The normality, linearity, homoscedasticity, and independence of residuals were examined through the use of a scatter plot showing predicted values and residuals. It appears that all four of these assumptions were met.

Multicollinearity did appear to be a problem. The correlations between the pain intensity variables range between .34 and .65, this is not as high as could possibly be expected. It appears though, that all values entered into the regression equations without violating the default value of tolerance.

Mahalanobis distances were examined to establish if there were any outliers. Only one outlier was found, this case was removed from analyses because it was nonsensical.

Standard multiple regression: Predicting disability by pain intensity and pain extent.

A standard multiple regression was conducted in order to assess the relationship between the independent variables (current pain intensity, best pain intensity, worst pain intensity, and pain extent) and the dependent variable, disability. Table 14 displays the unstandardised regression coefficients (B) and intercept, the standardised regression coefficients (Beta), the semi partial correlations (sr^2), R, R^2, and the adjusted R^2. Overall, R was significantly different from zero, $R = .55$, $F(4, 194) = 21.25$, $p<.001$.

All of the independent variables contributed significantly to the prediction of disability, pain intensity current (sr^2 = .022), best (sr^2 = .015), and worst (sr^2 = .038), and pain extent (sr^2 = .022), $p < .05$. The four independent variables in combination contributed another .203 in shared variability. It appears that there is a large amount of shared variability between the pain intensity variables and the pain extent variable when predicting disability. Overall, the three pain intensity variables and the pain extent variable were able to predict 30% (29% adjusted) of the variability in disability.

Table 14

Summary of Standard Multiple Regression Analysis for Pain Variables Predicting Disability

Variables	B	Beta	sr^2
Current Pain Intensity	1.60*	.21	.022
Best Pain Intensity	1.41*	.16	.015
Worst Pain Intensity	2.15**	.22	.038
Pain Extent	.17*	.16	.022
Intercept 6.55			
R^2= .30			
adjusted R^2= .29			
multiple R= .55			

Note. *p<.05 **p<.01

Hierarchical regression: Predicting disability by pain intensity and pain extent.

The question that was being examined with this regression was whether or not the pain extent variable could be used to predict disability after differences in the pain intensity variables were statistically eliminated. In other words, does pain extent add to the regression equation over and above the pain intensity variables. To examine this question, the three pain intensity variables were entered into the equation at the same time and then on the second step, the pain extent variable was entered. The unstandardised regression coefficients (B) and intercept, the standardised regression coefficients (Beta), R, R^2, and adjusted R^2 were the same as those presented in Table 14.

At step one, with the three pain intensity variables entered $R^2 = .28$ (.27 adjusted), F (3, 194) = 25.57 $p < .001$. The sr^2 value after step one was .282. After step two R^2 increased significantly $R^2 = .30$ (.29, adjusted), F change (1,194) = 6.23, $p < .05$, the sr^2 was .022. At the end of the second step, when all four variables are entered into the equation, $R = .55$, F (4,194) = 21.25, $p<.001$. It appears that the addition of the pain extent variable after the pain intensity variables were in the regression equation did reliably improve R^2 .

Hierarchical regression: Addition of pain duration.

A hierarchical multiple regression was performed to assess if addition of pain duration would improve the prediction of disability. On the first step, the three pain intensity variables and the pain extent variable were added to the equation. The pain duration variable was added on the second step. Table 15 displays the unstandardised regression

coefficients (B) and intercept, the standardised regression coefficients (Beta), the semi partial correlations (sr^2), R, R^2, and the adjusted R^2 .

After step one R^2 = .27 (.25 adjusted), F (, 186) =18.55, p <.001. After the second step, when pain duration was added to the regression equation R^2 increased significantly = .31 (.29 adjusted), F change(1, 186) = 7.70, p < .01. Overall, with all five independent variables in the equation, R = .56, F (5, 186) = 16.9, p<.001. It appears that addition of pain duration reliably improved R^2. When differences in pain intensity and pain extent are accounted for there is a reliable increase in prediction of disability when pain duration is added to the equation.

Table 15

Summary of Hierarchical Regression Analysis for Pain Variables Predicting Disability

Variable	B	Beta	sr^2
Current Pain Intensity	1.58*	.21	
Worst Pain Intensity	1.71*	.18	
Best Pain Intensity	1.25	.15	
Pain Extent	.13	.12	.284
Pain Duration	.06*	.18	.028
Intercept =8.49			
R^2 = .31			
adjusted R^2 = .29			
Multiple R= .56			

Note. *p<.05

Hierarchical regression: Addition of demographic variables.

