EMOTION AND PERCEIVED CONTROL AS PREDICTORS OF DISABILITY IN CHRONIC PAIN PATIENTS

Ph.D. Thesis

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University of London 1992

ABSTRACT

EMOTION AND PERCEIVED CONTROL AS PREDICTORS OF DISABILITY IN CHRONIC PAIN PATIENTS

Early work in behavioural medicine has shown that there is no simple relationship between pain and resulting disability. There are numerous reasons for this which are due both to behavioural factors such as environmental consequences and cognitive ones such as negative beliefs, anxiety and perceived control over the pain problem.

A pilot study in the clinical setting which forms the basis of this study, suggested that in a chronic low back pain population, disability measured by a specially designed disability questionnaire reduced as a result of intervention although pain largely remained unchanged.

It was therefore necessary to explore the data for possible mediating variables and this lead to the identification of emotional and cognitive factors which contributed to the pain - disability relationship.

Two experiments were carried out, one to assess the role of emotional distress and the other the role of perceived control in the modification of disability. The experiments demonstrated that both anxiety and perceived control could be successfully increased or decreased by manipulating patients' cognitive set and that the emotional but not the control manipulations were able to affect activity on a task of daily living (carrying a weight) in the predicted direction relative to baseline.

Studies were also undertaken to validate the pain, disability, emotional distress and locus of control measures and it was ascertained that both criterion related and discriminant validity could be established for the disability measure by asking patients to perform sitting, walking and lifting assignments to tolerance and comparing their results with their scores on the relevant sections of the disability questionnaire. Examination of the other measures yielded some validity data.

Finally a replication study was carried out to confirm the earlier findings that emotional factors rather than pain itself predict disability and the potential to change limitation of function. This hypothesis was upheld.

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ACKNOWLEDGEMENTS

I should like to thank Dr. Marie Johnston for supervising the gestation of this thesis, not only for her comments on its merits and failings but also for her invaluable enthusiasm which restored my motivation at critical points.

Admiration and gratitude are extended to Margaret Piper who worked beyond the call and hours of duty to keep the word processor under control and patiently retyped and retyped until the finished document was finally off her desk.

Grateful thanks are also due to Chris Barker for advice on statistical analysis and Janet Simpson for information about presentation.

Finally and most importantly, I would like to express great appreciation to the patients who willingly allowed themselves to be subjected to rice carrying experiments and to be pursued round the Outpatient Department in order to fill in yet more psychological questionnaires. It is hoped that they also derived some benefit from seeing their results.

Keren Fisher
Royal National Orthopaedic Hospital Trust 1992

PART 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

CHRONIC PAIN

The quest for a suitable definition of chronic pain has engaged the attention of philosophers, scientists, clinicians and sufferers since Aristotle. There are so many different perspectives to consider that as Chapman and Wyckoff (1981) point out, the problem of integration is still like that of the mythical blind men examining an elephant. Each found and reported a different thing. The elephant is still not seen as a whole greater than the sum of its parts because each part is still being examined at different qualitative levels of analysis. Nowadays, however, chronic benign pain is generally characterised by persistent pain which has lasted for six months or longer and is accompanied by behavioural and psychological symptoms such as decreased activity levels, sleep disturbance, depression, anxiety, medication abuse and marital, family and financial difficulties (e.g.Fordyce 1976). Each of the components of the experience, pain, behaviour and mood needs to be examined separately and their interrelationships explored before the elephant can be properly conceptualized. This thesis attempts to meet this challenge.

Mechanisms of Chronic Pain

1. Physiological

Bonica (1977) has categorised the mechanisms of chronic pain into peripheral, central and psychophysiological. In the first of these, the source of chronic pain may be repetitive stimulation of pain receptors. Damage to peripheral A delta and C nerve fibres may sensitise pain receptors which may become hypersensitive to noradrenalin. Mechanical pressure in peripheral nerves can also contribute to destruction of large fibres allowing more small fibre activity to be noticed in the brain.

Central mechanisms may be the critical factor in pain caused by diseases or injuries to the central nervous system. For example, cerebral vascular accidents and lesions of the thalamus can produce a characteristic burning pain.

In suggesting that psychophysiological responses may be responsible for production of pain producing substances, Bonica points out that both central and peripheral sympathetic mechanisms may be involved in the development and maintenance of chronic pain. Patients may not be able to differentiate sympathetic arousal symptoms associated with anxiety from those resulting from pain. Persistent avoidance of an aversive event may lead by negative reinforcement to increased experience of anxiety labelled pain by the patient when such an event has to be confronted. In support of this Cohen et al. (1980) found that skin conductance responses of low back pain patients are elevated, and hyperventilation is common in many chronic pain patients according to Glynn et al. (1981).

Melzack and Wall (1965) first postulated the gate control theory of pain which states that pain is generated by small fibres when tissue damage occurs. The conduction of nerve impulses to the spinal cord transmission cells and thus to the brain is modulated by a spinal gating mechanism in the dorsal horns. This is influenced by the relative amount of activity in large diameter and small diameter fibres. Activity in large fibres tends to inhibit transmission (close the gate) while small fibre activity tends to facilitate transmission (open the gate). As physiological evidence accumulated it became clear that the substantia gelantinosa was the most likely site of the gating mechanism as it consists of a highly specialised closed system of cells receiving different inputs from large and small fibres and is able to influence the activity of cells that project to the brain (Melzack & Wall 1981).

Alongside this line of research has been that of Akil and others on the mechanism of analgesia produced by electrical stimulation of the periaqueductal grey areas of the brain (Richardson & Akil 1977). The neurotransmitters serotonin and dopamine are necessary for this type of analgesia to occur. Morphine analgesia also depends on serotonin and electrical stimulation of certain raphe nuclei enhances the action of morphine (Akil & Liebeskind 1975). Opiate and stimulation produced analgesia appear to share a common mechanism which is further supported by evidence of the existence of opiate receptors throughout the brain and particularly in the periaqueductal grey matter (Barchas, Akil et al. 1978). When morphine is given, analgesia occurs because opiate molecules bind to the specific receptors which presumably exist in order to bind to naturally occurring substances. Barchas et al. (1978) go on to describe a variety of morphine like substances (endorphines) produced in the brain. A subset of these called enkephalins is located in the substantia gelatinosa and these may inhibit the release of an excitatory substance that is necessary for the transmission of noxious impulses to the higher brain centres. It may therefore be the case that chronic pain patients have depleted levels of critical neurotransmitters or morphine like substances thus enhancing the perception of noxious sensory input. (Chapman & Wykoff 1981).

According to Turk, Rudy and Steig (1988), however, pain has been viewed historically as either a sensory physiological event or the result of a psychological process and therefore assessment has been aimed at measuring these dimensions independently instead of comprehensively. For example, the biomedical assessment of the patient has looked at the sensory-physiological perspective in which pain is viewed as directly linked to the extent of tissue damage. Assessment on these lines is intended to establish the nature and extent of the pathology that causes the pain. Interpretation of these findings has relied on clinical judgements which have not been adequately standardised in terms of instructions for performing the test. Neither has there been sufficient information about the collection of data for norms, or reliability or validity.

2. Psychopathological

In contrast, the psychiatric approach to chronic pain suggests that in the absence of "objective" biomedical information, pain can be explained by personality characteristics or a psychiatric disorder. Blumer and Heilbronn (1982), for example, describe the "pain-prone" patient as one who has psychodynamic features similar to those of the "depression - prone" patient and Schaffer et al. (1980) report a higher than expected frequency of depression among relatives of pain patients, implying a genetic or learning basis for both disorders. This has led to construing pain as a dichotomous variable - either "organic" or "psychogenic". Not only is this dichotomy at variance with the concept of pain as a multifactorial experience, but it assumes that there are standards available by which to assess whether reported pain is appropriate for given conditions. It is also assumed that a psychiatric problem and a pain disorder cannot coexist or that an emotional problem cannot be the result rather than the cause of a complaint of chronic pain. The dichotomy, thus, has to be dismissed as over simplistic and inappropriate.

3. Behavioural

Behavioural approaches to the understanding of pain have focused on the fact that pain, being a subjective phenomenon, can only be communicated by means of a range of behaviours and it is these behaviours that should be studied directly (e.g. Fordyce et al. 1968, Keefe et al. 1982). These pain behaviours include complaints of pain, adoption of certain postures and facial expressions, reduction in activity, avoidance of home and work responsibilities and reliance on medication. These behaviours will be elicited initally by pain of acute onset and may extinguish as the pain resolves. However, when the pain persists many opportunities are available for the behaviours to come under the influence of environmental consequences. Through a process of operant conditioning complaints of pain are reinforced by attention of family members, delivery of analgesia or avoidance of unwelcome social or occupational responsibilities (Keefe & Gil 1986).

Keefe, Gil and Rose (1986) note that chronic pain is one of the major complaints that lead individuals to seek medical care and because medical interventions rarely cure it, a broad multidisciplinary approach needs to be considered.

These studies recognise the view that pain cannot be assessed objectively and thus the psychological (cognitive, affective and behavioural) context in which it is experienced and reported must be taken into account in any comprehensive theory of pain.

DISABILITY

Historically disability was considered the same as impairment. X-rays and physical and psychological assessments were used to assess impairment and from these disability was evaluated (Tait, Chibnall and Krause 1990). Subsequent definitions of disability have noted the relative independence of limitation of function from physiological impairment. Assessments of disability have therefore begun to focus on the selection of appropriate measures of activity.

It is important to measure disability, that is loss of function resulting from physical or psychological impairment, separately from handicap, which is the social disadvantage which may result from the physical disability. Many authors do not address this problem. The World Health Organisation (1980) has recently defined disability as any restriction or lack of ability resulting from an impairment to perform an activity in the manner or within the range considered normal for a human being. Handicap is defined as a disadvantage for a given individual resulting from an impairment or a functional limitation that limits or prevents the fulfilment of a role which is normal for that individual. This definition, which involves interference with activities of daily living, allows for inclusion of conditions such as chronic pain where the physical condition giving rise to the disability is in doubt.

Gallagher et al.(1989) note that patients suffering from low back pain are known to sustain significant limitation in physical, psychosocial, work and recreational activities, but the dimensions of the problem that actually account for the degree of disability are not fully understood. There is an absence of data linking patient characteristics to successful rehabilitation or change in disability status.

Different situations require different measures of disability and handicap. For example, examiners faced with decisions about a person's vocational status tend to focus on impairment and interference with work related activities, but clinical research has concentrated on activities of daily living. Fordyce et al. (1984) recommended that disability assessment regardless of its purpose include attention to both voluntary activities, such as work and socialising and obligatory activities such as self care. Further, when considering the emphasis which one should place on selecting activities to define disability, Sainsbury (1973) has pointed out that inherent in the disabled condition is the limitation of choice of activity and this needs to be taken into account in any discussion of definition or selection of measurement instruments. Thus, if disability is defined as any restriction in relevant activities and suitable measures of this are available it should be possible to examine the relationship between pain and limitation of function.

MOOD

Affective or emotional experiences have widespread physiological concomitants which influence behaviours and cognitive processes. From the neurochemical point of view, mood states such as anxiety or anger are relatively undifferentiated. Secretions of the adrenal gland are accelerated under control of the Autonomic Nervous System in order to prepare for any kind of perceived threat. An increase in heart rate and sweating may result. Impulses from different receptors pass through or near to the hypothalamus on their way to the cerebral cortex. Information can also travel to the hypothalamus from the cortex if the emotion provoking stimulus is a memory or thought. The hypothalamus then sends efferent impulses to the viscera and the muscles resulting in changes in secretion of adrenalin, noradrenalin and cortisone which are perceived as a state of generalized emotional arousal (Lashley 1938). Schachter (1971) proposed that it is a cognitive process which then determines the appropriate affective label based on the individual's previous experience and current perception of the relevant features of the environment. A study by Maslach (1979) did indeed show that when subjects had been given an injection of adrenalin and reported "jittery" feelings associated with an increase in heart rate and muscle tremors, the reported emotion experienced in the presence of an assistant was consistent with the behaviour of the assistant and information about the expected mood state following the injection. Those subjects who were told the drug would produce feelings of euphoria and who observed the assistant engaging in "amusing" behaviours such as playing "basketball" with rolls of paper, reported relatively more pleasant emotional experiences than those who were informed the drug would produce feelings of anger and observed the assistant behaving angrily towards the experimenter. This group tended to report increased feelings of anger. However, their reported emotion was not primarily influenced by the behaviour of the assistant. Although they accurately perceived the confederate's expressed emotion they did not always judge their own emotional state as similar. There was a general tendency to describe their own arousal more negatively than was portrayed by the assistant. This would indicate that excessive secretion of adrenalin is almost always unpleasant irrespective of the context and this factor may then influence behaviour to reduce it.

Specific facial expressions are associated with different emotions and Tomkins (1981) argues that certain types of stimuli activate innate structures in the brain which represent primary emotions like fear and anger and are linked to specific facial displays. In this case the innate associations between arousal patterns, emotion and facial expressions would indicate that mood states are not entirely cognitively determined.

Moreover, the experience of depression is more physiologically differentiated than anger, fear and anxiety. The usual chemical picture in depression is of reduced noradrenalin and adrenalin and reduction in hypothalamic reactivity. This is normally described by patients as reduced arousal, loss of enjoyment and apathy, all entirely different from the reported experiences of anxiety, and showing a different profile on tests of psychopathology such as the MMPI (Hathaway and McKinley 1943).

Mood states can have acute and chronic manifestations. Spielberger (1972) describes anxiety states, characterised by subjective feelings of tension, nervousness and worry, as expressions of personality states which can occur when evoked by appropriate stimuli and endure over time when these stimuli persist. Personality traits are relatively stable individual differences in tendencies to perceive situations as stressful or manageable. Trait anxiety will determine the tendency to respond to perceived threat with elevations in the intensity of state anxiety reactions. These responses can be measured and differentiated, the authors claim, by suitably designed questionnaires such as the State-Trait Anxiety Inventory (Spielberger et al. 1970).

Affleck et al. (1992) emphasise the complex role that the personality trait neuroticism involving low self esteem, helplessness, anxiety and depression plays in mood. Rheumatoid arthritis sufferers were asked to complete a modified Profile of Mood States (Lorr and McNair 1982) on a daily basis during a 75 day prospective study. Mean mood scores were correlated with a neuroticism questionnaire score (NEO Personality Inventory, Costa and McCrae 1985) and High N individuals were found to experience more chronically distressing emotions and low chronic mood.

Thus it would seem that mood states particularly anxiety and depression can be determined by influences other than immediate environmental ones, and need to be considered as a contributory factory in the experience of pain and the resulting disability.

PAIN AND MOOD

Chemically depleting levels of serotonin in the rat increases response to electric shock and reduces analgesia (Akil and Mayer 1972). Administration of noradrenalin produces a strong analgesia in animals which may inhibit the release of substance P thus blocking pain perception (Pang and Vasko 1986). There is also an accumulation of evidence that depression is associated with depletion of noradrenalin (e.g. Warburton 1975) and serotonin (e.g. Coppen, et al. 1972). It seems to be clear that both neurotransmitters serotonin and noradrenalin are involved in the process of pain perception and in the probable mechanism of depression. Chronic pain and depression seem to share, at least in part, common neurochemical substrates and perhaps similar alterations in function. While this is compatible with the hypothesis that one may underlie the other, it may also simply indicate that similar biological mechanisms may be present in both conditions.

Some authors believe that patients' complaints of pain in the absence of an organic lesion may be an expression of underlying depression. Krishnan et al.(1985) found that 36% of a group of chronic pain patients who had signs considered a definite explanation for their pain symptoms and 74% of an indeterminate group, who had signs which might explain their pain symptoms, met the criteria for diagnosable depression. Magni and DeBertolini (1983) showed that there was a positive significant correlation between monoamine oxidase activity and 5-hydroxyindoleacetic acid (the breakdown product of serotonin) in the cerebro spinal fluid of patients with chronic pain. Decrease in serotonin activity may thus account for an increased susceptibility to both depression and chronic pain.

There is considerable controversy, however, regarding the extent to which depression and chronic pain are associated and the mechanism by which such an association could occur. Other authors report that depression occurs in a relatively small subset of chronic pain patients (e.g. Pilowsky et al. 1977). Romano and Turner (1985) have looked at pain complaints in depressive psychiatric patients and found incidences ranging from 40 to 60%.

Anxiety may also potentiate the development of pain in depressed individuals. In those studies in which the incidence of pain complaints is highest, anxiety has been present as well as depression. Von Knorring (1975) proposed that increased levels of muscle tension may contribute to the development of pain in anxious depressives but EMG measurements have generally failed to document a close relation between pain report and muscle tension. Wade, Price, Hamer, Schwartz and Hart (1990) investigated the relative contribution of frustration, anger and anxiety to pain unpleasantness and depression. Using data from visual analogue scales analysed by multiple regression and controlling for pain intensity, they concluded that anxiety predicted pain unpleasantness, and anger and frustration predicted depression in pain patients.

The successful treatment of chronic pain with tricyclic antidepressants (Feinmann 1985) is further evidence that there may be a neurochemical substrate common to pain and depression as Magni and DeBertolini (1983) suggest. Anxiety appears to be a moderator variable and correlates with greater pain before and pain relief after treatment with tricyclics (Ward et al. 1983).

Keefe et al. (1986) point out that studies examining depression have failed to consider the medical variables likely to affect pain and pain behaviour and these need to be understood and controlled before concluding that pain or pain behaviour is reflective of depression. These authors defined pain behaviours as body posturing or facial expression which are overt and can be objectively recorded rather than by means of self report or clinical rating scales. They set out to determine whether depression would predict a significant proportion of variance in pain behaviour beyond that which could be predicted on the basis of demographic and medical variables. Scores on the Beck Depression Inventory (Beck 1972) did indeed predict a significant proportion of the variance on some measures of pain behaviour; higher scores on the depression measure were related to increased pain behaviour. They also found, however, that the percentage of variance in pain behaviours that could be attributed to depression was small. This suggests that some other cognitive or affective variable may also have a contribution.

It is known that emotional distress is associated with chronic pain (Benjamin et al. 1988) and Watson and Pennebaker (1989) reported that symptom perception is associated with "negative affectivity" because of a cognitive style characterised by introspection and perceptual amplification of bodily sensations. Thus, negative affective states, particularly anxiety and depression (Wade et al. 1990) are associated with the experience and reporting of pain.

Ackerman and Stephens (1989) found no significant differences between acute and chronic pain patients' scores on the Sensory, Affective or Evaluative subscales of the McGill Pain Questionnaire (MPQ) (Melzack 1975) or on measures of depression, anxiety or negative life change scores (which does not concord with other authors - e.g. Sternbach 1974). However, in the chronic pain group significant correlations were found between depression and each of the Sensory, Affective and Evaluative scores of the MPQ and between anxiety and the 3 classes of the MPQ, which were not apparent for the acute group. This suggests that psychological distress becomes more associated with pain over time.

Romano and Turner (1985) also examine the temporal relationship between the onset of chronic pain and depression. Only one study was found in their review of the area, that investigated pain complaints in relation to depression over time. This was a retrospective study from patient notes dating back 24 years from the completion of the study. Pain complaints were not assessed systematically and duration and severity of the pain problems were unknown (Widmer and Cardonet 1978). Romano and Turner remark that the variability in the results of studies trying to investigate the coexistence of depression and pain is due to difference in instruments used as well as differences in diagnostic criteria for both pain and depression.