The following hierarchical regression was conducted to assess the contribution to the prediction of variability in disability of age, sex, and employment status. Employment status was recoded into a dichotomous variable of employed or unemployed. There were two steps to this regression. On the first step, the three pain intensity variables, pain extent, and pain duration were added to the equation. On the second step, the demographic variables of age, sex, and employment status were added. Table 16 displays the unstandardised regression coefficients (B), intercept, the standardised regression coefficients (Beta), the semi partial correlations (sr^2), R, R^2, and adjusted R^2.

Table 16

Summary of Hierarchical Regression Analysis for Variables Predicting Disability

Variable	B	Beta	sr^2
Current Pain Intensity	1.4*	.19	
Worst Pain Intensity	1.6*	.17	
Best Pain Intensity	.94	.11	
Pain Extent	.14*	.13	
Pain Duration	.04	.12	.311
Sex	-2.96	-.09	
Age	.16	.10	
Employment Status	-5.6**	-.17	.046
Intercept = 16.62			
R^2 = .36			
adjusted R^2 = .33			
Multiple R = .60			

Note. *p<.05 , **p<.01

After step one R^2 = .31 (.29 adjusted) $F(5, 179) = 16.42$, $p<.001$. After step two, when the three demographic variables were added R^2 increased significantly, R^2= .36 (.33 adjusted) F change (3,179) = 4.30, $p< .01$. After the second step, when all of the variables were entered R was significantly different from zero, $R = .60$, $F(8,179) = 12.43$, $p<.001$. It appears that the three demographic variables did significantly improve the prediction of variability in disability over and above the pain intensity, pain extent, and pain duration variables. However, of the three demographic variables, employment status was the only one which contributed significantly to the regression equation.

Summary.

It appears that pain extent does significantly improve the prediction of variance in disability over and above pain intensity. There is only a small improvement in the prediction of variance in disability when the variance explained by the pain intensity variables is taken into consideration. There is a lot of shared variability between the pain intensity variables and pain extent. Any one of these variables only improves the prediction of the variance in disability by the other three variables by a small amount. Pain duration significantly improves the prediction of variance in disability over and above the pain intensity and pain extent variables. It appears that the most variability in disability that is able to be explained using the variables of pain intensity, pain extent, and pain duration is about thirty percent. The demographic variable of employment status was also found to be associated with disability.

CHAPTER SIX

Discussion

Findings and Implications

Sample Description

The first goal of the present study was to describe the sample and examine possible differences between the back pain and OOS diagnosis groups. Although the information was often inconsistent there were several interesting aspects of the sample which were found. There is also evidence to suggest that there are possible differences and similarities between the back pain and OOS groups

There was a very high level of unemployment in the sample, and of those who were employed, most were only employed part time. Also, the time since participants had last worked was considerable. Although these findings may have been expected, they serve to underline the fact that the pain experienced by the participants has a huge impact on their lives.

There was a wide variety of occupations in the sample. There was a higher proportion of women in clerical occupations which included tasks such as word-processing and data entry. This is likely to be the reason why there were a higher percentage of women in the OOS diagnosis group. Men tended to have occupations such as labourer or tradesperson, types of jobs which include heavy manual work. This is probably the reason why there were more men in the back pain diagnosis group. These findings

support previous findings which suggest that heavy manual work increases the risk of back pain (Volinn et al., 1991; Turk 1997).

The information gathered about living arrangements indicated that the majority of participants lived with family. This suggests that behavioural processes involving family members, such as reinforcement and social modelling, could have influenced the participants' pain behaviours and disability. The family is an important part of the environment in which pain behaviours and disability develop. It appears that most of the participants lived with family who could potentially be included in the assessment and rehabilitation of pain problems (Flor et al., 1987).

The general medical information gathered indicated that the majority of participants were taking medication and had undergone therapy for their pain problem. About one third of the participants had undergone surgery for their pain problem and a similar number were experiencing another illness as well. Obviously, the medication, therapy, and surgeries were not successful in relieving the participants of their pain, highlighting the difficulties associated with treating chronic pain. Medications and illness can affect levels of pain and disability. It may be important to take into consideration the medication the pain patient is taking, and other illnesses they may be suffering from, when assessing their pain problem. Also, there may be many confounds when examining a group of chronic pain patients with a particular diagnosis. For example, there have been many studies which have assessed the disability and pain associated with back pain, which have not taken into consideration the influence of another illness (Waddell et al., 1993; Triano et al., 1993; Beurskens et al., 1995). Levels of pain and

disability are likely to have been influenced by the other illnesses as well as the pain problem. A large number of participants were cigarette smokers. Because of the many health problems associated with smoking this may also need to be taken into consideration when assessing pain problems.