Gamsa (1990) addresses the issue of the causal direction of the relationship between emotional disturbance and pain. She contests the view held by many authors (e.g. Blumer and Heilbronn (1982) and Violon (1982)) that in the absence of significant findings on diagnostic procedures and the failure of many treatments to alleviate the pain, that the conclusion must be that the pain is likely to be psychological in origin. She questions the assumption that the emotional disturbance observed in these patients preceded the onset of pain and is thus significant in its aetiology. Although many studies have suggested that personality and personal history variables are causally linked to pain, few have used adequate conceptualisations or methodology to warrant such conclusions. This is a particular problem if causal conclusions are drawn from correlational studies as in the Blumer and Heilbronn work.

Gamsa designed a study comparing pain patients with control subjects and examined both current emotional disturbances and antecedent events. A total of 244 subjects, 163 with chronic pain and 81 controls participated. She used the Parental Bonding Instrument (Parker, Tupling, Brown 1979) to assess recollections of parental care and a specially constructed scale of unmet childhood dependency needs focusing on such areas as regular work before the age of 14, parental beatings and prolonged absence of either parent during childhood. These were intended to measure the antecedents of depression and other aspects of the subjects' lives which were assessed by the Zung Self Rating Depression Scale (Zung 1965) and the Life Satisfaction Scale which the author designed herself.

Comparison of the pain and control groups showed that the pain group had a higher depression score and a lower Life Satisfaction score than the control group, but did not differ on most of the antecedent variables. Further analysis with multiple regression showed that the antecedent measures as a whole were not related to pain intensity, but that pain was associated with the concurrent measures of depression. In patients who suffered greater pain intensity, little relationship was found between pain and events preceding pain onset. The overall pattern of results suggest that the depression and low life satisfaction found in pain patients are more likely to be consequences than causes of pain, since events preceding pain onset were not shown to be related to pain. This is supported by work of Rudy et al. (1988), who found, using structural modelling with latent variables (LISREL analysis), that patients become depressed as limitations associated with pain interfere increasingly with activities of daily living.

It is clear therefore that although about 50% of chronic pain patients do not suffer associated depression (Magni 1987), those who do are likely to experience depressed mood as a consequence of pain and disability. Although there may be common biochemical mechanisms these may only operate together in individuals predisposed to depression. The role of other negative emotional states such as anxiety has received relatively little attention and yet may have a stronger relationship with pain than depression itself. Wade et al. (1990) have shown that this is likely to be the case and it deserves further experimentation.

PAIN AND DISABILITY

Fordyce et al. (1981) found a negative correlation between pain complaints and exercise performance suggesting that the more active patients became the less pain they reported - a finding that is inconsistent with the postulate that activity causes pain.

Turner and Clancy (1988) discuss the usefulness of different treatments for chronic back pain and compare two approaches, operant conditioning which aims to decrease pain behaviours and increase well behaviours and cognitive behavioural therapy which aims to modify the patients' subjective experience and beliefs while in pain. Both treatment groups showed greater changes on the disability measure which was the Sickness Impact Profile (Bergner et al. 1981), than on the pain measure (McGill Pain Questionnaire (Melzack 1975)). These changes were maintained at 12 month follow up. The authors concluded that both the operant behavioural and the cognitive behavioural therapies resulted in long term improvement but the effect was more marked for disability than pain.

Fisher (1988) (see Chapter 3) found this was also true in a sample of patients who attended a pain management course. Although pain intensity did not significantly change at 3 months, disability measured by the Oswestry Low Back Pain Disability Questionnaire

Questionnaire (Fairbank et al. 1980) showed a reduction.

These results clearly show that improvement in disability can be achieved in chronic pain patients which is not necessarily mediated by a preliminary improvement in pain. Thus pain per se is not an adequate explanation of disability in chronic pain patients. Some intervening construct must be considered and it is proposed that cognitive and affective aspects should be examined as the fundamental variables able to provide the potential for change.

DISABILITY AND MOOD

There is an apparently universal finding that chronic disability will be associated with emotional distress as measured by the MMPI (Hathaway and McKinley 1943). In particular, as the psychological world of the patient becomes more limited by disability, scores on the somatic preoccupation and depression subscales will become higher. Lebovits et al. (1967) in a prospective study, found that survivors of coronary heart disease had significantly higher scores after the onset of their illness than before. Moos and Solomon (1965) found that those patients more severely disabled by rheumatoid arthritis than those whose limitation of function was less restricting, had more physical complaints, depression, anxiety and social isolation on the MMPI.

Shoor and Holman (1984) also note that the mood disturbance of depression predicts worse outcome in rheumatoid arthritis patients. They further found that a programme of self management education demonstrated, in addition to an increase in self care behaviours, an improvement in pain and disability but found no correlation between the two. They also found a higher negative correlation for self efficacy for physical function and disability than self efficacy for pain control and actual pain measures. Psychological factors such as improved self esteem and self efficacy may thus influence the disability which results from chronic pain.

Gallagher et al. (1989) report that one of the major predictors of return to work in a treated chronic pain population was low emotional distress measured by selected subscales of the MMPI. Clinical and biomechanical measures were not predictive of post treatment employment.

Fewer studies have looked at whether affective variables such as depression and anxiety predict a significant proportion of disability beyond that explained by demographic and medical variables. Anderson et al. (1988) addressed this issue in a rheumatoid arthritis population and found that depression did indeed predict a significant amount of variance in ability in tasks of daily living measured by self report on a standardised questionnaire.

Keefe et al. (1986) found that higher scores on the Beck Depression Inventory were associated with more pain behaviours (which may be relatively independent of pain intensity) and decreased activity levels in chronic low back pain patients. One study was found which measured emotional distress with the twelve item General Health Questionnaire (GHQ 12 Goldberg 1972) and related the results to outcome of treatment for low back pain patients. This study (Harkapaa et al. 1991) was able to show that psychological distress did not predict a reduction in disability (as measured by their purpose designed Disability Index) but did predict accomplishment of exercise, those scoring high enough on the GHQ 12 to be "distressed" achieving a smaller number of exercises which was associated with smaller decreases in disability.

The studies reported here are a sample of those which show that mood variables have a higher predictive power in the minimization of disability associated with chronic pain, than the pain itself. It is now necessary to explore the central role of cognitions in the pain - mood - disability triad.

ROLE OF COGNITIONS

a) In Chronic Pain

Turner and Clancy (1986) report that using the Coping Strategy Questionnaire (Rosenstiel & Keefe 1983), they were able to identify three factors called 1) denial of pain, 2) diverting attention and praying, and 3) helplessness in a population of 74 chronic low back pain patients. These three factors predicted depression on the Beck Depression Inventory, "downtime" (the amount of time recorded as reclining or lying down on a daily diary) and Psychosocial Limitation and Total Sickness Impact Profile scores (Bergner et al. 1981). Denial of pain was significantly and positively related to downtime. The second factor, diverting attention and praying was significantly and positively related to average pain reported in the diary. Patients who scored highly on the third factor which includes catastrophisation and infrequent use of coping self statements were more depressed and had higher scores on the Sickness Impact Profile. Following treatment, decreased use of castrophisation strategies and increased use of praying and hoping were significantly related to decreases in pain intensity as well as disability measures obtained from the Sickness Impact Profile.

Dolce (1987) reviewed the available literature on self efficacy and coping with chronic pain. He quotes Turk, Meichenbaum and Genest (1983) as suggesting that the difference between individuals with high and low tolerance for pain does not appear to be the result of the lack of coping skill employed but seems to be related to their expectancies of how effectively they can use the skills they possess. Individuals' beliefs about their ability to cope with an aversive event are an essential component of effective coping. Dolce (1986) observed self efficacy expectancies were better predictors of tolerance levels than subjective pain ratings.

Experiments with false feedback of EMG levels suggest that patients with clinical pain who received high success feedback showed significantly greater reductions in headache activity and significantly higher self efficacy ratings than those who received mild success feedback. (Holroyd et al. 1984) Self efficacy ratings were observed to correlate significantly with larger reductions in headache activity scores but actual EMG levels failed to be so correlated.

The construct of Locus of Control (Rotter 1966) is also demonstrably associated with chronic pain, (e.g. Bowers 1968, Toomey 1991), the most widely accepted conclusion being that patients scoring higher on a measure of internal control have a greater tolerance for pain or report it as less intense than those who score lower. Most of the studies on locus of control have concentrated on its relationship with pain in an arthritis population (e.g. Skevington 1990). However, these data suggest that it is a sense of confidence about being able to cope which plays a central role in the ability to tolerate pain.

b) In Mood in chronic pain patients

Beck et al. (1979) produced seminal work on the role of cognitions in emotional states. According to Beck's theory of depression, negative automatic beliefs are activated by unpleasant life events and lead to appraisal of the event as supplying evidence in favour of the belief. This leads to a downward spiral of depressed mood, negative beliefs and hopelessness for the future. More recently the same theory has been extended to encompass anxiety reactions (Beck, 1985) based on the intrusion of automatic overestimation of danger. Williams et al. (1989) have demonstrated that anxious people experience a selective bias of attention and information processing which predispose them to make anxiety producing interpretations of events through anxious cognitions and images.

Lefebvre (1981) found that patients with both depression and low back pain showed more cognitive distortions on items specifically related to back pain than the depressed subjects without pain on a specially designed cognitive errors questionnaire. It is not clear however, whether having negative cognitions predisposes patients with chronic pain to develop depression or whether a negative cognitive style predisposes the patient to both depression and pain as has been mentioned before.

Rudy, Kerns and Turk (1988) have found that there is little evidence to support the suggestion that chronic pain is a variant of depression. They hypothesise that a model integrating behavioural and cognitive formulations can explain depression as a reaction to pain in chronic pain patients with limited physical activity and reduction in social rewards and personal mastery. The model consisting of pain, perceived interference and perceived lack of self control accounted for over 60% of the variance in depressed mood. They predicted that the direct relationship between pain and depressed mood would be non significant and that the cognitive appraisal variables of perceived interference and lack of self control would be significant mediators of the pain/depression relationship. They found a small association between pain and depressive symptomatology which was significant by a simple correlation but LISREL modelling analysis showed latent variables to be more powerful. This was in fact, able to determine that the direct link between pain and depression was not significant but that the association between pain and depression was significantly mediated by perceived interference and lack of self control.

Kerns and Haythornthwaite (1988) found significant differences between depressed, mildly depressed and non depressed chronic pain patients on activities and coping skills, the greater the depression, the lower level of functioning. These results suggest the need to consider a cognitive-behavioural model of depression secondary to chronic pain in which low levels of activity reduce the potential for rewards and increase the risk of negative evaluations and behavioural avoidance.

c) In Disability in chronic pain patients

Bandura (1978) has shown that there is evidence to demonstrate that covert events such as beliefs can function as stimuli, responses and consequences of behaviour.

Actual performance accomplishments are believed to be the best active way of raising self efficacy beliefs. Exercise quota systems effectively raise self efficacy expectancies for exercise. Bandura (1977) reported that patients who do not display improvements in efficacy beliefs despite physical improvements tend to attribute their success to external factors such as the therapists' assistance and encouragement and these patients have a higher risk for relapse, whereas those showing improvement in self efficacy attribute their success to their own efforts and retain their improvement.

Dolce (1986) has also looked at the effect of self efficacy on the level of functioning or disability in chronic pain patients. He found that setting exercise quotas increased levels of previously avoided exercise which were paralleled by increases in self efficacy. Kores et al. (1985) further found that patients with high self efficacy scores reported less "downtime", medication use and better achievement of function following a pain rehabilitation programme than those with low self efficacy scores. Self efficacy expectancies were the main predictor of reduction of disability in chronic pain patients.

Locus of Control has also been used to show that cognitive variables mediate the reduction of disability in treated pain patients. Gallagher et al. (1989) for example found that internal Health Locus of Control using the Multidimensional Health Locus of Control scale (Wallston et al. 1978) was a significant predictor of return to work in a treated chronic pain population.

Kaplan, Atkins and Reinsch (1984) found clearer relationships between self efficacy ratings and actual performance of exercise regimes for Chronic Obstructive Pulmonary Disease in patients with internal Locus of Control than in those with external Locus of Control, and Nicassio et al. (1985) showed that changes in helplessness which had a strong negative correlation with changes in internality were significantly associated with reductions in disability in rheumatoid arthritis patients. In a low back pain sample, Harkapaa et al. (1991) found that a stronger belief in internal back pain control was associated with a decrease in disability and higher frequency of exercise.

From all these studies it would appear that cognitions play a central role in all the components of the pain - mood - disability complex. Depression and anxiety are the main affective variables associated with pain, on the one hand, and disability on the other. Cognitive processes are the mechanism by which negative mood states are generated and maintained which then mediate the perception of pain and influence the availability of coping strategies to manage the disability.

SUMMARY

The preceding review of the area has indicated that any discussion of the relationship of pain to disability must include the contribution of cognitive and affective variables since there is no simple path from one to the other. It is clear that both pain and disability are associated with mood which is itself influenced by cognitions. It is very likely therefore, as there are numerous references to the relative independence of pain and disability, that cognitions (particularly locus of control) and emotions (depression and anxiety) are able to mediate between them and explain some of the reasons why the relationship is not as clear cut as common sense might predict. Little experimental work has focused on this problem from the viewpoint of emotions other than depression.

THE PROPOSED RESEARCH - plan of the thesis

It is hypothesised that cognitions and anxiety are the mediating variables between pain and disability.

An initial study is was carried out to investigate whether emotional distress and cognitions about locus of control predicted more change in disability than did pain, and the emotional and cognitive mechanisms are subsequently gradually elucidated. Cognitive distortion (Lefebvre 1981) is first tested as the possible mediator, followed by an exploration of measures of disability, pain, emotional distress and locus of control. Two experiments are reported which examine the effect of manipulating anxiety and cognitions on disability. Finally, a second clinical study is described in which it was intended to confirm the finding that emotional distress is the strongest predictor of disability and its reduction in a treated chronic pain population.

CHAPTER 2

MEASURES

As indicated in Chapter 1, a comprehensive assessment of patients suffering from chronic pain needs to include measures of pain, disability, mood and cognition with at least some attempt at answering questions about validity and reliability. There has been a proliferation of instruments in recent years and the choice of relevant measures must depend on the context in which the patient presents, the treatments available for which outcome assessments may be required and the hypotheses under test in examining specific chronic pain patient groups.

Karoly and Jensen (1987) state their strong belief that "when an individual achieves the dubious status of a chronic pain patient, it is the first duty of the assessment/intervention agent to seek to maintain that patient's integrity as a thinking, behaving, interacting and changing human being who also feels unpleasant bodily sensations" (page 5). They have therefore prepared a guiding conceptual model consisting of many attributes. Primarily the object of assessment should be non reductionistic so that all elements are fully legitimate areas of study. It should enable chronic pain to be viewed as a continuous rather than a categorical variable, influenced by sensory events, emotions, thoughts and actions. Thus it should be multivariate rather than focused on isolated causes or effects. Reciprocal relationships between biological, cognitive and situational elements should be capable of exploration. Chronic pain should be construed as context dependent and should adopt a competency-based rather than a deficiency-based perspective on the patient. The model should provide for the patient being an active participant rather than a passive sufferer and should try to maximise self determined learning and enable construction of the pain as an ever changing product of representation, reflection and self guidance. Finally Karoly and Jensen recommend that the main conceptual approach should be to recognise that chronic pain is a social construction as well as a body reaction and there is therefore nothing to be gained by seeking to establish the "objective reality" of the pain per se.

Gracely and Dubner (1981) listed the five properties of an ideal pain measure. These are that such a measure should be sensitive and free of biases such as exaggeration and random errors which reduce accuracy, such as response variability. The second property is that an ideal measure should provide information about the reliability of patients' performance similar to that offered by "lie scales" in some personality inventories. Thirdly an ideal measure should allow separation of the sensory from the emotional properties of pain. Fourthly it should be useful for clinical as well as experimental pain measurement. Lastly the measure should anchor verbal judgements as far as possible to allow comparison between groups without the assumption that a certain number on a Numerical Rating Scale or a certain part of the line on a Visual Analogue Scale indicates the same degree of pain for the different groups under study.

What follows is a limited review of instruments available for the various components of the pain experience in line with these guiding principles and recommendations.

PAIN

The most common measures of subjective pain intensity include Verbal Rating Scales, Visual Analogue Scales and Numerical Rating Scales. Experimental methods such as the Tourniquet Pain Test and Cold Pressor Test will not be considered here because of the striking difference in psychological context between chronic unrelieved pain and that which can be voluntarily terminated.

Verbal Rating Scales

A Verbal Rating Scale (VRS) is a list of adjectives to describe different levels of pain intensity such as mild and moderate. The patient must choose the adjective that best describes pain at any given stage in assessment. The possible number of adjectives ranges from four, no pain, mild, moderate or severe (Seymour 1982) to 15 (extremely weak, very weak, weak, very mild, mild, very moderate, slightly moderate, moderate, fairly strong, slightly intense, strong, intense, very strong, very intense, or extremely intense) (Gracely et al. 1978). At least at the fewer choice end of the spectrum of VRS's their advantages are that they can be easy to comprehend, administer and score. They have also been shown to correlate well with other measures of pain intensity, such as Numerical Rating Scales (Downie et al. 1978). The disadvantage of simple VRS's however is that they are not sensitive to change because they do not provide sufficient response categories to permit an assessment of marginal treatment effects or natural variation. There is also an assumption that there is an equal interval between intensity levels indicated by successive words on the scale when there has been little attempt to establish the validity of this assertion. If the longer and more sensitive scale such as that recommended by Gracely et al. (1978) is used, then this is normally accompanied by cross modality matching in which the assumption of equal intervals is not made but patients must equate pain severity to any one of several other modalities such as loudness of a tone, or length of a line thus fulfilling Gracely and Dubner's fifth property of a good scale. This however is an extremely complex task and has been shown by Urban, Keefe and France (1984) to yield less precise scores than was originally predicted.

Visual Analogue Scales

Visual Analogue Scales (VAS's) consist of a straight line usually 100 millimetres long whose ends are defined with anchor words to describe the extremes of pain such as "no pain" and "pain as bad as it can be". Patients are asked to make a mark across the line at the point that best indicates perceived intensity. The number of millimetres to the left of the patient's mark is the VAS score. Orientation of the VAS is important depending on the chronic pain population under study. Downie et al. (1978) found that results were more consistent using a horizontally oriented line than a vertically oriented one. Patients with low back pain may construe a vertical line as a schematic representation of the spine and may mark off areas of the line related to the position rather than intensity of their perceived pain. Although Karoly and Jensen (1987) suggest that task complexity renders the results of the VAS assessment unreliable, in fact Downie et al. (1978) found that the horizontally oriented VAS correlated .91 with a Numerical Rating Scale. Care must be taken in measuring the line accurately and making sure it is not distorted by photocopying, but if this is done then it is probably at least as free from bias as a Verbal Rating Scale.

Numerical Rating Scales

These involve asking patients to rate their pain from zero to ten or zero to one hundred where zero represents no pain and the highest score represents pain as bad as it can be. These scales are considered by Chesny and Shelton (1976) and Seymour (1982)and many others to be sensitive to treatment effects. They are easier to score than VAS's since they do not require measurement with a ruler and are recommended by Karoly and Jensen as being easy to administer. They are suggested by Jensen et al. (1986) to be the best measure. Nevertheless they require considerable explanation and they have not been studied for the contamination effect of mood as have VAS's (Peet et al. 1981). They are less acceptable in some clinical settings where patients express anxiety about their competence with arithmetical operations, in spite of explanation and probably need anchor words at both ends of the scale as well to satisfy the fifth property of a good measure. There is no reason to believe they would be any more free from bias than Verbal Rating Scales or VAS's.

The McGill Pain Questionnaire

The McGill Pain Questionnaire (Melzack 1975) is an attempt to allow systematic, verbal description of pain by classifying adjectives such as throbbing, aching, frightful, wretched and intense into small groups describing different qualities of the pain. Early research focused on scaling the words in the groups to give a measure of increasing intensity. The resulting questionnaire purports to measure the sensory, affective and evaluative aspects of pain independently. Although subsequent research on this instrument (e.g. Turk et al. 1985), has questioned the validity of this differentiation, it nonetheless remains the most widely used and comprehensive pain measure available in numerous clinical and experimental settings and is the measure of choice according to Gracely's and Dubner's recommendations.

All the measures described here allow for the continuous and representational nature of the pain experience, but probably confound the intensity with unpleasantness which is an emotional and cognitive component and therefore fail to reach Gracely's and Dubner's third recommendation. Separate measures of mood and cognitions are also required in addition to behavioural ones concerning disability or limitation/competence.

DISABILITY

Observational Techniques

Traditional approaches to the measurement of disability have ranged from measures of gross motor competence such as the Barthel Index (Mahoney 1965) to direct observational methods such as those recommended by Follick, Ahern and Arberger (1985) and Keefe and Block (1982). These latter techniques seem to be simultaneously measuring persistence at activities such as walking, and behavioural responses to the pain itself such as grimacing and posturing. As such they are not measures of disability per se, but are rather confounded with pain indicators. In addition these techniques are limited to the setting in which the observations are recorded and are extremely labour intensive. Social and personal activities should also be sampled by any comprehensive measure of disability, which are not addressed by Keefe.

Pain Disability Index

Pollard (1984) developed a self report measure of disability, the Pain Disability Index (PDI) which is an inventory of interference with a number of areas of function such as home responsibilities, recreation, social activity, occupation and self care. This has been validated by Tait, Chibnell and Krause (1990) using factor analysis. This study showed that the PDI falls into two areas of disability; that concerning voluntary activities and that concerning obligatory (self care) activities as suggested by Fordyce (1984). Tait et al. also found a strongly significant relationship between scores on the PDI and on self report measures of abandonment of daily activity and "downtime". However the construction of the questionnaire is one of serial VAS's measuring 7 different aspects of daily functioning, with the anchors "no disability" and "total disability" at either end of all the scales. These anchors may not be appropriate to the wording of the item (e.g. "Sexual behaviour - this category refers to the frequency and quality of one's sex life") where the required response of marking a VAS may not be an informative method of rating interference by pain. Category 7 is a combination of "life supporting" activities (eating, sleeping and breathing). Given the frequency of sleep disturbance in chronic pain patients as opposed to the frequency of complaints of impaired breathing (related to the pain per se), this item could be criticised for confounding behaviours of greater and lesser relevance and thus reducing the overall predictive power of the PDI. In addition, test-retest results for the whole scale collected two months before and immediately upon admission to a pain management unit showed only a modest correlation (r=.44).

Sickness Impact Profile

The Sickness Impact Profile (Bergner and Bobbitt, 1981), although hailed by Wilde et al. (1990) as the best instrument available for the measurement of disability has a number of draw backs. For example, it is composed of 136 items and is therefore time consuming to administer. Also while it seems to address relevant areas such as ambulation, mobility, work and recreation, it contains items such as those from the communication subscale ("I communicate mostly by gestures, moving head, pointing or sign language" or "I don't write except to sign my name") which are not appropriate for pain-related disability where such major disruption of social behaviour is not expected as it might be with ongoing deterioration of central nervous system function. Further, the test authors recommend interviewer training which could result in the whole exercise being costly and over inclusive.

Oswestry Low Back Pain Disability Questionnaire

This Questionnaire (ODQ Fairbank et al. 1980) was specifically developed to measure limitation of function associated with low back pain. Initial work both by the authors and by Meade et al. (1990) suggest that it is a relevant and useful instrument for measuring pain-related disability in a chronic low back population and is sensitive to change. The ODQ consists of items from ten areas of daily functioning each containing six statements intended to represent increasing difficulty with that item. Each item is scored from 0 - 5 depending on the statement chosen and a composite percentage score is obtained. Further work is needed on the psychometric properties of validity and reliability and if this is undertaken it could form a valuable part of a comprehensive patient assessment battery. It contains social and personal care items as well as physical tolerance ones, and allows for both competency-and deficiency-based assessment. Because of its specificity for low back pain patients it is worth further consideration for this patient group.

MOOD

The emotional context in which the pain is experienced is an integral part of the patients' presentation. However, traditional scales to measure psychopathology are probably not appropriate for a pain population. For example, the Minnesota Multiphasic Personality Inventory (Hathaway and McKinnley 1943), although widely quoted in the literature from the USA, shows inconsistent findings. It consists of true/false response choices to 566 statements (e.g. I am not easily angered). It is often used to discriminate "organic" from "functional" pain patients, but as suggested in Chapter 1 and by Karoly and Jensen in this chapter, this is to disregard the complexity of the pain experience and should not be considered as a useful concept. There is also very little empirical work on the differentiation of emotional states in pain patients as opposed to those in the psychiatric populations on which the questionnaire was standardised.

Symptom Check List 90-Revised

This check list developed by Derogatis et al. (1977) is another commonly used psychopathological index. Patients are asked to rate how much they have been bothered by 90 specific symptoms on a five point scale ranging from not at all to extremely. The 90 symptoms are classified into dimensions such as Somatisation, Obsessive Compulsive Disorder, Depression, Anxiety, Paranoid ideation and Psychotism. It is clear that a number of these may not be relevant for pain patients and a high degree of interscale correlation has been found (Duckro et al. 1985) suggesting that this scale reflects general distress rather than distinct symptom constellations. Because of its psychopathological bias, it has low face validity for pain patients who do not see themselves as suffering from a primarily "psychiatric" disorder, and is probably also out of line with the non-reductionistic principle.

Beck Depression Inventory

The Beck Depression Inventory (BDI, Beck et al. 1979) is a popular measure of depressed mood with well established validity and reliability. It consists of 21 areas of depression with four statements in each area scored from 0 to 3. Although this questionnaire is often used routinely in the measurement of depression in pain patients a number of items are contaminated by the pain experience itself. For example, questions about sleep disturbance and tiredness may be due to the effects of pain on ability to sleep rather than disturbance of vegetative states in depression per se. Questions about appetite and weight loss may be contaminated by the gastric irritation produced by long term use of some analgesics. Further work on the BDI would be needed to try and select out the cognitive from the vegetative aspects of depression to enable better measurement of the mood state. Similar comments apply to the Beck Anxiety Inventory (Beck et al. 1985).

State Trait Anxiety Inventory

The State Trait Anxiety Inventory (Spielberger 1983) is commonly used as a measure of anxiety among medical patients. It was developed from items with a demonstrated relationship to other measures of anxiety and it has been subjected to well documented construct and factorial validity (e.g. Barker et al. 1977). It is a 40 item inventory asking about experiences of feeling nervous or worrying too much scoring from 1 "almost never" to 4 "almost always". 20 items are concerned with Trait Anxiety or the tendency to perceive stressful situations as dangerous and to respond with elevations of State Anxiety, and State Anxiety which is the level of anxiety experienced at a specific time in response to a specific situation. In chronic pain patients, measures of State Anxiety are probably less relevant than Trait Anxiety as their general ability to function is of interest, and although very few studies have reported its use in chronic pain patients, since it has been found to be a valid measure of the construct, it may prove to be a good assessment of the emotional context of pain, rather than a mood indicator that is contaminated by pain intensity per se. This is yet to be demonstrated in the literature.

Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HAD, Zigmond et al. 1983) is a brief scale composed of seven yes/no items relating to anxiety and seven to depression. It was designed for use in assessing emotional states in physical illness and items relating to the vegetative symptoms associated with these mood states such as anorexia and insomnia have been excluded. Initial work with the HAD purported to distinguish between the concepts of depression and anxiety and a criterion-related validity study was undertaken by Bramley et al. 1988. This showed that the anxiety scale was not able to discriminate diagnostic groups suffering primarily from generalised anxiety disorder from those suffering from major depressive disorder. The intercorrelation of the anxiety and depression scales on the HAD was .49, suggesting that about 25% of variance is shared between the two scales. There is little known published work using this scale with pain patients.

General Health Questionnaire

Goldberg (1972) discussed the development of the General Health Questionnaire (GHQ) which is intended to be a self administered screening instrument for detecting psychopathology in community settings such as primary care or general medical outpatients. Since it is aimed at detecting those forms of psychiatric disorder which may be relevant to the patient's presentation in a medical clinic, its focus is intended to be on psychological components of ill health, and as such it is relevant for pain patients.

The GHQ supposes a dimensional model of psychopathology in which there is no dichotomy between"cases" and "normals". People are placed along a continuum, "caseness" being assigned once their score passes a predetermined threshold, in line with the guiding principle of continuous rather than categorical measurement of variables.

The original scale consisted of 93 items which were finally reduced to 60 and has been shown (Goldberg 1978) to correlate approximately .80 with the summed scores of the Clinical Interview Schedule (Goldberg et al. 1970) and the Present State Examination (Wing 1976). It contains six scales of which four are retained in a 28 item version which is mainly used for research (Goldberg 1978). These are Somatic Symptoms, Anxiety and Insomnia, Social Dysfunction and Depression. Patients are asked to check one response to each item on a four point scale from "not at all" to "much more than usual". It is scored either by assigning zero to the first two response categories (not at all, same as usual) and one to the other two (rather more than usual, much more than usual) or by a

Likert type scale (0,1,2,3).

Benjamin, Lennon and Gardner (1991) have studied the behaviour of the 28 item version of the GHQ in British pain clinic populations and have concluded that it is an effective and valid instrument for the elucidation of mood (as opposed to psychiatric) disorders in chronic pain patients. Further work on the differentiation of the four components needs to be undertaken, but since it has been studied specifically in pain patients it has some advantages over other scales with this patient group.

COGNITIONS

The main areas of cognitions, other than those related to pain and emotion, which have been studied by researchers in the chronic pain field have been in the use of coping strategies, cognitive errors and locus of control.

The Coping Strategies Questionnaire

The Coping Strategies Questionnaire (Rosenstiel and Keefe 1983), produces three general coping measures. These are denial of pain, helplessness and diverting attention and praying. This scale, although asking questions in relevant dimensions (e.g. reinterpreting pain sensations and using coping self statements), has been reported by Karoly and Jensen (1987) as having inadequate internal consistency and test-retest reliability data. It has not been widely used in a British population.

Cognitive Errors Questionnaire

The Cognitive Errors Questionnaire (CEQ, Lefebvre 1981) was developed to explore the relationship between chronic pain and depression and is a 48 item instrument asking patients to record the extent to which they agree with a negative thought supplied after a description of an everyday situation. Cognitive errors as illustrated by this questionnaire were found to occur significantly more often in patients who were both depressed and who suffered chronic pain. It is thought to be useful in identifying cognitions about pain which reduce optimal coping.

Multidimensional Locus of Control

Rotter (1954) originally described the construct of Locus of Control based on social learning theory. He stated that an individual's experience in a given situation will lead to the development of specific expectancies which play a role in determining the individual's future behaviour in that situation. In 1966 Rotter published a scale to measure internal and external (I.E.) locus of control for generalised situations in order to enable predictions of an individual's behaviour to be made.

Wallston et al. (1976) noted the difficulty in predicting behaviour in specific areas such as health from measures of generalised expectancies and developed a health related locus of control scale in order to provide more sensitive predictions of the relationship between internality and health behaviours.

Using a six point Likert type format investigations were carried out on an item pool of 34 until 11 items remained which fulfilled the criteria of significant item to scale correlation, a wide distribution of response alternatives and low correlation with the Marlowe-Crowne Social Desirability Scale (Crowne and Marlowe 1964). This 11 item scale correlated .33 with Rotter's I.E. scale which suggests some concurrent validity but since it was also necessary to produce a scale that would focus more specifically on health concerns, this correlation can also be interpreted as satisfactorily low.

Levenson (1975) questioned the conceptualisation of locus of control as a unidimensional construct and argued that prediction could be further improved by studying Chance expectations separately from external control (Powerful Others). She developed three eight item Likert type scales which were Internal (I), Powerful others (P) and Chance (C) to measure generalised locus of control beliefs. Wallston, Wallston and DeVellis (1978) then enlarged their original 11 point Health Locus of Control Scale by increasing the number of Powerful others items in line with this recommendation.

Six pairs of items were finally chosen for each of the three scales which allowed the use of two equivalent forms, (A and B). These correlated satisfactorily with Levenson's I, P and C scales. The two forms showed slightly different intercorrelations, but Internal Health Locus of Control correlated negatively with Chance, and approximately zero with Powerful others. The resulting instrument is known as the Multidimensional Health Locus of Control Scale (MHLC). The patients' task is to check agreement with all 18 items on a 6 point Likert scale from "strongly disagree" to "strongly agree".

The MHLC however, has been found by other researchers to be insufficiently specific for a chronic pain population.

Toomey (1991) reports the use of a modified Pain Locus of Control Scale but the questionnaire is not published. Skevington, (1990) has more recently devised a three factor Beliefs in Pain Control Questionnaire but the items (based on those appropriate to a population of Rheumatoid Arthritis patients) view pain as an intermittent or relievable phenomenon. This would be inappropriate for chronic pain patients. The original MHLC is quoted in the literature on pain patients (e.g. Harkapaa et al. 1991) though needs more exploration.

SUMMARY

Multidimensional assessment of chronic pain patients needs measures of pain, disability, emotion and cognition in order to fulfill the guiding principles of Karoly and Jensen and to elucidate the social, behavioural and emotional context of the pain experience.

In the following chapters Visual Analogue Scales, the McGill Pain Questionnaire, the Oswestry Low Back Pain Disability Questionnaire, the General Health Questionnaire, the Cognitive Errors Questionnaire and the Multidimensional Health Locus of Control Scale have been selected as some of the most relevant examples of these areas. They were chosen because of previous experience with their ease of administration and face validity (an important aspect when considering patient compliance). With the exception of the CEQ, all had been shown by previous clinical use in the author's setting to be acceptable to the patients because of simplicity, brevity and relevance. The CEQ was introduced in an attempt to explore cognitions more directly than had hitherto been undertaken. Efforts are made to study reliability and validity for clinical pain populations to attempt to meet Gracely's and Dubner's recommendations wherever possible.

PART 2

EARLY ATTEMPTS AT EXPLORING RELATIONSHIPS BETWEEN PAIN, DISABILITY AND THEIR MEDIATORS

CHAPTER 3

RELATIONSHIPS BETWEEN PAIN, DISABILITY, EMOTION AND COGNITIONS IN A MULTIDISCIPLINARY PAIN MANAGEMENT PROGRAMME:

a Pilot Study

INTRODUCTION

In Chapter 1 it was noted that chronic pain is best understood as a multimodal phenomenon involving affective and cognitive responses as well as sensory ones and as early as 1968 Fordyce was alerting clinicians involved in the treatment of chronic pain to the fact that patients' responses to pain are behaviours which are under the influence of environmental variables. Although a number of attempts have been made to measure the pain experience itself, it is the behavioural consequences of this experience which are the only elements directly accessible to the external observer. This fact has led numerous researchers, namely those involved in interpretation of the Minnesota Multiphasic Personality Inventory (MMPI) (e.g. Beals & Hickman 1972) to assign patients to "genuine" or "non-organic" categories. Wiltse and Rocchio (1975) suggested that patients with high scores on factors 1 and 3 (hypochondriasis and hysteria) of the MMPI did poorly with surgery and thus they implied that these patients had more psychological than physical problems. Following Fordyce's argument however, this could be seen to be a misinterpretation of the data since patients may learn to become progressively more prone to endorse questions about physical symptoms by partial reinforcement as they are gradually offered more and more medical treatment.

Black and Chapman (1976) have suggested that total suffering is always made up of somatic experiences plus depression and anxiety cognitions. Since these very cognitions may have a central role in the pain - disability relationship, the emphasis of treatment should rest on eliminating the tendency to label and dichotomise the patients and to facilitate reduction of the consequences of the pain problem on their lives by decreasing both physical and psychological limitation to function.

Thus it would seem a worthwhile line of approach to deal with chronic pain not only with physical, but also with behavioural and cognitive methods. A comprehensive care package, would then consist of a multidisciplinary approach using medical and surgical expertise where appropriate, but also including psychological interventions which may involve the family. It is also necessary to offer a resource to those patients who see themselves as still significantly disabled by their pain, when no relevant surgical or medical treatments remain in order to try to prevent further reinforcement of the complaining behaviour.

Multidisciplinary pain management courses are now widespread but even at the present time there is no consensus as to what constitutes a comprehensive programme and those that are described have differing inputs and outcome measures. Linton (1982) attempted to evaluate the literature to date on the outcome of such programmes and found the disparity of patients treated, of measures taken, of outcomes studied, and of overall experimental design made the task extremely difficult, though this last has since improved (Linton 1986).

Gottlieb et al. (1977) for example, described a programme for 72 chronic back pain patients who "received a broad range of therapeutic modalities designed around the theme of self regulation". This involved biofeedback training, psychological counselling involving stress and anxiety management and assertion training, patient regulated medication reduction, patient involved case conferences, physiotherapy, vocational rehabilitation and education.

The average length of a programme was 45 days and at 30 days post discharge 59 (82%) of the patients were either at work or ready for reemployment. Gottlieb reports that the average length of disability was 3.6 years but he does not define disability except in terms of employability.

Keefe, Gill and Rose (1986) reviewed six pain clinic programmes and found methodological problems in all of their outcome studies. Mainly the measures depended on clinicians' ratings which are vulnerable to therapist bias. The study reported by Cinciripini and Floreen (1982), however, involved directly observing patient behaviours for five minutes every 30 minutes, by having patients rate their pain on a ten point scale, by measuring walking distance and by counting daily repetitions of exercises, minutes spent jogging and number of stairs climbed. Immediate post programme measures showed large reductions in pain talk and non verbal pain behaviours, an 83% increase in distance walked and "substantial" increases in jogging time and number of stairs climbed daily. At one year follow up most patients had maintained or extended their initial gains and 50% of patients were fully employed. However, the components of the course are sketchily defined and the course participants suffered from a variety of complaints, at least 45% having pain in the head, neck and face which is known to respond better than low back pain to behavioural treatments (Blanchard et al. 1982).

Keefe, et al. (1986) go on to discuss various issues associated with the evaluation of treatment programmes for chronic pain. They point out that many use a wide variety of exclusion criteria to screen out patients unlikely to benefit. Some programmes select out patients who show evidence of underlying tissue pathology, (e.g. Fordyce et al. 1973), whereas other programmes accept only patients who have documented tissue pathology (e.g. Greenhoot and Sternbach 1974). Other exclusion criteria include financial disability compensation, ongoing litigation, addiction to narcotic medication and serious psychopathology (not defined). However, available literature does not support the use of such exclusion criteria. For example, elevations on the hypochondriasis and hysteria scales of the MMPI are not necessarily predictive of poor behavioural treatment outcome (Kleinke & Spangler (1988)) and good outcomes have been documented in patients receiving disability payments, (Keefe, Block, Williams and Surwit 1981).

Since the outcomes of programmes designed both for patients with underlying pathology and those without pathology are encouraging and since there is little relationship between pathology and disability there seems little justification for setting selection criteria to do with tissue damage. All patients who have received previous surgery have tissue damage and further surgery may well be inadvisable. For this reason referral to a behavioural management programme would be an appropriate option.