Fairbank et al. (1980) suggested interpretations of Oswestry disability scores. They consider a score of 0% - 20% indicates minimal disability. This group can cope with most activities of daily living. Those with a score of 20% - 40% exhibit moderate disability experiencing problems with sitting, lifting, and standing. Work, travel, and social life are likely to be affected. A score of 40% - 60% indicates severe disability with sleep, personal care, social life, and travel being affected. Those with a score between 90% - 80% are described as crippled. A score of more than 80% indicates the patient is bed-bound or exaggerating. The majority of the sample in the present study were experiencing a moderate to severe level of disability. The interpretations suggest that their social life and work are likely to be affected. The very high levels of unemployment clearly indicate that work was affected. The only information available related to social activities was concerned with club membership and sporting activities. About forty percent of the sample belonged to a club. This may have been an inflated value due to missing data, but still indicates that a significant number of participants did participate in social activities to some degree. Many participants had stopped participating in sporting activities, indicating a probable reduction in social activities. So, there is evidence to support the interpretation of Oswestry disability scores provided by Fairbank et al. (1980).

It has been previously suggested that there are similarities between back pain and OOS sufferers with regards to disability (Feuerstein et al., 1993). This suggestion was not supported as there were significant differences in disability scores found between the back pain and OOS groups. The back pain group appeared to be more disabled than the OOS group. There are number of possible reasons for this finding. To begin with, the Oswestry disability questionnaire was specifically designed for use with back pain sufferers. Items included in the Oswestry, such as standing and sitting, are not as relevant to an individual suffering from OOS. This means that the Oswestry would give lower disability scores to OOS sufferers who may be quite limited in an area not assessed by the Oswestry. The significantly longer pain durations for the back pain group suggest another explanation. It may be that back pain sufferers are not referred for functional capacity evaluations as soon as OOS sufferers, by which time they are more disabled.

Another difference between the back pain and OOS groups was that the OOS group had significantly greater total pain extent scores because of larger front of body pain extent scores. This is likely to be due to the nature of the pain syndromes. Back pain is usually felt only on the back of the body while OOS is often experienced on both sides of the arms, shoulders and neck.

Worst pain intensity was the only pain intensity variable that was significantly different between the back pain and OOS groups. However, the difference was very small. Overall the back pain and OOS groups appear to be very similar with regards to pain intensity levels. Because pain intensity was equally appropriate for use with both of the

groups, and not influenced by the nature of the pain problems, these findings are really the only ones in which a degree of confidence can be placed.

Pain Intensity and Disability

The second goal of the present study was to explore the relationship between pain intensity and disability. There were a number of findings which suggest that pain intensity is an important aspect of disability.

The correlations between the pain intensity variables were not as high as could have been expected. This suggests current pain intensity, best pain intensity and worst pain intensity, are all valid aspects of pain which give additional information about the pain experienced. It appears that using only one of the visual analogue pain intensity scales would not measure pain intensity as comprehensively.

Previous studies have found correlations of .62 (Gronblad et al., 1993) and .50 (Bolton & Christensen, 1994) between disability measured by the Oswestry and pain intensity measured by a visual analogue scale. The present study found correlations ranging between .39 and .47 between the three pain intensity variables and disability. The level of association between pain intensity and disability was slightly lower than found in previous studies. This is probably because the average pain intensity was measured in the previous studies.

The correlations indicated that best and worst pain intensity were associated to a similar degree with disability and that current pain intensity was the variable most associated

with disability. However, the regression analyses showed that worst pain intensity contributed the largest amount of unique variance to the regression equation. It appears then that the relationship between current pain intensity, best pain intensity and disability is mediated by worst pain intensity. Worst pain intensity also had the regression coefficient with the highest level of significance. This suggests that it is important to consider when examining disability. Worst pain intensity may have been highly associated with disability because when individuals rate their level of disability they may rate their worst level of disability when they are experiencing their worst level of pain.

Waddell et al. (1993) found that pain severity only explained 14% of the variance in disability. Like the present study they used a visual analogue scale to measure pain severity. The present study found that together the current, best, and worst pain intensity variables could explain about 28% of the variance in disability, and that about thirty percent of the variance in disability could be explained using the pain intensity, pain extent, and pain duration variables. Also, each of the pain intensity variables examined in the present study explained more of the variance in disability than the one reported by Waddell et al. (1993). These comparisons raise two points. Firstly, using a single visual analogue scale to measure pain intensity is not as effective as using several. Secondly, the conclusion drawn by Waddell et al. (1993) that pain is relatively less important than other psychological and social factors, may have been premature, and more comprehensive measurement of pain might have suggested a more important contribution of pain to disability.