A further comment made by Keefe et al. (1986) is that published reports evaluate the efficacy of multidisciplinary treatment programmes for chronic pain by relying on statistical differences between pre and post treatment variables. This information does not convey the benefit of treatment for individual patients, nor does it necessarily relate to clinical relevance. Reductions in complaints of pain without increases in activity are not of value in themselves (Fordyce 1976), nor is an increase in activity without concurrent reduction in pain complaints. In this case the spouse, family members and local physicians may reverse whatever treatment gains have been obtained (Keefe, et al. 1981).

As reported by Kerns, Turk and Holtzman (1983) few treatment studies have described the effectiveness of multidisciplinary approaches to chronic pain compared to controls and in most of them methodological flaws preclude valid interpretation of the findings. The main ones of these are compounded treatment protocols, inadequate follow up, and reliance on retrospective self report measures.

More recently, programmes have incorporated cognitive and social learning theory as well as operant approaches. Kerns et al. believe that this is effective because it provides patients with a sense of control over their pain. Turner (1979) compared the treatment efficacy of a cognitive behavioural therapy programme with a progressive relaxation therapy programme and a no treatment waiting list condition. In all areas assessed at one month follow up, both groups had improved when compared to the no-treatment controls but the cognitive behavioural patients rated themselves as better than the relaxation patients. Longer term follow up studies are required.

Linton (1986) reiterates the point that although the outcome from behavioural treatments involving relaxation and cognitive techniques are quite promising, methodological problems in the research make it impossible to draw unequivocal conclusions. Linton, Merlin and Stjernloef (1985) reported a study comparing a waiting list no treatment group with a regular rehabilitation group and a group, treated with behavioural approaches. The results indicated that the behaviour therapy group clearly had the best overall improvement. Linton and Goetestam (1984) found that applied relaxation in itself led to improvements approximately equal to those of a group receiving both applied relaxation and an operant programme. The combined group was somewhat better on the variables of activity and medication reduction while the pure relaxation group was superior regarding pain intensity ratings. Consequently both treatment approaches were successful in changing their target specific behaviours and need to be considered equally in programme design.

No good "dismantling" design studies have yet been reported in which there is a clearly established relationship between effective treatment components and patient characteristics. Nor do any of the studies quoted apparently use a standardized measure of disability. Linton (1986) points out that a return to work goal for all patients is unrealistic and therefore treatment should be oriented towards helping patients live as normally and productively as possible despite residual pain. "Normally" and "productively" are not defined so there remains an overall problem of defining a patient relevant outcome.

The Experimental Pain Programme

The overall aim of this programme was to decrease disability and to measure such a decrease using a standard instrument in a population of patients at the end of their active treatment options. The process by which this decrease in disability was to be achieved was encouraging patients to use self management techniques and thus to become independent of medical care. If this was successful then it might be possible to suggest that cognitive and emotional factors were playing a role in the achievement of this aim.

In the analysis of the results of this programme it was intended a) to explore methods of measuring pain, disability, emotional distress and cognitions and b) to investigate the following hypotheses:

1. That disability would decrease even if pain did not.

2. That disability, therefore, would not be correlated with pain but would be correlated with emotional distress as measured by the General Health Questionnaire (Goldberg 1978) and with cognitions as measured by the Multidimensional Health Locus of Control (Wallston et al. 1978).

3. That change in disability would be associated with emotional distress and cognitions on admission but not with pain.

4. That change in disability would not be correlated with change in pain but with changes in emotional distress and with changes in cognitions.

METHOD

Subjects

A total of 42 patients (cohort 1 see Appendix A) participated in this pilot study. The mean age of the patients was 46.8 (standard deviation 11.7, range 21-65) years and there were 19 men and 23 women. The mean duration of the patients' symptoms was 10.3 years (S.D. 6.9, range 3 - 29) years, and all patients had a diagnosis of low back pain either as a primary (76%) or secondary problem (24%) depending on whether it was rated by the patient as the site of the worst pain, or whether it was exceeded by neck or leg pain.

The patients were referred to the Psychology Department from the Rehabilitation Unit at the Royal National Orthopaedic Hospital and had been admitted to the Unit prior to the course while all previously untried treatments relevant to the problem were tested out. These included transcutaneous neural stimulation, acupuncture, or medication change. Obvious psychological difficulties such as moderate to severe depression or agoraphobia received attention from the psychologist during this period. Those who remained significantly disabled or distressed by their pain problem and who agreed to the goal achievement philosophy of the course were selected for participation in the study.

Measures

In this early study, the measures used were the 28 item version of the General Health Questionnaire (GHQ) (Goldberg 1978), the Oswestry Low Back Pain Disability Questionnaire (ODQ) (Fairbank et al. 1980), the Multidimensional Health Locus of Control Scale (MHLC) (Wallston et al. 1978) and a 100mm Visual Analogue Scale (VAS) for pain intensity with the anchor words "no pain" and "worst pain" on either end.

Procedure

The patients were seen in a specialist referral centre who had already participated in all the rehabilitation strategies judged relevant for their problem. These patients were considered to be unchangeable by traditional therapeutic methods and return to work was not a viable outcome measure for them. The programme was multidisciplinary in that it involved the contribution of physio-and occupational therapists and educational sessions led by the physician, pharmacist, nurse and social worker as well as the psychologist. However no individual "hands on" treatments were incorporated as it was considered that these had all been exhausted previously. For this reason daily personal targets sessions were emphasised in which patients could achieve their individual goals using the principles of graded exposure, and relaxation and cognitive challenges. The Alexander Technique (Barlow 1973) was included as an alternative method of encouragement to reach goals and deal with the possibility of increased discomfort. This approach relies specifically on teaching and encouraging "good use" of the spine by establishing correct alignment of the vertebral column in sitting and lying postures and maintaiing it in all activities of daily living, using only the body's natural hinges (hips and knees) to bend.

The patients were admitted to a Monday - Friday minimal care unit and baseline assessments were carried out on day one of the course. These involved psychological questionnaires, various physical measures taken by the therapists and the setting of individual goals for achievement. The psychological assessment focused on measuring pain and disability and the surrounding context of emotional and cognitive variables such as anxiety, depression and locus of control.

The initial assessment also sought to identify real life problems in the patients' environment such as stairs to be negotiated, the distance to be walked in order to achieve certain goals and the willingness of the spouse or other family member to attend a "family day" on the course in order to learn more about the process of behaviour change. An information booklet was distributed explaining the ideology and the components of the course, stressing the need for weekend assignments to help generalization.

The programme consisted of a mixture of activity and formal teaching sessions interspersed with times for personal target achievement. These targets were substeps of the goals which the patients discussed at initial assessment. The lectures were intended to give patients direct information about the current state of medical knowledge, the inadvisability of using narcotic medication, the mechanics of bones and joints and, from the psychological point of view, the model of Melzack and Dennis (1978)

TABLE 3.1 SAMPLE TIMETABLE

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9.00	Staff meeting	Get fit	Alexander Technique	Personal targets	Personal targets
9.30	↓	↓	↓	↓	↓
10.00	↓	Psychology/Relaxation	Auto-hypnosis	↓	↓
10.30		↓	↓	Swimming	↓
11.00		Lecture – pharmacist/	Lecture – medical	↓	Get fit
		physiotherapist	↓	↓	↓
11.30			↓	↓	↓
12.00	L	U	N	C	H
2.00	Assessment	Personal targets	Personal targets	Social work group	
2.30	↓	↓	↓	↓	
3.00	↓	↓	↓	Alexander Technique	
3.30	↓	↓	Swimming	↓	
4.00	↓	Psychology discussion	↓	Lecture – nurse tutor/	
	↓	↓	↓	psychologist	
4.30	↓	↓	↓	↓	
5.00	↓	↓	↓	↓	

explaining the role of sensory-discriminative, motivational-affective and central control mechanisms in the gate theory of pain modulation was described. Table 3.1 shows a timetable of the typical components of the course. Family members were invited to attend for one day during the programme and to accompany the patients when they attended for their three month and 1 year follow up following Roberts and Reinhardt's (1980) recommendation that involving families minimised reversal of adaptive behaviours.

Patients were assessed by the author on the standardized measures of disability, emotional distress and locus of control as self administered questionnaires on admission to the course and at three months after the course. The only pain measure for this study was an intensity VAS. The patients were not reassessed directly on discharge because it was considered that short term changes in psychological functioning may be volatile and reflect the group process. Changes found at longer term follow up were considered to be more likely to be sustained. The results were analysed by MANOVA and Pearson correlation. Programme evaluation was also attempted by looking at the patients' mean rating of subjective value of each of the course components.

TABLE 3.2

MEANS (STANDARD DEVIATIONS) AND MANOVA VALUES OF F, BETWEEN ADMISSION AND 3 MONTH FOLLOW UP SCORES ON PSYCHOLOGICAL VARIABLES N=42

Variable	Admission Mean (SD) 1	FOLLOW UP Mean (SD) 2	F (1,41)
Pain VAS	70.6 (18.6)	71.9 (19.6)	0.0
Oswestry Disability Questionnaire	51.8 (12.5)	47.3 (15.7)	5.8*
GHQ 28			
Somatic Symptoms	7.1 (4.5)	7.3 (4.4)	0.0
Anxiety	8.4 (5.3)	6.9 (4.8)	3.2
Social Dysfunction	10.6 (3.7)	8.5 (2.3)	10.8**
Depression	4.8 (5.7)	3.8 (5.4)	1.3
Total	31.8(16.6)	26.5 (14.6)	3.0
Health Locus of Control			
Internal	21.5 (7.1)	20.9 (6.8)	2.1
Powerful Others	18.8 (6.1)	17.5 (4.6)	8.2**
Chance	21.1 (6.6)	21.6 (5.8)	0.2

* p < .05
** p < .01

Analysis

After examining the data for skewness, MANOVA (SPSS pc Norusis/SPSS 1988) was used on the pain VAS, the four subsections of the GHQ and the total GHQ score, the three factors of the MHLC and the ODQ Total scores to compare admission and follow up results.

Relationships between Total disability on admission and follow up and change in disability and pain, emotional distress and locus of control, were examined by Pearson correlation.

RESULTS

The data were all quasi-normally distributed, skewness being between .04 and .74 for all dependent variables. Table 3.2 shows the means, standard deviations and MANOVA values of F of the measures obtained on admission and at three month follow up. Reduction in disability, social dysfunction on the GHQ and Powerful Others Locus of Control, reached statistical significance between admission and follow up but pain did not (hypothesis 1).

TABLE 3.3

CORRELATIONS OF DISABILITY WITH PAIN, EMOTIONAL DISTRESS AND LOCUS OF CONTROL AT ADMISSION AND 3 MONTH FOLLOW UP. N = 42

	VASP	GHQA	GHQB	GHQC	GHQD	TOT GHQ	IHLC	PHLC	CHLC
Admission Disab.	.42*	.18	.30	.31	.27	.32	-.37*	.29	.18
3 Month Disab.	.24	.42*	.42*	.45**	.32	.46**	-.30	.17	.12

* p < .01
** p < .001

VASP = Visual Analogue Scale Pain Intensity
GHQA = General Health Questionnaire - Somatic symptoms
GHQB = General Health Questionnaire - Anxiety
GHQC = General Health Questionnaire - Social Dysfunction
GHQD = General Health Questionnaire - Depression
TOT GHQ = General Health Questionnaire - Total score
IHLC = Multidimensional Health Locus of Control Scale - Internal
PHLC = Multidimensional Health Locus of Control Scale - Powerful others
CHLC = Multidimensional Health Locus of Control Scale - Chance
Disab . = Oswestry Low Back Pain Disability Questionnaire - total score

The relationship of disability to measures of pain, emotional distress and locus of control cognitions was examined by correlation on admission and at 3 month follow up and Table 3.3 summarises these results. From this table it can be seen that disability on admission is associated with pain (as measured by a VAS) but is also related to Internal Locus of Control. At 3 months disability is only related to follow up scores on emotional distress. Somatic symptoms, anxiety, social dysfunction and total distress (but not depression) are significantly related to disability. Pain is not significantly correlated. (Hypothesis 2).

Hypothesis 3 was tested by computing change in disability as defined by the Total Score on the ODQ compared between admission and follow up and looking at its relationships with admission measures of pain, emotional distress and locus of control.

The results are shown in Table 3.4 and demonstrate that no variables on admission predict change in disability so that hypothesis 3 cannot be upheld. Table 3.4 also shows the relationships between change in disability and change in pain, emotional distress and locus of control computed between admission and follow up. It is clear that neither change in pain nor change in emotional distress show an

TABLE 3.4

CORRELATION OF CHANGE IN DISABILITY WITH PAIN, EMOTIONAL DISTRESS AND LOCUS OF CONTROL ON ADMISSION. N = 42

	VASP	GHQA	GHQB	GHQC	GHQD	TOT GHQ	IHLC	PHLC	CHLC
(C) DISAB.	-.14	.12	.06	-.08	-.05	.02	-.14	.01	.08

CORRELATION OF CHANGE IN DISABILITY WITH CHANGE IN PAIN, EMOTIONAL DISTRESS AND LOCUS OF CONTROL FROM ADMISSION TO 3 MONTH FOLLOW UP.

	(C)VASP	(C)GHQA	(C)GHQB	(C)GHQC	(C)GHQD	(C)TOT GHQ	(C)IHLC	(C)PHLC	(C)CHLC
(C) DISAB.	.10	.24	.16	.08	.07	.19	-.39*	.15	.11

* $p < .01$

VASP = Visual Analogue Scale Pain Intensity
GHQA = General Health Questionnaire - Somatic symptoms
GHQB = General Health Questionnaire - Anxiety
GHQC = General Health Questionnaire - Social Dysfunction
GHQD = General Health Questionnaire - Depression
TOT GHQ = General Health Questionnaire - Total score
IHLC = Multidimensional Health Locus of Control Scale - Internal
PHLC = Multidimensional Health Locus of Control Scale - Powerful others
CHLC = Multidimensional Health Locus of Control Scale - Chance
Disab . = Oswestry Low Back Pain Disability Questionnaire - Total score
(C) = Change from admission to 3 month follow up

association with change in disability. Increases in Internal Locus of Control cognitions are, however, significantly related to decrease in disability. (Hypothesis 4).

Evaluation of the programme was carried out according to the patients' mean rating of the value of the individual components on a subjective 11 point scale on which 0 = no value and 10 = very valuable. Table 3.5 shows a summary of these during the course from which it can be seen that the Alexander Technique is viewed as the most useful component and that other self management techniques such as relaxation and autohypnosis are valued more highly than contact with the physician.

DISCUSSION

Linton (1986) has shown that pain management courses run on behavioural lines have a positive impact, and in some cases dramatically change patients' pain experience. However, no indication is given of the mean duration of symptoms or disability indicators on entry. This study has been able to show improvement on a standardized measure of disability in spite of the previously intractable nature of the problem. Since most of the patients were tertiary

TABLE 3.5

PATIENTS' MEAN SUBJECTIVE RATING OF VALUE (10 POINT SCALE) FOR EACH COMPONENT DURING COURSE.

1	Alexander Technique	8.9
2	Swimming	8.5
3	Psychology Discussion	7.8
4	Lecture Nurse Tutor	7.7
5	Lecture Physiotherapist	7.2
6	Relaxation	7.1
7	Personal Targets	7.0
8	Auto - hypnosis	6.4
9	Get Fit	5.9
10	Lecture Pharmacist	5.8
11	Social Work Group	5.3
12	Lecture Physician	5.0
13	Lecture Psychologist	4.5

referrals (i.e. already treated by their GP's and local hospitals), they were considered to have more long standing problems and to be more severely disabled than those seen by clinicians in the acute sector. Measures of these factors are needed in the literature in order to compare the potential for change in different populations of pain patients.

The patients in this study had a high disability score in the first place and a long duration of symptoms, both contributing to limited expectation of change in this area.

The results show that pain as measured by a simple VAS was not the only predictor of disability. A sense of internal control over health issues also influenced concurrent self reported disability and at follow up emotional distress was the main predictor. The potential for change in disability was related to changes in Internal Locus of Control. It is possible that with a relatively small N the number of variables under consideration has raised the possibility of Type I error. A fairly stringent criterion of p needing to be at most .01 has been set to minimize this eventuality but replication with a larger cohort is needed, to be confident about the findings. These relationships also need to be explored experimentally to explain more fully the role of emotional distress (especially somatic symptoms, anxiety and social dysfunction) and locus of control as mediators between pain and disability and this will be addressed in Chapters 10 and 11.

The fact that change in disability was not predicted by any variables on admission needs more explanation. While the original hypotheses would allow an expectation that pain would not be associated, they would also predict that emotional and cognitive factors would be related. This hypothesis was not upheld and it is possible that other explanations are operating. An alternative hypothesis is that reduction in disability is necessary before changes in emotional distress can occur.

The patients did not score as highly on the depression subscale of the GHQ as they did on the anxiety and social dysfunction subscales and they saw relaxation and goal achievement as valuable coping skills which probably contributed to their reduction in GHQ scores at follow up. The Alexander Technique was considered to have more impact on the problem than contact with the physician, and was consistently rated the most useful component of the programme though its relationship to reduction in disability was not assessed.

Further exploration of the measures used, in particular validation of the ODQ by comparison with actual behavioural performance, and validation of the GHQ and MHLC in a chronic pain population is required.

A more sensitive measure of pain needs to be included as the VAS is inadequate alone and may have reduced the possibility of finding a stronger relationship between pain and disability, and other measures of cognitions should be investigated.

All these issues will be addressed in subsequent chapters and the next study explores an alternative measure of cognitions.

CONCLUSION

Preliminary experiences of running a pain management course have highlighted a number of ways in which change can be demonstrated. In spite of the long chronicity and severe reported physical limitations of function, disability, emotional distress (social dysfunction) and locus of control ratings improved.

Pain did not predict disability as strongly as did emotional distress and Internal Locus of Control. Better knowledge of the behaviour of the measures used and exploration of other possible cognitive mediators is needed.

CHAPTER 4

COGNITIVE DISTORTION: THE MEDIATING VARIABLE BETWEEN PAIN AND DISABILITY IN CHRONIC PAIN PATIENTS?

INTRODUCTION

In Chapter 3 it was demonstrated that among patients completing a Pain Management Programme, emotional and cognitive variables were associated with disability scores at follow up and change in disability but pain was not.

It is possible that the mediating variable between pain and disability is the belief system the patients have about the pain, and also that pain only leads to disability when negative cognitions such as occur in depression, intervene.

According to Beck's theory of depression (1967) the dysphoric mood state is maintained and in some cases created by cognitive distortions of reality. Beck has demonstrated that depressed people form an excessively negative view of themselves, their environment and their future. This interpretation of events leads them to predict equally negative outcomes to their own and others' behaviour. The key to this self perpetuating state of affairs is an irrational belief system, based on negative assumptions which the patients rehearse. Beck's theory further suggests that the treatment for this condition is to set the patients cognitive and behavioural challenges to demonstrate the discrepancy between their beliefs and reality. A number of studies (e.g. Robinson et al. 1990) have indeed shown this to be an effective therapeutic strategy.

Following this line of reasoning Lefebvre (1981) suggests that the cognitive processes of depressed people and pain patients are strikingly similar. He designed two questionnaires, a General Cognitive Errors Questionnaire (GCEQ) and a Low Back Pain Cognitive Errors Questionnaire (LBPCEQ) asking patients about their cognitions in pain and non pain situations to see if a) there was any relationship between the cognitive errors which characterise the thinking of depressed psychiatric patients and back pain sufferers and b) to explore whether depressed (versus non depressed) back pain patients show distorted cognitions about pain experiences only or about general experiences as well. Each of Lefebvre's patients was also administered the Beck Depression Inventory, (BDI). The Pearson correlation between the BDI scores and the General Cognitive Errors Questionnaire scores was .61 which is highly statistically significant and acts as a useful validity indicator for the GCEQ as a measure of cognitive distortion. Lefebvre's pain patient group were also asked to fill in a general information form including a pain rating on a 5 point intensity scale. He demonstrated a significant pain and depression interaction on an analysis of variance which showed higher overall scores on the LBPCEQ, as pain ratings increased, as well as a significant depression effect. These results indicate that depressed low back pain patients showed higher pain-related cognitive distortions than depressed non pain patients, and that pain plays a central role in the depression of low back pain patients.

Smith et al. (1986) found that the total CEQ was able to account for variance in disability measured by the Sickness Impact Profile (SIP) (Bergner & Bobbitt 1981) beyond that accounted for by the severity of pain or by depression per se. However, Smith et al. (1988) found in arthritis sufferers the greatest relationship between the total CEQ and the other variables was with depression. Although cognitive distortion was related to disability this relationship was smaller.

Since Lefebvre was able to demonstrate clear cognitive distortion in the depressed pain population, and several authors (e.g. Main and Waddell 1982, Neufeld and Thomas 1977) have shown that cognitive and behavioural factors are important in managing the consequences of pain, a number of further questions seemed to be worthy of investigation.

These were

1) Do chronic pain patients in the population under study differ from non-pain controls in the amount of cognitive distortion they report?

2) Are cognitive distortions related to pain?
3) Are cognitive distortions related to disability?
4) Does cognitive distortion explain the relationship between pain and disability?

METHOD

Subjects

The pain patient subjects who participated in the study were 51 of an initial 55 judged to be sufficient for a pilot study and labelled cohort 2 (see Appendix A). These were a heterogeneous group, 40 of whom were referred for psychological assessment associated with their intractable pain problem. The remainder were volunteers in the rehabilitation programme at the time of this study who agreed to complete the questionnaire. The sample contained 16 men and 35 women with a mean age of 41.0 years (standard deviation 11.53. Range 18 - 67). They had a mean duration of symptoms of 9.2 years (standard deviation 8.5. Range 1 - 30 years). All suffered from low back pain. The remaining four patients did not return completed forms.

A control sample of non-pain patients was collected from clerical staff at the hospital who had no personal contact with the patients and their spouses, and other volunteers known socially to the author. Nurses were excluded from the control sample since (Fisher 1989) they have a tendency to absorb the patients' cognitions about disability. Forty nine non pain control subjects (15 men and 34 women) were thus identified of whom the mean age was 30.8 years (standard deviation 8.8. Range 20 - 49 years). This is significantly different from the mean age of the patient sample and this effect was allowed for using analysis of covariance in the main calculations.

Measures

COGNITIVE ERRORS QUESTIONNAIRE

This is a 48 item test based closely on the Lefebvre version though adapted for use by an English population by the present author. The items from the General and Low Back Pain sections were combined by Lefebvre in random order into one questionnaire. The format of the questions is a vignette of a situation followed by a negative thought with which subjects are asked to record the extent to which the item describes how they would react by checking an answer on a five point scale from "almost exactly like I would think" to "not at all like I would think".

There are 10 subscores obtainable from this questionnaire, 5 applicable to General situations and 5 to Low Back Pain situations. These are named by Lefebvre Catastrophisation, Overgeneralisation, Personalisation, Selective Abstraction and Overall.

An example from the Catastrophisation Low Back Pain Scale is, "You have always been a very athletic individual. This weekend your back has been hurting and you think to yourself, "Now that I have hurt my back I can't play sports anymore"".

DISABILITY

The referred patients (the sub sample of 40 patients) were also asked to fill in the Oswestry Low Back Pain Disability Questionnaire (ODQ) (Fairbank et al. 1980).This is a self report questionnaire asking about patients' perceived difficulty in carrying out activities of daily living such as standing, walking, sitting, lifting, self care, travelling, sleeping, use of pain killers and engaging in a sex life and social life. (See Chapter 5).

PAIN

Pain patients also completed the McGill Pain Questionnaire (MPQ) (Melzack 1975) from which the scores used were the number of words chosen in the 3 classes Sensory, Affective and Evaluative, the total number of words chosen and the Present Pain Intensity which is the word chosen on a 5 point scale from Mild to Excruciating. A pain intensity Visual Analogue Scale (VAS) was added with the labels "no pain" and "worst pain" on either end.

Non-pain control subjects were given the CEQ only, but were also asked to fill in a supplementary questionnaire concerning their experience of back pain at the present time or in the past and to check its severity on the 5 point McGill Pain Intensity rating described above in order to be sure of their non-pain status.

Procedure

All subjects were asked to complete the Cognitive Errors Questionnaire in their own time and to return their checked forms to the author either personally or by post. Sixty were sent out and of these fifty were returned fully completed but one was rejected because of present pain experience. Thus 100 were obtained for analysis (51 pain patients and 49 non-pain controls). Of the pain patients, 40 completed the ODQ and the pain VAS and 30 filled in the MPQ which was introduced after 10 patients had been assessed.

ANALYSIS

All variables were examined for skewness of the distributions. The groups were compared for age by one

TABLE 4.1

MEANS (STANDARD DEVIATIONS) AND F VALUES OF CEQ SCORES, PATIENTS AND CONTROLS COMPARED BY ANALYSIS OF COVARIANCE

GENERAL CEQ			
	PATIENTS	CONTROLS	F (1,98)
Overall	15.0 (14.5)	18.1 (19.4)	0.90
Catastrophisation	3.4 (4.1)	4.4 (3.7)	1.30
Overgeneralisation	3.3 (4.0)	3.2 (3.7)	0.03
Personalisation	3.3 (3.8)	3.6 (3.7)	0.75
Selective Abstraction	5.2 (4.7)	4.7 (3.9)	0.02
LOW BACK PAIN CEQ			
Overall	26.4 (23.5)	18.6 (13.6)	0.95
Catastrophisation	4.3 (5.3)	4.0 (3.8)	0.34
Overgeneralisation	8.5 (6.6)	6.6 (4.8)	0.97
Personalisation	5.4 (5.0)	3.1 (2.9)	5.57*
Selective Abstraction	6.0 (5.4)	4.9 (4.0)	0.20

*p<.0 5

way analysis of variance and because they were significantly different, comparison of the results of the Cognitive Errors Questionnaire was performed by analysis of covariance (Norusis/SPSS. inc. 1988).

For the patient sample Pearson correlations were calculated on all subscales of the CEQ with all the subscales of the ODQ and with the results obtained from the MPQ and the pain intensity VAS. Correlations were also calculated between the ODQ and pain measures (MPQ and VAS). A criterion of $p<.01$ at most was chosen to reduce the likelihood of random associations being significant by chance.

RESULTS

Skewness was found to be acceptable (between -.4 and 1.2) for all variables and parametric tests were considered appropriate.

Pain and control samples compared.

There was a significant difference between the ages of the pain and control samples in this study (F (1,98) = 5.2 $p < .001$), the controls being younger. For this reason the differences in the scores for the 10 results obtainable from the Cognitive Errors Questionnaire were examined by analysis of covariance. Table 4.1 summarises these results. It can be seen that pain patients score higher than controls on all scales of the Low Back Pain CEQ but this is only significant for Personalisation of pain situations (F (1,98) = 5.6 p < .05). Otherwise there is no evidence that patients with chronic low back pain have a depressed cognitive style.

Cognitive Distortions and pain

Pearson correlation coefficients were calculated on all subscales and subtotals of the CEQ and the meaures derived from the MPQ obtained from the patient sample. Table 4.2 shows the correlations which reach at most p<.01. From this table it can be seen that nearly all subscales of the CEQ both General and Low Back Pain are related to the Affective scale of the MPQ. In particular the overall and catastrophisation LBPCEQ scores show the closest relationship with the Affective pain scale (p < .001). There is also a significant relationship between the total words chosen and the overall LBP cognitive errors score, which again

TABLE 4.2

SUMMARY OF SIGNIFICANT CORRELATIONS FOR CEQ SCORES WITH PAIN AND DISABILITY SCORES IN PAIN PATIENTS

GENERAL CEQ	MPQ AFFECTIVE N=30	MPQ TOTAL WORDS CHOSEN N=30	ODQ LIFTING N=40
Overall	.51*		
Catastrophisation	.46*		
Overgeneralisation	.49*		
Personalisation			
Selective Abstraction	.44*		.44*
LOW BACK PAIN CEQ			
Overall	.64**	.45*	
Catastrophisation	.56**		
Overgeneralisation	.52*		
Personalisation	.50*		
Selective Abstraction	.46*		

MPQ = McGill Pain Questionnaire
ODQ = Oswestry Low Back Pain Disability Questionnaire

* p < .01
** p < .001

can be explained by the close relationship between the number of Affective words checked and the CEQ scores.

Cognitive Distortions and disability.

Table 4.2 also includes the significant (p<.01) Pearson correlation coefficients for the CEQ with the ODQ scores. One of the ten subsections of the ODQ correlates with the CEQ which is the subscale concerned with ability to lift heavy objects. This correlates .44 with the Selective Abstraction (General) subscale of the CEQ and may indicate that lifting is an activity of daily living which is vulnerable to cognitive distortion.

Pain and Disability

Pearson correlation coefficients were obtained for the 6 pain measures and the 10 subscales and the total of the ODQ, Table 4.3 summarises the significant (p<.01) relationships between these two scales. This shows that there are very few significant relationships between most aspects of pain

TABLE 4.3

SUMMARY OF SIGNIFICANT CORRELATIONS BETWEEN PAIN AND DISABILITY MEASURES N = 30

ODQ SUBSCALE	PAIN		
	MPQ AFFECTIVE	MPQ PRESENT PAIN INTENSITY	VAS
Lifting	.40		.47
Standing		.39	.36
Socialising			.39
Total		.43	.44

p < .01 for all values

MPQ = McGill Pain Questionnaire
ODQ = Oswestry Low Back Pain Disability Questionnaire
VAS = Visual Analogue Scale - Pain Intensity

accessed by the MPQ and the ODQ subscales. Lifting again shows a relationship with the Affective subscale and the VAS. Standing relates to the Present Pain Intensity and the VAS as does the Total disability scale. Socialising relates only to the VAS. Other important aspects of daily living such as sitting and walking tolerances, sleeping, self care and travelling, all of which have a mean score of at least 1.6 on the ODQ suggesting significant limitation of function are not related to the pain measures. The fact that the number of significant relationships between CEQ scores and pain measures and between CEQ and disability scores is so small indicates that cognitive distortion (as measured by the CEQ) is not the mediating variable between pain and disability.

DISCUSSION

This study of the CEQ has demonstrated that negative cognitions are not endorsed appreciably more by the pain patients seen in this setting than by a non-pain control sample except for Personalisation, in spite of the long duration of pain symptoms (question 1). This is unlikely to be due to the inclusion of clerical staff who might have been influenced by patients' perceptions as they had no contact with the patients and formed the minority of the control sample who were mostly not health workers at all.

Most subscales of the CEQ relate to the Affective class of the MPQ which provides some useful validating evidence that the CEQ is tapping emotional reactions to pain and may help to further explain the patients' subjective experience (question 2). There is, however, no relationship with any of the other pain measures obtained from the MPQ nor with the VAS.

The CEQ scores are not related to the ODQ except for the subsection concerned with lifting. There is therefore little evidence to support the hypothesis that disability in general is mediated by cognitive distortion as measured by the CEQ (question 3). These findings are at variance with those of Smith et al. (1986) but are more consistent with their 1988 conclusions.

Since there are so few significant correlations between the pain scores and the disability subscales it is necessary to see whether the CEQ scores are related to either of these sets of variables in a way that explains the relationship between them. Table 4.2

demonstrates that there are in fact very few significant correlations between the CEQ and the pain, and the CEQ and the disability measures so it is not possible to conclude that cognitive distortion is the mediating variable between pain and disability (question 4).

There is evidently a relationship between cognitive distortion and the affective aspect of the pain experience, although this has little to do with pain intensity. It is possible, therefore, that the CEQ scores may have related to disability measures that focused on the reaction to physical limitation rather than limitation per se and may explain the disagreement between these findings and those of Smith et al. (1986) who measured disability with the Sickness Impact Profile (SIP) (Bergner and Bobbitt 1981) which concentrates on impact of dysfunction rather than levels of positive functioning. For example, an item on the Social Interaction Category of the SIP is "I isolate myself as much as I can from the rest of the family", which is a more emotionally loaded statement that those of the equivalent ODQ section of socialisation (e.g. pain has restricted my social life and I do not go out so often). Watson and Pennebaker (1989) as noted earlier (Chapter 1) have suggested that "negative affectivity" may play an important mediating role in health complaints. Thus one might expect that disability measures which tap the complaint rather than the health status aspect of disability would be related to the complaint element of pain as indexed by the Affective dimension of the MPQ. At least some scales of the ODQ have been demonstrated to relate to disabled performance and not simply to complaint reporting, thus possibly reducing the relationship with pain complaints. Similarly, it is possible that affective and behavioural responses to pain have separate predictors, behaviours for example, being mediated more by habit strength than cognitive evaluation.

It may also be the case that cognitions other than those associated with depression would show a more powerful relationship at the interface between pain and disability. The result of concentrating on this particular form of cognitive distortion and selecting those pain and disability variables accessed by the MPQ and the ODQ may have been to find minimal relationships where other instruments asking different questions about mood and activity, may have demonstrated stronger ones.

In conclusion, this study does not lend support to the notion that cognitive distortion is the mediating variable between pain and disability although it may be relevant in explaining links between the affective complaint of pain and disability complaints.

It is now necessary to return to the original finding that emotional and cognitive variables explained more variance in disability than did pain and study the behaviour of the measures used in order to elucidate their relationships and seek other evidence of mediation.

The next chapter will investigate the disability measure in detail.

PART 3

EXPLORING THE BEHAVIOUR OF THE MEASURES USED - VALIDITY AND RELIABILITY STUDIES.

CHAPTER 5

MEASUREMENT

VALIDATION OF THE OSWESTRY LOW BACK PAIN DISABILITY QUESTIONNAIRE

The aim of this chapter is to explore the structure of a suitable disability measure for the chronic pain population in order to investigate its validity and elucidate the pain-disability relationship encountered in chapter 3 in more detail.

The assessment of disability related to chronic pain has developed rapidly over the last five to ten years for a number of reasons. Since Fordyce's (1973) seminal works on the behavioural contribution to the experience of chronic pain and resulting limitation in function, it has become progressively clear that disability is a behavioural issue relatively independent of pain status and therefore needs comprehensive assessment of relevant behaviours.

A suitable questionnaire developed for an English population and measuring relevant areas specifically related to low back pain, was developed by Fairbank and coworkers in 1980. It was named the Oswestry Low Back Pain Disability Questionnaire (ODQ). Since it was intended specifically for rehabilitation patients it was the instrument of choice in a recent study by Meade, Dyre, Brown, Townsend and Frank (1990) comparing the relative efficacy of chiropractic and traditional physiotherapy. It is sensitive to change and it was found in a feasibility study to be able to differentiate between patients suffering from short and longer episodes of pain and to predict different rates of improvement. These findings suggest that it is a valid instrument though more work is needed to substantiate this.

Following the recommendations of Collen, Cutler, Siegelaub and Cella (1969) Fairbank et al. devised the ODQ with a combination of closed questions and self administration to give a reliable format and avoid interviewer bias. They quote Metzner and Mann (1952) as suggesting that this type of questionnaire is comparable with data collected by an interviewer and is possibly more effective at exploring certain areas of patient functioning.

A study by Fairbank et al. (1980) on the validity of the ODQ involved a group of 25 patients who were suffering their first attack of low back pain and in whom there was a strong likelihood of spontaneous recovery. The ODQ was completed at weekly intervals and a gradual improvement over two to three weeks was reflected in the scores. This would seem to be an attempt at measuring the construct validity of the test and its sensitivity to change but there was no trial aimed at matching change in scores with any other external measure of change. A reliability study involved 22 patients with chronic low back pain who were not expected to change over the period of the study. They were asked to complete the ODQ at the same time and under similar conditions on two consecutive days. The correlation coefficient for the test-retest results was .99, but larger numbers and a longer interval between assessments is clearly necessary to improve confidence in this finding.

The first section of the ODQ is not a measure of disability per se but asks about the amount of relief of pain obtained from analgesics. Fairbank et al. carried out an internal consistency study by comparing all other sections of the questionnaire to do with various activities such as standing, sitting and walking with the score on the analgesia section and found that the mean score of each of the sections tended to rise with that of the analgesia section. However, Fairbank et al. did not test this statistically although they suggest that this is a good indication of internal consistency.

This test clearly addresses some of the relevant issues in the assessment of low back pain patients in a rehabilitation programme. It samples a number of important areas of patient functioning, the content is drawn from a valid pool of items and it is said to be reliable over time but also sensitive to change. Although Fairbank et al. seemed confident that self administered questionnaires give an accurate indication of patient behaviour, more work is needed to investigate the confidence that can be placed in this assumption.

Three studies were therefore undertaken to explore the validity and internal consistency of the questionnaire in more detail. Two of these involved criterion-related validity and the third investigated factorial validity. The relationship between scores on the walking, sitting and lifting subscales and their behavioural counterparts were examined. Sitting and walking tolerance were selected for the initial validity study because of their immediate relevance to the patients' behaviour during their programmes. They needed to sit for periods of time while certain tasks were undertaken and they needed to walk around the rehabilitation area and to move between the various therapy departments. Lifting was chosen because of its uniquely significant relationship with the cognitive errors studied in chapter 4 and because it is a representative task of other activities of daily living (e.g. shopping, removing laundry from the washing machine) and could easily be adapted for experimental study in a single assessment session.

The following hypotheses were tested.

1. That criterion-related validity could be established for some items of the ODQ by achieving a high correlation between scores on some subscales and actual performance of tasks in these areas. This would establish a relationship between self report and behavioural aspects of disability.

2. That discriminant validity could be established by finding a low correlation between behavioural measures and unrelated subscales of the questionnaire.

3. That the ODQ is internally consistent as assessed by Cronbach's alpha.

4. That exploring the factor structure would provide evidence of construct validity and possibly of more than one aspect of disability.

STUDY 1

METHOD

Subjects

A series of 82 consecutively referred patients at various stages of their rehabilitation to the Psychology department from the national pain service at the Royal National Orthopaedic Hospital were assessed. These were cohort 1 and 40 patients from cohort 2 (see Appendix A). There were 30 men and 52 women with a mean age of 43.4 years (standard deviation 12.1, range 18 - 65). The mean duration of pain was 8.2 years (standard deviation, 6.6 range 1 - 29 years). All patients suffered from chronic low back pain either as a primary (77%) or secondary (13%) problem, depending on whether they perceived it as the site of the worst of their pain problems. Of the 82 patients, the final 42 were also asked to provide data on walking and sitting tolerance for the criterion- related validity study as this aspect of the study was introduced after 40 patients had already been assessed. However, their data were included in the internal consistency and factor analysis calculations to increase the sample size.