Pain Extent and Disability

The third goal of the present study was to explore the relationship between pain extent and disability. The findings suggested that pain extent was associated with disability but not to the same degree as pain intensity.

The correlation between pain extent and disability found in the present study was .29. This was slightly higher than the correlation found in a previous study which was .20 (Tait et al., 1989). Tait et al. (1989) used the scoring system developed by Margolis et al. (1986) and it was thought that the scoring system used in the present study may have improved the quality of the measurement of pain extent. Another previous study found a similar correlation of .24 (Bolton & Christensen, 1994). Reasons why the association between pain extent and disability is not large may include the fact that a small area of pain can be very painful, while a large area can be relatively mild. Also, pain extent scores are likely to be a measure of several qualities of a patient other than their pain extent. For example, the neatness of their pain drawing as some patients use tiny crosses to indicate pain while others indicate pain by a scribble.

There are no previous findings to compare the amount of variance in disability that could be explained by pain extent in addition to the variance explained by pain intensity. When pain extent is added to the regression equation it significantly increased the amount of predicted variance in disability by a significant but small amount. The contribution of pain extent to the amount of explained variance in disability was not as great as the contribution of pain intensity. This suggests that pain extent is a significant

factor in disability but that the degree to which it amplifies the association between pain and disability is minimal.

Pain extent and pain intensity appear to measure aspects of pain which are related but different. There was a large amount of shared variability between the pain extent and pain intensity variables. By itself, pain extent could explain slightly less variance in disability than any of the pain intensity variables could by themselves. It appears that if a measure of pain is being sought, pain intensity rather than pain extent should be employed.

Pain Duration, Age, Sex, Employment Status, and Disability

The fourth goal of the present study was to examine the association of pain duration, age, sex, and employment status with disability.

Pain duration was found to have a correlation of .33 with disability, this was very similar to the correlation between pain extent and disability. Like pain extent, pain duration was able to add a significant but small amount of explained variance in disability.

The variables of age, sex, and employment status were added to the regression equation to examine the contribution that demographic variables may have to predicting variance in disability. Although there have been previous findings which suggest that age and sex are associated with disability (Turk, 1997; Volinn et al., 1991), they were not found to add significantly to the regression equation. However, employment status was found

to significantly add to the amount of explained variance in disability. It is not surprising that employment status did contribute significantly to the explained variance in disability because it is often used as an indication of disability (Cutler et al., 1994).

Methodological Issues

There were several methodological problems encountered in the present study. Most of these were due to the fact that the data was not collected for research purposes. This meant that the data was often inconsistent and not as precise as it could have been. There were several different occupational therapists at the Rehabilitation Institute of Wellington responsible for conducting the functional capacity evaluations. This also probably added to variations in the data collection process.

One of the most obvious methodological problems was the amount of missing data. Certain types of information were more consistently collected than others. For example, the average time spent at secondary school was calculated. However, this was only based on a sample of 221 participants. This means that for 69 cases there was missing data. It is possible that these cases were not evenly spread around the mean number of years spent at secondary school. Possibly those participants with no secondary school information had an academic qualification which superseded secondary schooling. It may have been deemed by the occupational therapist that the number of years spent at secondary school was irrelevant.

Another example of missing data is information on taking medication. There were only 213 cases in this sample. The information on medication is more likely to have been recorded if the participant was taking medication than if the participant was not taking medication at all. The missing information results in a sample that is not representative. This could mean that the percentage of participants taking medication was vastly inflated.

Missing data was also a problem with the measure of disability. Because there were few Oswestry disability questionnaires completed in the OOS diagnosis group this meant that the sample used for the regression analyses may not have been representative of the sample as a whole. Because back pain was over represented in the sample used for the regression analyses the findings of the present study need to be carefully considered before implying that theses findings relate to chronic pain patients in general. However, the correlations between the variables were conducted with and without the OOS participants without a completed Oswestry disability questionnaire. The size of the correlations was only slightly reduced when the OOS diagnosis group without an Oswestry were removed from the calculations. This suggests that their removal from the regression equations may not have significantly influenced the results.

Environmental factors can influence self report measures of pain (Jensen, 1997). Therefore, the situation that the data was gathered in must be taken into consideration. A functional capacity evaluation is often conducted to assess an individuals ability to return to work. This places considerable strain on individuals who feel that they are not ready to return to work, or are afraid of losing ACC compensation payments, which are

often more than a sickness or unemployment benefit. It is conceivable that the participants in the present study tended to rate their pain intensity and disability levels higher due to the demand characteristics of the situation. Social desirability response bias is also another important aspect to consider. There is evidence to suggest that individuals with greater social desirability response biases report higher levels of pain and disability (Deshields, Tait, Gfeller & Chibnall, 1995). This could easily have been a factor in the present study.

The degree of association between the pain intensity variables and disability could also be because the Oswestry measure of disability contains an item regarding pain intensity. This would mean that the correlations between pain intensity and disability may be higher than could otherwise be expected. Another problem with the Oswestry is that it is less appropriate for use with individuals with a diagnosis other than back pain. As mentioned, this is likely to have decreased the disability scores of those participants who did not suffer from back pain.

The examination of differences between the groups was plagued with methodological difficulties. The diagnoses that were used to classify the sample into groups were sometimes quite vague. Due to the lack of medical expertise of the researcher, any participants for whom it was not clear whether they were in the back pain or OOS group, were put into the other diagnosis group. As has been found previously, there was a lot a comorbidity, that is participants with more than one pain problem (Von Korff et al., 1988). When the sample was split into diagnosis groups, there were about one quarter of the sample who had more than one diagnosis. These two points mean that the

diagnosis groups can not be seen as representative of back pain or OOS sufferers in general.

It is difficult to clarify the nature of the samples from which the information for the present study was gathered. There were a large number of files at the rehabilitation institute which did not contain a functional capacity evaluation. Whether or not a participant received a functional capacity evaluation is likely to have depended on ACC procedures. It is difficult to know if the sample is of those with the most severe level of disability, or if the sample is made up of those whom ACC case managers thought may be suitable for assessment before rehabilitation or return to work.

Future Research

There are a number of ways in which the present study could be improved and extended. Initially, ways in which the findings of the present study could be clarified will be discussed. Then research which would extend the present study will be examined.

Data collection and sampling procedures need to be clearly identified. The establishment of guidelines regarding the information which is to be collected, and the administration of the measures, need to be developed. For example, clarifying the nature of the administration of the visual analogue pain intensity scales. Also, the referral procedures for functional capacity evaluations need to be explored so that the sampling can be described with more precision.

The measurement of several of the variables in the present study could be improved. Most importantly, the Oswestry measure of disability needs to be replaced with a disability measure designed for use with a range of chronic pain patients. Also, a disability measure which does not contain an item on pain intensity would be more appropriate. Pain intensity could be measured more comprehensively by including aspects such as the frequency of pain episodes. Also, the use of a visual analogue scale which measures average pain intensity may mean that the association between pain intensity and disability may increase. Occupation could be analysed more comprehensively by getting participants to indicate components of their jobs such as lifting or word-processing. This would allow a more accurate and detailed job classification.

The biopsychosocial model of pain suggests that biological, psychological, and social factors are involved in pain and disability. Future research could incorporate several psychological and social variables not included in the present study. For example, fear-avoidance beliefs which have been found to be associated with disability (Waddell et al., 1993). Future research could also address social factors involved in disability more comprehensively. Examples of possible social factors are social support and marital satisfaction. When trying to conduct research through a biopsychosocial perspective cultural factors are also often forgotten (Landrine & Klonoff, 1992; Kraus & Miller, 1990). Because of New Zealand's multicultural society it provides a great opportunity to examine the impact of culture on pain and disability.

The relationship between pain and disability can not be assessed comprehensively through the use of only cross-sectional analyses. The need to examine the possible causal links between the different aspects of pain and disability can only be addressed through the use of a longitudinal research design. A setting such as a rehabilitation institute provides a suitable environment for such research. With the collaboration of an organisation such as ACC the necessary information needed for a longitudinal study could be gathered as part of usual assessment procedures. Guidelines and procedures which ensure that the data collected is accurate and consistent would result in better quality data than was available in the present study.

Summary and Conclusions

The description of the sample suggested that pain problems experienced by the participants had impacted negatively on their lives, particularly in the area of employment. Also, there were several factors which may need to be taken into consideration when examining groups of chronic pain sufferers, such as the presence of an illness, in addition to their pain problem. There was evidence that there were similarities and differences between the back pain and OOS groups, but methodological difficulties made conclusions difficult.

Pain intensity was found to be the aspect of pain most associated with disability. However, pain extent and pain duration were also significantly associated with disability. These findings suggest that pain intensity is important to take into

consideration when assessing disability, however, there are also other aspects of pain worth considering.

The three aspects of pain examined in the present study, pain intensity, pain extent, and pain duration, were able to explain a significant amount of the variance in disability but there was still a large amount of unexplained variance. These findings are in keeping with the relationship between pain and disability proposed by Waddell (1987; see Figure 2) which suggests that that disability is not a direct function of pain. These findings are also in keeping with the biopsychosocial model of pain which suggests that a wide range of biological, psychological, and social factors are involved in pain and disability. Because the present study contained a narrow range of variables it is not surprising that a limited amount of variance in disability was able to be explained. Further research which includes social variables would be useful.