Materials

The ODQ is divided into ten sections selected from a series of experimental questionnaires designed to assess limitations of various activities of daily living. Fairbank et al. chose those which were found to be most relevant to the problems suffered by people with low back pain. Each section contains six statements ordered so that each statement describes a greater degree of difficulty in that activity than the preceding statement. The task is to mark the one statement in each section which most accurately describes limitation of function in that activity. Each section is then scored on a 0 - 5 scale, 5 representing the greatest disability so that there is a total possible score of 50. The total is expressed as a percentage so that if a section is not completed because it is inapplicable (e.g. section 8 sex life, if the patient is not engaged in a relationship), the final score is still comparable with those in which all sections are completed.

The wording of the walking, sitting and lifting subscales of the ODQ is:

Section 4

Pain does not prevent me walking any distance.

Pain prevents me walking more than a mile.

Pain prevents me walking more than half of a mile.

Pain prevents me walking more than a quarter of a mile.

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

I can sit in any chair as long as I like.

I can only sit in my favourite chair as long as I like.

Pain prevents me sitting more than one hour.

Pain prevents me sitting more than a half an hour.

Pain prevents me sitting more than 10 mins.

Pain prevents me from sitting at all.

Section 3 (for study 2)

I can lift heavy weights without extra pain.

I can lift heavy weights but it gives extra pain.

Pain prevents me lifting heavy weights off the floor but I can manage if they are conveniently positioned e.g. on a table.

Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned.

I can only lift very light weights.

I cannot lift or carry anything at all.

Procedure

Patients were invited into the assessment room by the author and were immediately told that they would be asked to fill in several questionnaires about their pain problem, and this would involve some sitting. They were told to feel free to stand up and move around at any time if they became uncomfortable. When the patients were seated, a stop watch to measure latency to standing was started but kept out of sight. Details of the history were discussed and the McGill Pain Questionnaire was administered next. Following this, for all patients the ODQ was always presented second with the instructions, "Please choose one sentence in each of the next sections that is most true for you at the present time. Please tick the box next to your chosen statement. Please do not spend too long thinking about each item. Your first response is probably the right one".

Behavioural Assessment of Sitting (BS)

In the subcohort of 42 cases the latency to standing was measured. The time seated before standing was recorded in minutes.

Behavioural Assessment of Walking (BW)

At the end of the session these 42 patients were asked to walk a standard circuit until they felt they needed to rest. Distance walked in metres was recorded up to the point where they first sat down or leaned against the wall. This was labelled walking tolerance.

Analysis

Non-parametric (Kendall's tau) intercorrelations (Norusis SPSS Inc 1988) were calculated for all ODQ subscores with the Total score. Kendall's correlations were carried out between BW and the score on subscale 4 (walking) of the ODQ and between BS and the score on subscale 5 (sitting) of the ODQ. Kendall's tau was used to reduce the possibility of correlations being significant by chance, especially since the subsections of the ODQ have a limited range of scores (from 0 - 5) which could result in numerous ties when the data were ranked. Discriminant validity was assessed by calculating Kendall's correlations between the Behavioural Assessments and all other subscales of the ODQ in addition to those directly related. Internal consistency was assessed with Cronbach's alpha (Cronbach 1951).

TABLE 5.1

MEANS, STANDARD DEVIATIONS AND VALUES OF KENDALL'S TAU BETWEEN BEHAVIOURAL ASSESSMENTS AND ALL SUBSCORES OF ODQ - STUDY 1

Means and standard deviations of Behavioural Assessments

	Mean	S.D.
BW metres	711	715
BS mins.	39	22

ODQ SUBSCALE

Observed Performance	1	2	3	4	5	6	7	8	9	10	TOTAL
BW	-.12	-.13	-.10	-.56*	-.32*	-.41*	-.09	-.43*	-.43*	-.27*	-.43*
BS	-.23	-.29*	-.24	-.25	-.44*	-.14	.05	-.19	-.41*	-.23	-.30*

*p< .01

1. Analgesia
2. Personal care
3. Lifting
4. Walking
5. Sitting
6. Standing
7. Sleeping
8. Sex
9. Socialising
10. Travelling

RESULTS

Criterion-related validity

Table 5.1 summarises the values of Kendall's tau between the behavioural measures of walking and sitting and all subsections of the ODQ.

The correlation between BW in metres and reported walking tolerance on subscale 4 of the questionnaire was -.56 which is significant beyond the .01 level. The correlation coefficient between BS in minutes and reported sitting tolerance on subscale 5 of the questionnaire was -.44 which is also significant beyond the .01 level.

The overall mean number of metres was 711 with a standard deviation of 715 and the modal score on the walking subscale of the ODQ was 3 ("pain prevents me walking more than a quarter of a mile"). The mean number of minutes seated was 39 with a standard deviation of 22 and the modal score on subsection 5 (sitting) of the ODQ was 2 ("pain prevents me sitting for more than an hour"). Figures 5.1 and 5.2 show the median actual performance for those patients who selected statements scoring 0, 1, 2, 3, or 4 on each of the sections measuring walking and sitting. No patients were found to score 5 which was the most extreme

FIGURE 5.1

MEDIAN DISTANCE WALKED AS FUNCTION OF ODQ SCORE

STUDY 1

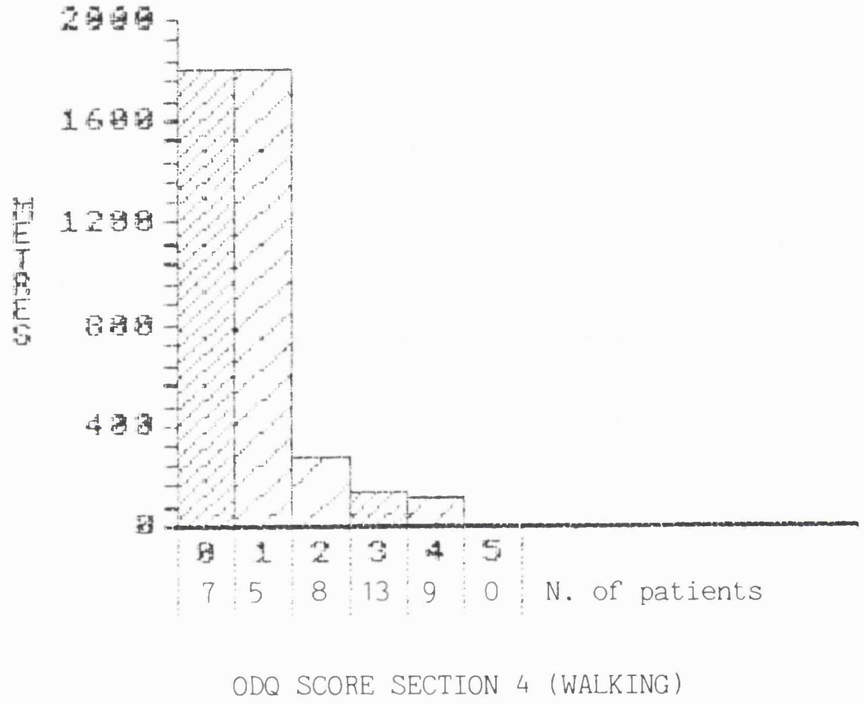
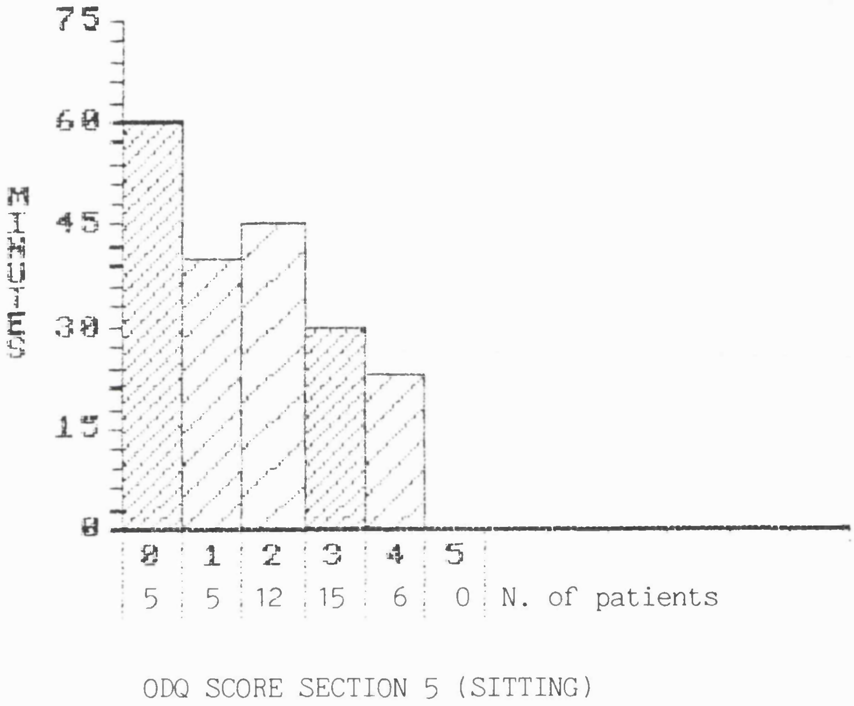


FIGURE 5.2

MEDIAN TIME SEATED AS FUNCTION OF ODQ SCORE

STUDY 1



statement.

These figures show a clear cut off between scores 1 and 2 on the walking section. No patients who actually walked 1600 metres (approximately one mile) or further scored higher than 1. Only 1 (8%) patient scoring 0 or 1 walked less than 1600 metres. This shows good specificity (a true relationship between longer distance and lower scores) and sensitivity (a true relationship between shorter distance and higher scores), with a misclassification rate of only 2%. These data are shown in Table 5.2.

The sitting subscale data show more evidence of a decreasing BS with higher scoring self report on the ODQ, but in this case there is a less sharp discrimination between low and high scores. Among people scoring 2 or below, 10 (23%) sat for less than 60 minutes and among those scoring 3 or higher 1, (2%) sat for more than 60 minutes, the overall misclassification rate being 25% (see table 5.2)

Discriminant validity

While BW shows the strongest relationship with ODQ walking, it is also significantly related to Total disability standing, sex and socializing. There is a smaller

TABLE 5.2

NUMBERS OF SUBJECTS SCORING ABOVE AND BELOW CUT OFF POINTS ON SECTIONS 4 (WALKING) AND 5 (SITTING) OF ODQ IN RELATION TO THEIR BEHAVIOURAL ASSESSMENT SCORES - STUDY 1

ODQ WALKING

		SCORE	
		0 - 1	2 - 5
DISTANCE IN METRES	>1600	11	0
	<1600	1	30

ODQ SITTING

		SCORE	
		0 - 2	3 - 5
TIME IN MINUTES	>60	11	1
	<60	10	20

relationship with travelling and sitting. (Table 5.1).

BS is related to ODQ socializing, self care and Total disability but has its highest correlation with sitting.

These results suggest that walking, which is related to standing and may play a part in socialising, shows relevant associations with other related behaviours (though its relationship to sex is not clear). Sitting, which may also contribute to ability at socializing shows an almost equally clear relevant association of behaviours, although self care is also related in a less obvious way. Otherwise these behaviours are well discriminated from others which do not contribute to walking or sitting ability. Walking and sitting are to some extent interrelated and they also form a significant substrate of Total disability.

Internal consistency

A Kendall's correlation study was carried out between each subsection of the Disability Questionnaire and the Total to further explore Fairbank's original internal consistency analysis. Table 5.3 summarises these data. It can be seen that all sections have reasonably high correlations with the total score except for the use of analgesia which does not relate significantly to Total disability.

TABLE 5.3

KENDALL'S CORRELATIONS OF EACH OF THE SUBSECTION SCORES OF THE OSWESTRY LOW BACK PAIN DISABILITY QUESTIONNAIRE WITH THE TOTAL SCORE - STUDY 1

SECTION	VALUE OF TAU
1. Analgesia	.07
2. Personal care	.34*
3. Lifting	.42*
4. Walking	.56*
5. Sitting	.44*
6. Standing	.54*
7. Sleeping	.31*
8. Sex	.62*
9. Socialising	.42*
10. Travelling	.57*

* p<.01

Cronbach's alpha was .79 which is a further indication of good internal consistency.

STUDY 2

The aims of study 2 were to replicate study 1 and additionally to validate the ODQ lifting against a behavioural assessment.

Method

Subjects

100 new consecutively referred pain patients were the subjects. These patients were mostly referred while rehabilitation attempts were still being made. These were cohorts 5 and 6 (see Appendix A). They had a mean age of 42.7 years (S.D. 11.6 range 20-64) and a mean duration of symptoms of 7.2 years (S.D. 7.1 range 1-42). These were 37 men and 63 women and suffered low back pain as a primary (81%) or secondary (19%) problem.

Procedure

As before, patients were seated (having first been invited to stand as soon as sitting became uncomfortable) and asked about their history as part of the initial assessment. They then completed the psychometric questionnaires as self report assessments including the ODQ second after assessment of pain. The behavioural sitting (BS) task was measured as before. All patients were then asked to stand in order to perform the lifting task. If they had not already stood up, then they were asked to do so at this stage and a ceiling of 90 minutes was applied to the BS task which was about the length of the assessment to this point.

Behavioural Assessment of Lifting (BL)

The patients were handed a weightless plastic carrier bag which was then filled with as many 250 gram weights (packets of rice) as they felt able to hold comfortably. They were advised to put the weight down as soon as they felt any increased discomfort. The instructions were, "I am going to put these packets of rice into the bag one at a time. Please tell me to stop as soon as the amount of weight feels as much as you want to hold. Now please hold the weight for as long as it feels comfortable. Please put it on the table as soon as it becomes a problem or feels uncomfortable in any way". Measures of the weight chosen

(BL weight) and the time (BL time) it was held were recorded.

All patients walked a standard circuit at the end of the assessment as before.

Analysis

Correlation of the ODQ subsections of sitting, walking and lifting were examined by Kendall's tau with their respective behavioural measures. Both weight chosen and the time it was held were correlated with the lifting subscale. All other sections were also included to explore discriminant validity.

RESULTS

Criterion-related validity

Table 5.4 shows the correlations of the subscales of the ODQ with the Behavioural Assessments. In each case except for BL time, the Behavioural Assessment had the highest correlation with the corresponding ODQ score. Thus BW has a high correlation (tau = -.58 p < .01) with subsection 4 (walking). BS also correlated significantly (tau = -.38 p < .01) with subsection 5 (sitting) of the ODQ.

TABLE 5.4

MEANS, STANDARD DEVIATIONS AND VALUES OF KENDALL'S TAU BETWEEN SUBSCALES OF ODQ AND BEHAVIOURAL ASSESSMENTS OF WALKING, SITTING AND LIFTING

STUDY 2

Means and standard deviations of Behavioural Assessments

	Mean	S.D.
BW (metres)	508.2	701.0
BS (mins)	49.3	23.4
BL weight (grms)	1395.0	808.9
BL time (secs)	33.6	22.8

	ODQ subscale										
Observed performance	1	2	3	4	5	6	7	8	9	10	Total
BW	-.09	-.27*	-.05	-.58*	-.11	-.17*	-.21*	-.19*	-.16	-.00	-.29*
BS	-.07	-.05	-.14	-.04	-.38*	-.04	.02	-.02	-.01	-.18*	-.13
BL weight	-.08	-.23*	-.35*	-.21*	-.26*	-.17*	-.28*	-.32*	-.15*	-.16	-.38*
BL time	-.12	-.16	-.04	-.01	-.16	-.16	-.10	-.07	-.17*	-.18*	-.19*

ODQ = Oswestry Disability Questionnaire

*p<.01

Subscale	1	Analgesia	6	Standing
	2	Personal care	7	Sleeping
	3	Lifting	8	Sex life
	4	Walking	9	Social life
	5	Sitting	10	Travelling

BL (weight) correlated most highly (tau = -.35 p < .01) with the lifting subscale of the ODQ but BL(time) did not have much common variance with any of the ODQ subscales though it had a small significant correlation with social life, travelling and Total disability (-.17, -.18 and -.19 respectively, p<.01 in each case).

Table 5.4 also shows the means and standard deviations for achievements on walking, sitting, weight held and time the weight was held.

Figures 5.3 and 5.4 show histograms of the median distance walked and scores on subsection 4 and median time seated and scores on subsection 5 respectively.

The second study has been able to replicate the good criterion-related validity found initially and to show that a further dimension of disability (lifting) is related to actual weight chosen by the patients.

Discriminant validity

Discriminant validity has been achieved by demonstrating that although actual walking has its highest correlation

FIGURE 5.3

MEDIAN DISTANCE WALKED AS FUNCTION OF ODQ SCORE

STUDY 2

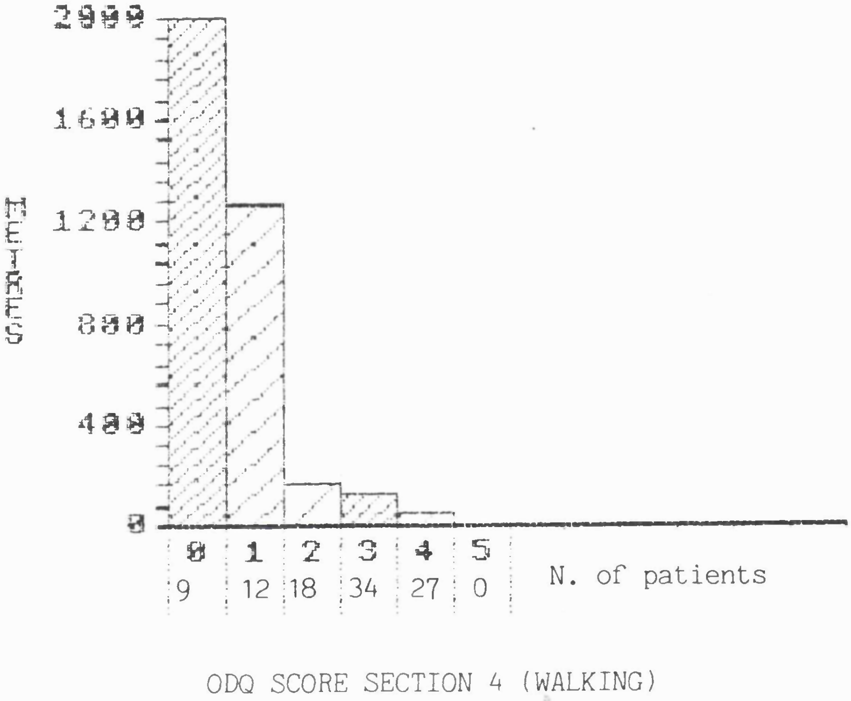
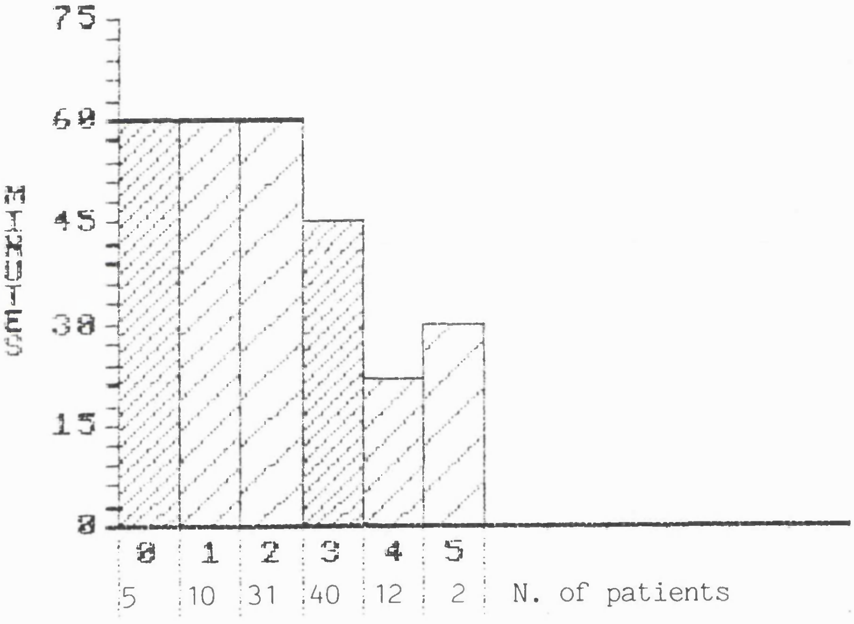


FIGURE 5.4

MEDIAN TIME SEATED AS FUNCTION OF ODQ SCORE

STUDY 2



ODQ SCORE SECTION 5 (SITTING)

with reported walking it is also related to standing (tau = -.17 p < .01) and as before has a significant contribution to Total disability (tau = -.29 p < .01). It also has a small association with sex as before (tau = -.19 p < .01) but is now associated with self care and sleeping as well (p < .01 in both cases).