It is important to understand the factors which contribute to the disability associated with chronic pain which place many limitations on an individuals life. Although there are other biological, psychological, and social factors involved in disability, it seems that pain is a significant contributing factor. The importance of pain in disability can not be underestimated.

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Appendix A

Data collection sheets

Consent form ? ☐

ID Number ☐☐☐☐

Program at RIW _____

_____

Year Born ☐☐

Sex ☐

Funder ☐

Marital Status ☐

Number of Children ☐

Diagnosis _____

Pain Duration Start_____ FCE date_____

Injury Sites _____

_____

Hand Dominance ☐

Medication _____

_____

Pain Intensity

Current ☐☐

Best ☐☐

Worst ☐☐

Past Medical History

Operations _____ ☐

_____ ☐

Illnesses _____ ☐

Accidents _____ ☐

Change in Fitness _____ ☐

Therapies _____ ☐

Weight _____ ☐

Smoking _____ ☐

Drinking _____ ☐

Home Shared With ☐

Self Care Activities

Shaving/Bathing ☐

Grooming/Hygeine ☐

Dressing ☐

Oswestry

Pain Intensity ☐

Personal Care ☐

Lifting ☐

Walking ☐

Sitting ☐

Standing ☐

Sleeping ☐

Sex life ☐

Social Life ☐

Travelling ☐

Total: ☐☐

Home Making Activities

Dusting ☐

Dishes ☐

Cooking ☐

Rubbish out ☐

Laundry ☐

Sweeping/Mopping ☐

Changing Bed ☐

Vacuuming ☐

Grocery Shopping ☐

Lawn Mowing ☐

Gardening ☐

Home Maintenance ☐

Leisure Recreation

Sports, preinjury _____

postinjury _____

Interests _____

Clubs/Groups/Societies ☐

Education

Secondary Yrs ☐

qualifications _____

Tertiary Yrs ☐

qualifications _____

Technical Vocational _____

Vocational

Employment status ☐

Most recent occupation _____

Nature of job _____

Dates _____

Months since last employed _____

Self Employed ☐

Position still held open ☐

Compensations during unemployment _____

Pain Drawing Score Sheet

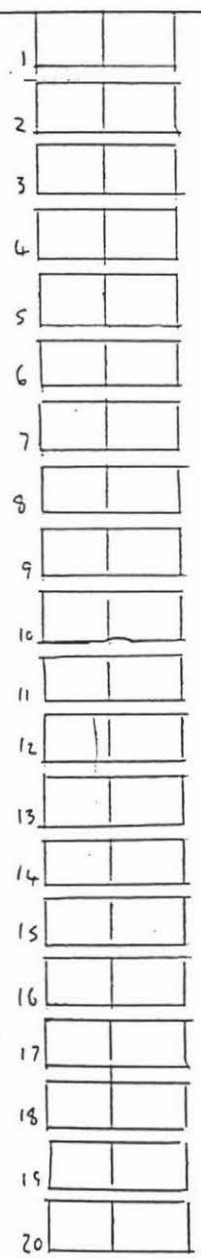
ID Number

Total Back

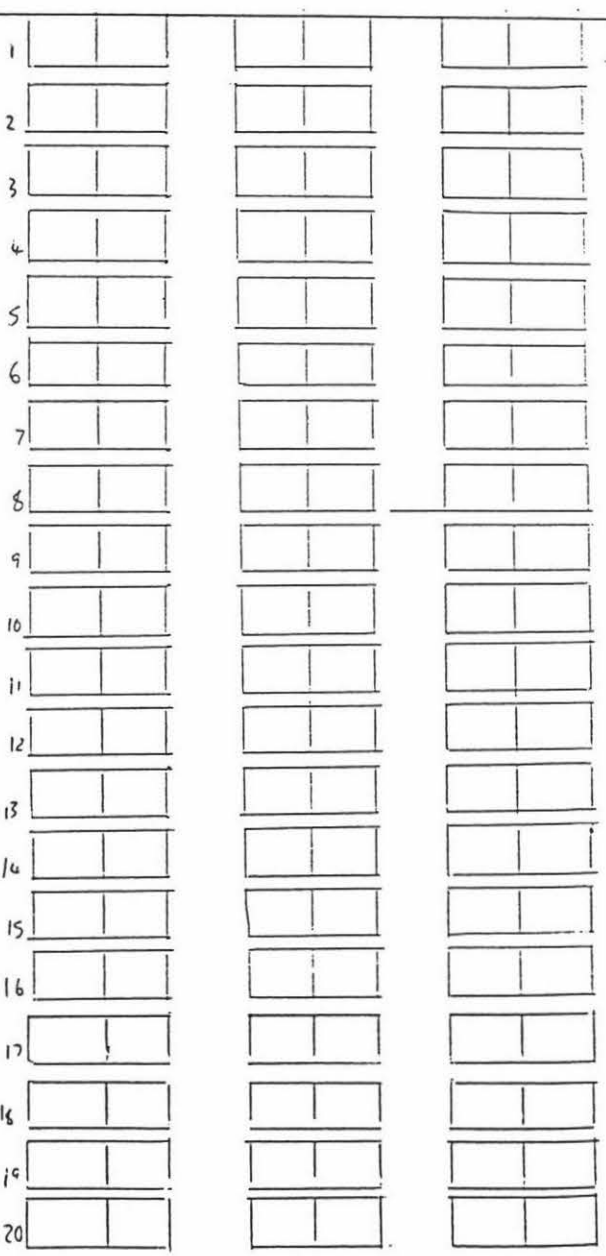
Total Front

Overall Total

Back

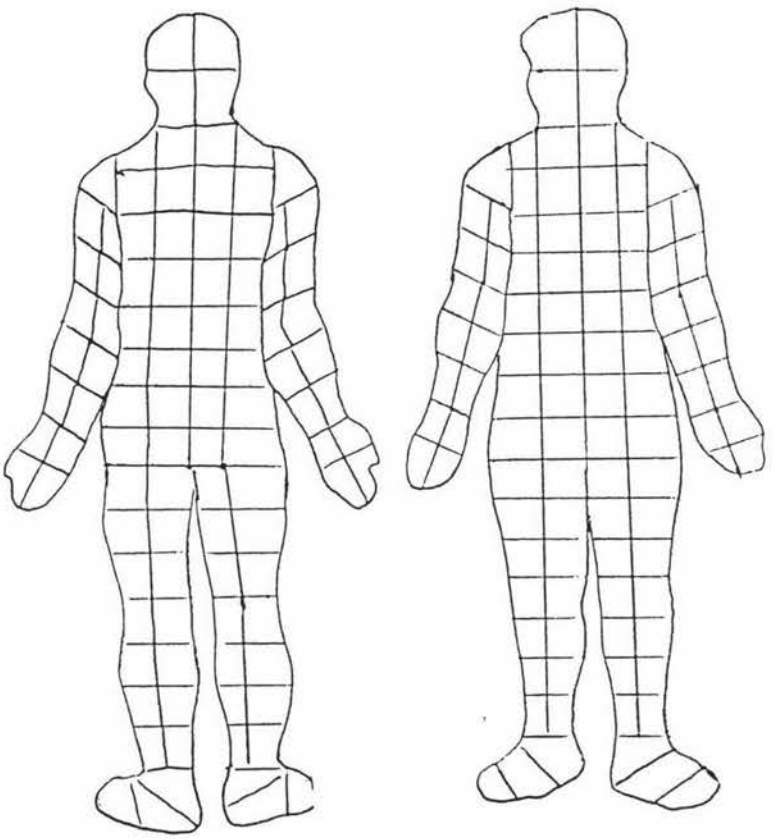


Front



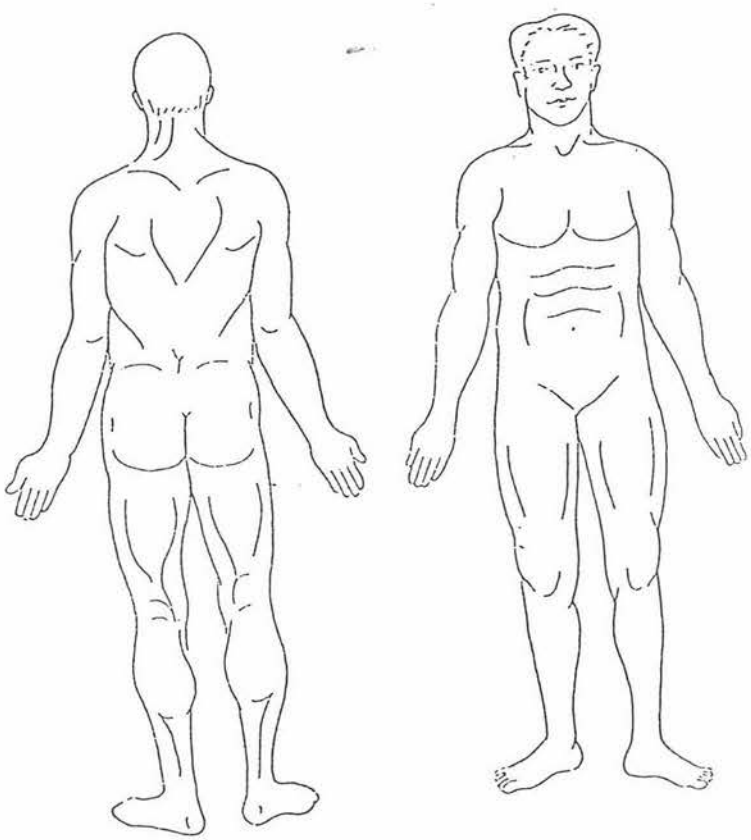
Appendix B

Pain Drawing Scoring Template



Appendix C

Pain Drawing Outline



Appendix D

The Oswestry Disability Questionnaire

This questionnaire has been designed to give us information as to how your pain level affects your ability to manage in everyday life. Please read each of the sections below and mark in each section only the **ONE BOX** which applies to you. We realise that you may consider that two of the statements in any one section relate to you, **but please just mark the box which most closely describes your problem.**

Section 1 - Pain Intensity
- ☐ I have no pain at the moment
- ☐ The pain is very mild at the moment
- ☐ The pain is moderate at the moment
- ☐ The pain is fairly severe at the moment
- ☐ The pain is very severe at the moment
- ☐ The pain is the worst imaginable at the moment

Section 2 - Personal Care (washing, dressing etc.)
- ☐ I can look after myself without causing extra pain
- ☐ I can look after myself but it causes extra pain
- ☐ It is painful to look after myself and I am slow and careful
- ☐ I need some help but manage most of my personal care
- ☐ I need help every day in most aspects of self care
- ☐ I don't get dressed, wash with difficulty and stay in bed

Section 3 - Lifting
- ☐ I can lift heavy weights without extra pain
- ☐ I can lift heavy weights but it gives me extra pain
- ☐ Pain prevents me from lifting heavy weights off the floor but I can manage if they are conveniently placed
- ☐ Pain prevents me from lifting heavy weights but I can manage light and medium weights if they are conveniently positioned
- ☐ I can lift only very light weights
- ☐ I cannot lift or carry anything at all

Section 4 - Walking
- ☐ Pain does not prevent me from walking any distance
- ☐ Pain prevents me from walking more than 2 kilometres
- ☐ Pain prevents me from walking more than 1 kilometre
- ☐ Pain prevents me from walking more than ½ kilometre
- ☐ I can only walk using a stick or crutches
- ☐ I am in bed most of the time and have to crawl to the toilet.