Actual sitting is related to travelling (tau = -.18 p <.01) which normally involves sitting, but not to any other subsections. BL (weight) contributes to Total disability but its range of associations with other subscales (sex, sleeping, sitting, self care, walking and standing) suggests that it may be a general rather than a specific measure.

Clear differentiation between high and low achievers and low and high scorers was found for walking, using the same cut off as for Study 1 and to a lesser extent for sitting using a cut off between 2 and 3 as before. These findings also replicate those of the first study. In the case of lifting there is some discrimination between those who are able to lift a heavy weight if it is conveniently positioned (which this was) and those who report being able to lift only light weights.

The clear cut relationships between walking subscale scores

TABLE 5.5

NUMBERS OF SUBJECTS SCORING ABOVE AND BELOW CUT OFF POINTS ON SECTION 4, SECTION 5 and SECTION 3 OF ODQ IN RELATION TO THEIR BEHAVIOURAL ASSESSMENT SCORES - STUDY 2

ODQ WALKING

		SCORE	
		0 - 1	2 - 5
DISTANCE IN METRES	>1600	14	4
	<1600	7	75

ODQ SITTING

		SCORE	
		0 - 2	3 - 5
TIME IN MINUTES	>60	38	21
	<60	8	33

ODQ LIFTING

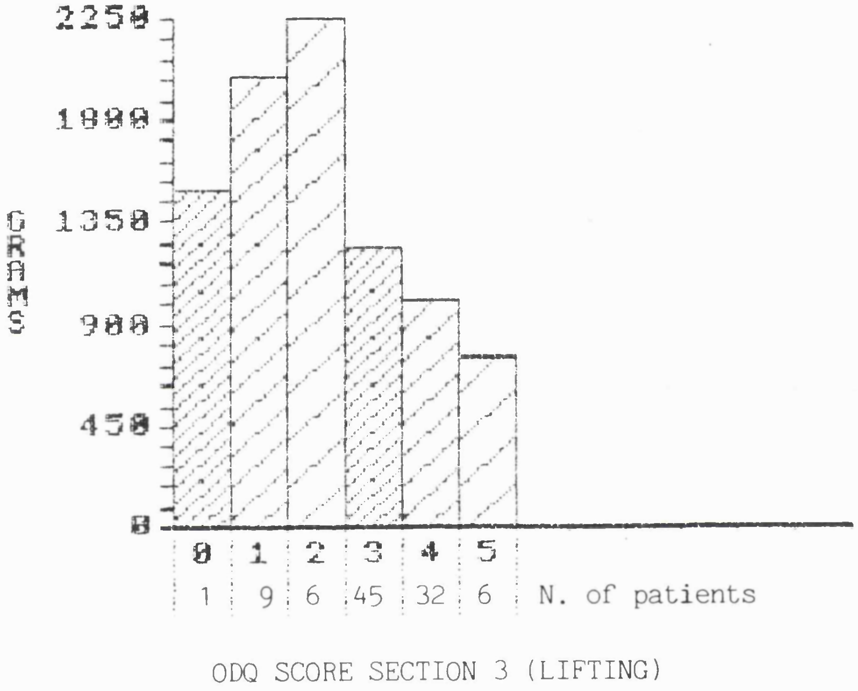
		SCORE	
		0 - 2	3 - 5
WEIGHT IN GRAMS	>1250	14	40
	<1250	3	43

of 1 or less on the ODQ and ability to walk 1600 metres, and between scores of 2 or greater and a more limited walking distance has been replicated and suggests that some confidence can be placed in the results of this as a self report measure although the misclassification rate is slightly higher than before. On this occasion 7 patients (33%) who scored 0 or 1 walked less than 1600 metres and 4 (5%) of those who scored greater than 1 were able to walk 1600 metres or further (see Table 5.5). This gives an overall misclassification rate of 11% with a larger number of false positives (those who report less limitation than they actually demonstrate). In sitting, 8 patients (17%) of those scoring 2 or below sat for less than 60 minutes, but 33 (41%) of those scoring 3 or higher sat for more than 60 minutes. This gives an overall misclassifaction rate of 29% with the majority of errors being false negatives (those who report more limitation than they demonstrate). Table 5.5 also summarises these data.

As is seen in Figure 5.5 lifting shows some discrimination between scores of less than or greater than 2 though the wording of the test item does not define an actual weight. It was decided to divide the weights chosen at the median and label weights below this value "light to medium" (ODQ wording) but weights at or above this value "heavy". The cut off score for this item of the ODQ was therefore 2 and

FIGURE 5.5

MEDIAN WEIGHT CHOSEN AS FUNCTION OF ODQ SCORE



the median weight was 1250 grams. On this Behavioural Assessment 14 patients (82%) of those who scored 2 or less tolerated a weight at or above the median while 3 (18%) chose a weight below 1250 grams. Of those with ODQ lifting scores above 2, 43 (52%) chose a weight below 1250 grams but 40 (48%) tolerated more. This gives an overall misclassification rate of 43% as forty patients of the total sample underestimated their ability and 3 patients overestimated it. These data are also shown in Table 5.5. The choice of cut off would seem to have been set too low.

Internal Consistency

Correlations with each of the subscales of the ODQ with the Total in this sample show significant interrelationships. These are summarised in Table 5.6. On this occasion there is a significant relationship between Total disability and use of analgesics which was not found before. Cronbach's alpha in this case was .73 showing moderate internal consistency.

STUDY 3

The aim of study 3 was to examine the hypothesis that disability as measured by the ODQ is not a univariate construct.

TABLE 5.6

CORRELATION OF EACH OF THE SUBSECTION SCORES OF THE OSWESTRY LOW BACK PAIN DISABILITY QUESTIONNAIRE WITH THE TOTAL SCORE - STUDY 2

SECTION	VALUE OF TAU
1. Analgesia	.30*
2. Personal care	.45*
3. Lifting	.27*
4. Walking	.44*
5. Sitting	.38*
6. Standing	.29*
7. Sleeping	.40*
8. Sex	.46*
9. Socialising	.36*
10. Travelling	.44*

* p< .01

The results of both patient samples in the previous studies were combined to explore the factor structure of the instrument with a large sample of patients to provide evidence of the hypothesised multidimensional nature of disability and of factorial validity of the ODQ.

Subjects

The 182 patients were the total of those who had participated independently in the previous two studies. Together they had a mean age of 43.0 (S.D. 11.8, range 18 - 65), with a mean duration of symptoms of 7.7 years (S.D. 6.9, range 1 - 42). There were 67 men and 116 women.

Procedure

The results of 182 patients' ODQ records were examined by FACTOR (Norusis/SPSS inc.1988), a principal components analysis with varimax rotation on factors with eigenvalues greater than one. Items with a loading of at least .35 on one factor only were included.

Results

Table 5.7 summarises the factor structure. From this it can be seen that two clear factors emerge. One consists of lifting, walking, sitting, standing, socialising and travelling and accounts for 33% of the variance. The other is made up of self care, sleeping and sex and accounts for another 12%. Use of analgesics does not load significantly (i.e. at least .35) on either factor. Because of the items which make up the factors they can be labelled Public (Factor 1) and Private (Factor 2) activities.

DISCUSSION

These studies have demonstrated that the Oswestry Low Back Pain Disability Questionnaire is an acceptable instrument for back pain patients in a rehabilitation programme with criterion-related, discriminant and factorial validity and moderately high internal consistency. It had good face validity for the patients, none of whom refused to complete it or questioned its relevance. The ability to use a percentage score, which allows for omission of inappropriate sections, such as section 8 (sexual behaviour if the patient is not in a relationship) is an advantage as this occurred in about 24% of cases. The fact that the questionnaire was intended for use with patients suffering

TABLE 5.7

FACTOR STRUCTURE OF OSWESTRY LOW BACK PAIN DISABILITY QUESTIONNAIRE N = 182

	FACTOR 1 PUBLIC ACTIVITIES	FACTOR 2 PRIVATE ACTIVITIES
Variance Explained (%)	33	12
Eigenvalue	3.3	1.2
3	.51	.13
4	.63	.13
5	.54	.30
6	.80	-.07
9	.61	.17
10	.65	.26
2	.10	.75
7	.06	.71
8	.32	.71
1	.32	.30

Subscale 1 Analgesia
2 Personal care
3 Lifting
4 Walking
5 Sitting
6 Standing
7 Sleeping
8 Sex life
9 Social life
10 Travelling

from low back pain means that results from people with other pain problems must be interpreted with caution, but since back pain is the commonest cause of presentation in pain clinics it is probably useful for the majority of patients in chronic pain rehabilitation programmes.

It appears from these studies that the disadvantages inherent in a self report instrument have been addressed and somewhat mitigated by the very clear relationships between reported ability on walking and sitting and the actual measured performance on these activities. The trend towards a clear relationship of decreasing actual performance with an increasing disability score was most noticeable in walking where there is a makred differentiation between those patients in whom walking distance was minimally limited and those who could only manage short distances. This was found in both studies. In sitting although there was a clear difference between those people in whom sitting time was not limited (score =0) and those scoring higher, the median time actually observed in the first study was slightly higher for patients who reported that they were unable to sit for more than one hour than for those who reported sitting as long as they liked in a particular chair. In the second study, the median time was the same for both groups. It appears that the statements "favourite chair" and "more than one hour" may be incorrectly placed in their order of difficulty.

In other respects, however the findings of the two studies show some inconsistencies. In the first study walking was clearly associated with sitting, socialising and travelling (as well as sex and Total disability). In the replication sample these associations were not found but instead self care and sleeping were related to walking ability. A non-parametric measure of association was selected to minimise the risk of random correlations occurring by chance, but nevertheless these relationships are difficult to understand, especially in the light of the factor analysis which separated walking and self care activities. Also in Study 1 the first section of the ODQ (use of analgesia) was not related to the Total disability score. In the second study the correlation was significant and was higher than that of lifting with the Total score. The patient groups were comparable in the two studies in terms of age and duration, but the second sample, being largely in the early stages of their rehabilitation programmes, may have viewed taking medication as a significant aspect of their disability. By the time they were admitted to the Pain Management Programme, medication use had been addressed and possibly modified so that it was seen as less relevant. Further replication is necessary to test the stability of these findings.

The behaviours selected for the validity study (walking, sitting and lifting) serve as pointers to performance of some other activities in everyday life. Since the aim of most rehabilitation programmes is to increase patients' activity and if possible return them to paid employment, the ability to walk and sit for extended periods may be a necessary substrate. Clinical experience suggests that patients who cannot sit for longer than half an hour construe themselves as unable to perform most kinds of non physical work. Patients who report being unable to walk more than half a mile perceive themselves as unable to move around the work place or climb stairs. Inability to lift or carry is seen as a complete barrier to any form of manual work including household tasks. These perceptions are largely corroborated by the findings of the Behavioural Assessment correlations.

It may be true that the relevant associations (being the highest correlations) are in part determined by patients being aware of the relationship between the behavioural and self report assessments. However, this is unlikely as the invitation to stand whenever discomfort in sitting was a problem, was given before the assessment began, the stop watch was out of sight and patients were not aware of their standing latency being observed. The walking assignment was carried out after the self report measures were completed and opportunities to rest occurred at frequent intervals along the route. These intervals (sometimes as little as every 5 metres) bore little relationship to the distances mentioned in the ODQ (1 mile, or a half or quarter mile), so that it is difficult to assume that the patients were trying to match their performance with this report. They chose to rest when a suitable opportunity occurred and when they needed to reduce discomfort before proceeding. This was the selected measure and was chosen to reduce the contamination effect of length or numbers of rest periods before the circuit was completed.

It is clear from the third study that disability cannot be viewed as a unidimensional construct but in fact is made up of at least two different forms of disability. Factor 1 seems to consist of activities carried out in public (most people refer to their score on the lifting subsection as being related to ability to do shopping) and Factor 2 is made up of private and personal activities such as self care, sleeping and sex. Tait, Chibnall et al. (1987) found a comparable pattern using the Pain Disability Index with the exception of sex. In their case Factor 1 was found to consist of family and home responsibilities, recreation, social activity, occupation and sex and Factor 2 clearly consisted of self care and life support activity which included sleeping. This is not the same pattern as is produced by the Sickness Impact Profile (SIP) (Bergner and Bobbit 1981) in which 12 categories are combined into three dimensions by cluster analysis. These are firstly a Physical Dimension including the categories of ambulation, mobility and body care and movement, and secondly a Psychosocial Dimension consisting of the categories of social interaction, communication, alertness behaviour and emotional behavour. The third dimension is made up of the independent categories sleeping and rest, eating, work, household management and recreation and pastimes. The difference between the relationships and the components of the ODQ and the SIP could well be accounted for by differences in the item pools and general medical as opposed to chronic low back pain patients. These sources of variance were minimised in the ODQ and the Pain Disability Index studies by concentrating on chronic back pain patients in rehabilitation programmes and using comparable items.

The implication of there being at least two different types of disability accessible by the ODQ suggests that different types of outcomes may follow from pain management programmes. Although most comprehensive programmes would presumably attempt to focus both on private and public activities it may only be the latter that are directly addressed. This will be examined in a later study to see if there is a differential post treatment change in the two disability factors, and also to see if pain is related to one type of disability more than the other.

CONCLUSION

These studies have demonstrated good criterion-related, discriminant and factorial validity for the Oswestry Low Back Pain Disability Questionnaire. The results suggest 2 disability factors. Reliability is also moderately high.

The next chapter considers validity issues in the measurement of pain.

CHAPTER 6

MEASUREMENT - PAIN

Exploration of methods of scoring the McGill Pain Questionnaire

INTRODUCTION

The accurate measurement of pain remains elusive in spite of several attempts referred to in Chapter 2. In the early study reported in Chapter 3 the instrument used was a simple Visual Analogue Scale of pain intensity. The next study (Chapter 4) dealing with the possible mediating role of cognitive distortion between pain and disability used the McGill Pain Questionnaire (Melzack 1975) and showed some differential correlations between cognitive errors measured by the Cognitive Errors Questionnaire (Lefebvre 1981) and the Affective pain score. Since it appeared from the pilot study that emotional distress was more strongly related to disability than was pain intensity, it is necessary to explore the emotional component of pain purported to be accessed by the McGill Pain Questionnaire to see whether this can be isolated and subsequently used to investigate the pain, emotion and disability triad in more detail.

In order to do this, a validation study is now reported in which the intercorrelation of results obtained from different methods of scoring the protocols of a chronic pain population from this clinical setting is explored.

Also in clinical practice it might be advantageous to try and separate out the sensory and emotional aspects to pain and thus to investigate the potential for reducing these differentially depending on various treatment inputs. A further aim of this chapter is to explore whether the different methods of scoring the McGill Pain Questionnaire achieve this differentiation.

The McGill Pain Questionnaire

The McGill Pain Questionnaire (MPQ) is to date the most comprehensive instrument available for recording patients' pain experience and sets out to enable a distinction between sensory, affective and evaluative aspects to be made. The original studies (Melzack and Torgerson 1971) were based on Dallenbach's (1939) list of words describing five different aspects of pain, temporal, spatial, pressure quality, affective and other qualititive attributes.

Melzack and Torgerson reduced this number of words by those which they considered inappropriate and added additional words which were found by examining the clinical literature on pain. They then carried out a series of preliminary experiments aimed at classifying the words into groups. This resulted in three major classes -1) words that describe Sensory qualities such as temporal, spatial, pressure and thermal aspects of pain, 2) words that describe Affective qualities such as tension and fear arousing properties and 3) Evaluative words that describe the subjective overall intensity of the pain.

A validity study on the organisation of the words was reported in the 1971 paper. Two groups of 20 non patient subjects all with a University education were asked to agree or disagree whether a particular word belonged in a particular subclass. A final list of 100 words resulted which were then arranged in a further study into ranks of intensity. In this case 140 psychology students, 20 physicians and 20 patients were each asked to assign each word to a position on a 7 point scale in which one and seven represented respectively the least and worst pain they could imagine. Seven words in the evaluative list were found to have approximately equidistant distributions and these seven words were used as anchor words for the list. They were mild, discomforting, distressing, miserable, horrible, savage and excruciating. A second group of seventy students was asked to assign the Sensory, Affective and Evaluative words to one of the seven categories thereby indicating the intensity of pain implied by the word.

A pilot study with patients found they discriminated well at lower intensities but had difficulty deciding between levels 5, 6 and 7 so that five anchor words were finally chosen. These 5 words, mild, discomforting, distressing, horrible and excruciating were then used as the anchor words for another study with 20 doctors and 20 patients in which each of the 5 words was assigned a value from 1 to 5 and the total list of words was scaled by comparison with the anchor words. There was apparently good agreement between doctors and patients as to the scale order of the words. These data were added to those obtained by the previous student sample.

Table 6.1 shows the final list in which all words have an agreed scale value between the three sets of judges. However, the doctor and patient judges disagreed on the scale values of 29% of the Sensory words, 21% of the Affective words and 20% of the Evaluative words.

The original anchor scale from mild to excruciating was eventually used as a separate component of the final

TABLE 6.1

List of words for the McGill Pain Questionnaire which have rank orders agreed between students, doctors and patients

1	SENSORY Temporal	Flickering Quivering Pulsing Throbbing Beating Pounding
2	Spatial	Jumping Flashing Shooting
3	Punctate Pressure	Pricking Boring Drilling Stabbing Lancinating
4	Incisive Pressure	Sharp Cutting Lacerating
5	Constrictive Pressure	Pinching Pressing Gnawing Cramping Crushing
6	Traction Pressure	Tugging Pulling Wrenching
7	Thermal	Hot Burning Scalding Searing
8	Brightness	Tingling Itchy Smarting Stinging
9	Dullness	Dull Sore Hurting Aching Heavy

10	SENSORY Miscellaneous	Tender Taut Rasping Splitting
11	AFFECTIVE Tension	Tiring Exhausting
12	Autonomic	Sickening Suffocating
13	Fear	Frightful Terrifying
14	Punishment	Punishing Gruelling Cruel Vicious Killing
15	AFFECT.- EVAL. Miscellaneous	Wretched Blinding
16	EVALUATIVE	Annoying Troublesome Miserable Intense Unbearable

MISCELLANEOUS WORDS ADDED SUBSEQUENTLY

17	Spreading Radiating Penetrating Piercing
18	Tight Numb Drawing Squeezing Tearing
19	Cool Cold Freezing
20	Nagging Nauseating Agonising Dreadful Torturing

questionnaire and gives a measure of Present Pain Intensity. Four supplementary subclasses were added to the list of words derived from past experience with patients and which were thought to be valuable descriptors. These were also scaled according to the original rules and were added as Miscellaneous classes. They are seen on Table 6.1 as additional subclasses.