Section 5 - Sitting
- ☐ I can sit in any chair as long as I like
- ☐ I can sit in my favourite chair as long as I like
- ☐ Pain prevents me from sitting for more than 1 hour
- ☐ Pain prevents me from sitting for more than ½ hour
- ☐ Pain prevents me from sitting more than 10 minutes
- ☐ Pain prevents me from sitting at all

Section 5 - Standing
- ☐ I can stand as long as I like without extra pain
- ☐ I can stand as long as I want but it gives me extra pain
- ☐ Pain prevents me from standing for more than 1 hour
- ☐ Pain prevents me from standing for more than 30 minutes
- ☐ Pain prevents me from standing for more than 10 minutes
- ☐ Pain prevents me from standing at all

Section 7 - Sleeping
- ☐ My sleep is never disturbed by pain
- ☐ My sleep is occasionally disturbed by pain
- ☐ Because of pain I have less than 6 hours sleep
- ☐ Because of pain I have less than 4 hours sleep
- ☐ Because of pain I have less than 2 hours sleep
- ☐ Pain prevents me from sleeping at all

Section 8 - Sex Life (if applicable)
- ☐ My sex life is normal and causes no extra pain
- ☐ My sex life is normal and causes some extra pain
- ☐ My sex life is nearly normal but is very painful
- ☐ My sex life is severely restricted by pain
- ☐ My sex life is absent because of pain
- ☐ Pain prevents any sex life at all

Section 9 - Social Life
- ☐ My social life is normal and causes no extra pain
- ☐ My social life is normal but increases the degree of pain
- ☐ Pain has no significant effect on my social life apart from limiting my more energetic interests
- ☐ Pain has restricted my social life and I do not go out as often
- ☐ Pain has restricted my social life to home
- ☐ I have no social life because of pain

Section 10 - Travelling
- ☐ I can travel anywhere without pain
- ☐ I can travel anywhere but it gives me pain
- ☐ Pain is bad but I manage journeys over 2 hours
- ☐ Pain restricts me to journeys of less than 1 hour
- ☐ Pain restricts me to journeys of less than 30 minutes
- ☐ Pain prevents me from travelling except to receive treatment