Four types of data can be obtained from the questionnaire, 1) The Pain Rating Index(S) is based on the subjects' mean scale values, which consists of the sum total of the scale values for all the words chosen in the Sensory, Affective and Evaluative classes. This is known as the PRI(S). 2) The Pain Rating Index(R) (PRI(R)) which is based on the rank values of the words. In this scoring system the words are assigned a value of 1 up to a maximum of 5 depending on the number of items in the subclass and the total score is the total of the rank values. The third measure is the total number of words chosen and 4) is The Present Pain Intensity (PPI) based on the final section of the questionnaire. Since PRI(S) and PRI(R) are highly correlated it seems unnecessary to differentiate between them and as there is considerable disagreement among the scale values, rankings are thought to be sufficient.

In a further study (Melzack 1975), Melzack found that the patients' overall Present Pain Intensity (PPI) correlated significantly with the total number of words chosen and the rank PRI. The PPI correlated highest with the Evaluative class suggesting that the PPI may be an overall evaluative measure. This is not surprising considering that these words were removed from the intended Evaluative class in the first place. Melzack also points out that the PPI appears to be more susceptible to influence by variables other than the sensory dimensions of pain.

Melzack (1975) goes on to report data obtained from 29 patients who participated in a study of brief electrical stimulation as a pain treatment technique which showed that the PPI percentage change following treatment correlated extremely highly with the percentage change for each of the Pain Rating Indices separately. All these correlations are so highly statistically significant and indicate such a high internal consistency among the different classes of the PRI that it might be the case that the questionnaire does not differentiate the three classes of the pain experience and in fact the change is a global one.

The issue of reliability was addressed by Melzack (1975) by examining the questionnaires of ten patients only. These patients answered three questionnaires at intervals ranging from three to seven days and reported the same PPI level each time. The consistency of choice of subclasses among the three questionnaires ranged from 50% to 100% with a mean consistency of 70.3%. Melzack points out that he believes this high degree of consistency cannot be due simply to patients recording the words they chose earlier but the basis for this assertion is unclear.

In this same 1975 paper Melzack reports a study in which the questionnaire was used to determine the relative effectiveness of biofeedback training, hypnotic training and a combination of these procedures in the treatment of several clinical pain syndromes. There were baseline, training and practice sessions for each of the three groups and a percentage change was calculated for the PRI of the Sensory, Affective, Evaluative and Miscellaneous classes as well as the overall PRI. Further, percentage changes were calculated for the number of words chosen and for the PPI. During training there was a significant mean percentage decrease in the combined group for the Sensory, Affective, total PRI and PPI but no other groups changed. There was no significant change in any group from baseline to post treatment measures. Melzack interprets this as stability of the measure but in fact it could be due to ineffective treatment or that the measure is insensitive to change.

These two papers (Melzack and Torgerson 1971 and Melzack 1975) while outlining the development and uses of the scale have shown that the MPQ has considerable value. However, the fact that the initial studies concerned rating by doctors and students with the contribution of very few patients does not lead to confidence in the measure for a clinical pain population. Also the reliability experiments have been done on very small numbers. There remains the question as to whether the rankings of the PRI are stable across pain populations and it is also not possible to compare the PRI between the Sensory, Affective and Evaluative classes since there are different numbers of items in each class. Further, although subsequent papers have attempted to replicate the factor structure of the MPQ it should be borne in mind that the three dimensions to pain were never considered to be based on a factor structure but on a priori groupings of the words by multi-dimensional scaling.

Reading, Everitt and Sledmere (1982) attended to the problem of assessing validity using cluster analysis and found that it is in fact difficult to support a three factor pattern since the Evaluative class failed to emerge independently of Affective subclasses. The results that Reading et al. report from a study on the assessment of similarity between adjectives, show, using multi-dimensional scaling, the similarity matrix between Melzack's original grouping and their study based on the ratings of 90 unspecified subjects was disappointing. The reason for this seems to be that the adjectives clustered together in a way which had significant similarities between clusters rather than within clusters. However, there did seem to be two overall clusters reflecting the various subclasses of the Sensory class and a fear-evaluative component. Also the agreement between the subjects for ranking the adjectives for intensity was not strikingly high. Reading et al.point out that it would be interesting to replicate the groupings using patient populations but they think that the task would be different for a pain sample as patients may group words in accordance with their own experience of the pain rather than on the basis of similarity of meanings. This could be interpreted as saying the groupings may not be meaningful for pain patients.

A recent study by Lowe et al.(1991) has returned to the problem of factor structure and has used LISREL analysis to investigate whether a three factor solution can be confirmed. They quote Crockett et al. (1977) as being able to identify five factors which seem to be a combination of anxiety and sensory components and Leavitt et al. (1978)

who identified seven factors of which sensory descriptors constituted five and combinations of sensory and affective descriptors defined the final two factors. Neither Leavitt et al. nor Reading (1982) found empirical support for the Evaluative class described by Melzack. Prieto et al. (1980) found four dimensions by varimax rotation of the principal components method. The factors identified accounted for 51% of the total variance and were described as sensory pressure, evaluation, affective-sensory and punishing affect. Reading (1982) found six poorly differentiated factors reflecting specific sensory qualities and combined emotional-sensory dimensions. Lowe et al. conclude that in each of these exploratory factor analytic studies, orthogonal methods of rotation were used which do not allow the factors to correlate and this is inconsistent with the original conceptualization of the PRI scaling. They therefore undertook a confirmatory factor analytic study and found that a three factor model provided the best representation of the data. This was replicated in a second sample of acute pain patients.

Turk, Rudy and Salovey (1985) undertook a similar exercise and were also able to confirm the presence of three factors by LISREL. However, Turk notes that a minimum criterion for factorial distinctiveness is that the intercorrelations between constructs are smaller than the within construct correlations and he found that this criterion was not reached in two samples of pain patients. He concludes that the discriminant validity of these three classes is inadequate and the use of three separate scores is inappropriate because they are in reality measuring the same construct.

Thus it appears that attempting to differentiate the sensory and emotional components of pain is probably not possible with this instrument as it stands. Clinically, of course it would be useful to assess at least two aspects of pain (sensory and affective or sensory and evaluative or sensory and affective plus evaluative), so that treatments could be judged as to their differential effectiveness. It may be the case that psychologically based techniques such as deep muscular relaxation or cognitive therapy could be expected to change the emotional component of the pain experience while not necessarily reducing sensory qualities such as pressure or temperature.

One possible explanation for the problems in differentiating sensory and emotional components may be that the scoring system used is not equally sensitive to changes in the components as the number of subclasses in each class varies from 10 (Sensory) to 1 (Evaluative). These contain 42 and 5 items respectively with a further 14 items identified as the Affective class. Some modification to the standard scoring procedures (e.g. using number of words chosen in each category as a percentage of all words in that category) may enable this differentiation to be made. It is hypothesised that percentage scores for each of the three classes would allow discrimination of sensory and emotional components.

The present study was therefore undertaken to 1) explore the interclass relationships of the MPQ in the population under study 2) to see whether using the ranked data as recommended by Melzack had an advantage over using the total number of subclasses checked for each class and 3) whether using percentage data affected the interclass relationships of the questionnaire. If comparable results could be obtained then it would be useful to use percentage data for the brief communication of the relative weight given to components of pain experienced by individual patients.

METHOD

Subjects

The records of 135 unselected referred patients to the Psychology Department were used for this study. These included 30 from cohort 2 and cohort 3 (See Appendix A). Most of these patient referrals antedated the studies on the relationship between pain and disability and form cohort 4. There were 46 men and 77 women in the sample with a mean age of 40.7 years (standard deviation 13.3, range 16 - 65). Mean duration of pain was 9.1 years with a standard deviation of 7.1 and a range of 1 - 36 years. 77 (57%) of the patients identified low back pain as their primary problem with a further 20 (15%) having low back pain as their secondary problem. The remaining 38 (28%) patients did not have back pain but suffered from traction lesions of the brachial plexus or painful amputation stumps and were included to increase the sample size.

Measures

The MPQ was given to all patients as a self administered questionnaire. The Present Pain Intensity (PPI) was used as a measure of the patients' pain intensity at the moment they filled in the form. A 100mm Visual Analogue Scale (VAS) was drawn on the form with the anchor words "No Pain" and "Worst Pain" at either end.

Procedure

Patients experiencing pain were given the MPQ as part of their initial psychological assessment. After the history had been discussed they were asked by the author to check off all the word descriptors that were appropriate for their pain experience. This enabled potentially greater differentiation of patients' use of the classes for the percentage analysis. Only the highest ranking word in each subclass was used for the ranked data analysis and only those subclasses checked were counted for the subclass analysis. In addition the patients were asked to rate their present pain by choosing one of the five words from the list mild, discomforting, distressing, horrible or excruciating (PPI) and on a 100 mm Visual Analogue Scale with the anchors "no pain" and "worst pain" on either end. The instructions for this were "Please mark along this line how much pain you have at present". The VAS was included to see how this related to the more detailed aspects of the pain accessed by the MPQ and to see whether it could be considered an adequate alternative.

Analysis

The results of the 135 subjects were scored in three different ways. Firstly, maintaining Melzack's recommended tripartite structure, the total number of subclasses checked in the Sensory class (subclasses 1 - 10), in the Affective class (subclasses 11 - 15), the Evaluative class (subclass 16) and the Miscellaneous class (subclasses 17 - 20) were used as well as a total score. Secondly, the subjects' rank scores were calculated according to the procedure described by Melzack using only the most highly ranked word in each subclass. Sums of ranks for the Sensory, Affective, Evaluative and Miscellaneous classes and the PRI which is the sum of all ranks were produced by this method. Thirdly, the percentage of words chosen in each class was calculated by dividing the total number of words chosen by the total number available in the class (42, 14, 5 and 17 for the Sensory, Affective, Evaluative and Miscellaneous classes respectively). The total percentage was calculated by dividing the total number of words chosen by the total number of descriptors on the form (72). In each case the results were multiplied by 100.

The three methods of scoring were examined for skewness of the distribution of their scores and were subjected to Pearson, correlation by SPSS pc (Norusis/SPSS inc. 1988), the data set appearing large enough to permit parametric analysis which had also been considered appropriate by previous researchers.

The effect of sex and site of lesion were tested by MANOVA using the subclasses per class method of scoring.

RESULTS

Skewness was found to be acceptable for all variables (between .07 and 1.5). There were no significant differences found by MANOVA on any of the scores of the classes, the total or the VAS between the sexes (see Table 6.2a). A further MANOVA on the three levels of site of pain (primarily low back pain, secondarily low back pain or pain elsewhere) also showed no significant differences (see Table 6.2b). The PPI modal score was 2 (discomforting) in all cases.

Table 6.3 shows the intercorrelation of the three methods of scoring. It is clear that they are closely interrelated and in some cases make the choice of scoring method of little importance. For example the Sensory score derived from counting the number of subclasses in this class correlates .90 with the Sensory score derived from ranked data and similarly the total number of words chosen (potentially more than one per subclass) correlates .85

TABLE 6.2a

MEANS (STANDARD DEVIATIONS) AND MANOVA VALUES OF F, MEN AND WOMEN COMPARED

VARIABLE	MEN	WOMEN	F (1,133)
VAS	64.6 (20.3)	63.2 (20.9)	.0
SENSORY	6.0 (2.5)	5.4 (2.2)	1.8
AFFECTIVE	1.8 (1.6)	1.9 (1.5)	.7
EVALUATIVE	.9 (.3)	.9 (.3)	.2
MISC	2.1 (1.2)	1.9 (1.1)	.8
TNWC	13.5 (8.6)	12.5 (6.4)	.2

NO SIGNIFICANT DIFFERENCES

TABLE 6.2b

MEANS (STANDARD DEVIATIONS) AND MANOVA VALUES OF F, SITES OF LESION COMPARED

VARIABLE	PRIMARILY BACK PAIN	SECONDARILY BACK PAIN	OTHER PAIN	F (1,133)
VAS	65.0 (21.6)	60.5 (20.2)	61.9(18.5)	1.6
SENSORY	6.0 (2.4)	5.1 (2.3)	5.4 (2.3)	1.8
AFFECTIVE	2.2 (1.4)	2.1 (1.7)	1.4 (1.5)	.7
EVALUATIVE	1.0 (.2)	.9 (.2)	.9 (.3)	1.5
MISC	2.1 (1.1)	2.1 (1.2)	1.8 (1.1)	.1
TNWC	14.0 (7.7)	11.8 (6.3)	11.7 (6.7)	1.1

NO SIGNIFICANT DIFFERENCES

VAS = Visual Analogue Scale
MISC = Miscellaneous class
TNWC = Total Number of Words Chosen

with the total number of subclasses checked, .83 with the total value of ranks and .96 with the total percentage of all words chosen ($p<.001$ in all cases). The Affective score correlates with the ranked Affective score .82 ($p<.001$) and with the percentage Affective score .89 ($p<.001$). It is also clear that there are significant correlations between the classes so that no method of scoring allows for a clear differentiation of the sensory and emotional components. For example, Sensory and Affective classes correlate .45 and .38 by the subclasses checked and the ranked methods respectively ($p<.01$). Although these are not remarkably high (accounting for less than 20% of the variance) they cannot be said to be independent. By the percentage method of scoring there is less intercorrelation, Sensory and Affective classes sharing an insignificant amount of variance ($r=.19$, $p>.01$). However, if the miscellaneous class is included, giving the best overall chance of recording post treatment changes, then the intercorrelations are again too high to permit adequate differentiation of the components. This is also true of the ranked scoring method where the distinctiveness of the Evaluative class disappears once the Miscellaneous class is included.

The PPI has its greatest relationship with the VAS as would have been expected as the VAS is an intensity measure and

TABLE 6.3

CORRELATION AND INTERCORRELATION OF THE COMPONENTS OF THE MCGILL PAIN QUESTIONNAIRE AND VAS BY THREE METHODS OF SCORING

	PPI	VAS	SENS	AFFECT	EVAL	MISC	RSENS	RAFFECT	REVAL	RMISC	PSENS	PAFFECT	PEVAL	PMISC	TNWC	TOTCLASS	PRI	TPWC
PPI	-	.51**	.02	.15	.08	.11	-.02	.12	.43*	.18	-.10	.18	.04	.11	.06	.10	.15	.09
VAS		-	.28	.32	.20	.24	.23	.26	.35	.16	.12	.33	.08	.51**	.32	.35	.32	.33
SENS			-	.45*	.10	.65**	.90**	.28	.15	.35	.73**	.45*	.16	.55**	.86**	.88**	.78**	.82**
AFFECT				-	.18	.44*	.47**	.82**	.37	.59**	.22	.89**	.03	.61**	.56**	.79**	.69**	.50**
EVAL					-	.10	.01	.15	.46*	.20	.05	.16	.36*	.22	.12	.35	.17	.18
MISC						-	.52**	.36*	.18	.78**	.33	.37*	-.03	.99**	.62**	.80**	.71**	.55**
RSENS							-	.38*	.10	.42*	.68**	.48**	.11	.57**	.85**	.86**	.83**	.75**
RAFFEC								-	.35	.64**	.08*	.77**	-.07	.55**	.42**	.69**	.69**	.32
REVAL									-	.39*	-.03	.29	.41*	.30	.26	.44*	.45*	.25
RMISC										-	.30	.56**	.21	.78**	.61**	.62**	.75*	.54**
PSENS											-	.31	.19	.43*	.75**	.67**	.45*	.76**
PAFFECT												-	.02	.56**	.62**	.74**	.64**	.63**
PEVAL													-	.21	.36*	.35	.13	.37*
PMISC														-	.66**	.80**	.74**	.62**
TNWC															-	.85**	.88**	.96*
TOTCLASS																-	.91**	.82**
PRI																	-	.71**

* p<.01
** p<.001

PPI = Present Pain Intensity
VAS = Visual analogue Scale for Pain Intensity
SENS = No. of subclasses checked in Sensory class
AFFECT = No. of subclasses checked in Affective class
EVAL = Subclass checked in Evaluative class
MISC = No. of subclasses checked in Miscellaneous class
RSENS = Total of ranks of sensory words checked
RAFFEC = Total of ranks of affective words checked
REVAL = Rank of evaluative words checked
RMISC = Ranks of miscellaneous words checked
PSENS = Sensory words checked as percentage of all sensory words
PAFFECT = Affective words checked as percentage of all affective words
PEVAL = Evaluative words checked as percentage of all evaluative words
PMISC = Miscellaneous words checked as percentage of all miscellaneous words
TNWC = Total number of words chosen in whole questionnaire
TOTCLASS = Total number of subclasses checked
PRI = Pain Rating Index - total of ranked scores.
TPWC = Total of words checked as in percentage of all words.

apart from one significant correlation with the ranked Evaluation score, is independent of all others.

The VAS only correlates with PPI and the Miscellaneous class scored by the percentage method. It is clear that intensity is therefore independent of quality rated by the total scores by all methods and by the subclasses per class method. Two scores seem to be available which are Total and PPI. Since the correlation between the total number of words chosen and the total of subclasses checked is high (r=.85 p<.001) it seems possible to allow patients to check all relevant words rather than just one per subclass to enable a more sensitive measure of change to be obtained. As there is little advantage to be gained by using ranked data (PRI and Total Number of words chosen correlate .88, p<.001) calculating changes in ranking would probably not improve the chance of providing a reliable change measure.

DISCUSSION

The present results suggest that in this population of patients, the intercorrelation of the components of the MPQ show a failure to separate into the three proposed by Melzack (1975).

In common with various other studies which have looked at the factor structure, this study has shown a close relationship between the Sensory and Affective classes but it appears that Turk's (1985) assertion that it is valid only to look at the total score is not upheld if the PPI is included.

From the clinical point of view it is possible to look for changes in the total number of words chosen and the Present Pain Intensity as two separate outcome measures from treatment. It is therefore proposed to use these two measures in subsequent analyses in this thesis. The total number of words chosen gives a general measure of pain quality. The PPI is available for describing pain intensity.

It is possible that further work on the percentage method of scoring, especially if the miscellaneous class is omitted and the potential reduction in sensitivity to change accepted, may yield promising results. However, this is beyond the scope of the present study as factor analytic exploration, in line with the other researchers' work quoted earlier would need to be undertaken. This would involve larger numbers of subjects than are presently available.

A similar idea has been discussed by Charter and Nehemkis (1983) who also noted the problem of comparing class scores with uneven numbers of items. However, their percentage data are obtained by dividing the words chosen by the number of subclasses (rather than the number of words) available for each class. Although they recommend this as a more sensitive measure of pain complexity, it still does not address the difficulty of the Evaluative class consisting of only one subclass so that the scores available for this class can only be 0 or 100, depending on whether the patient chooses a word from this class or not. In spite of this innovative development, more recent authors (e.g. Turk et al. 1985, Lowe et al. 1991) have not incorporated it into their thorough investigation of the questionnaire's behaviour so it will not be pursued here.

The very large number of intercorrelations makes the possibility of Type I error high but since the hypothesis was intended to examine distinctiveness as opposed to association of the components, this is not a major problem. It is clear from the correlation table that a value of r of at least .36 is required to reach significance at p<.01 and this, indicating about 13% of shared variance does not permit confident disassociation of the classes, especially in view of the published reports of factor analysis.

CONCLUSION

This study has demonstrated that it is not possible to differentiate sensory and affective components of pain using the McGill Pain Questionnaire with this population. Two different components are identified, however which are total pain quality and pain intensity. The use of these as sensitive measures of change is discussed.

Studies on the emotional distress measure are described in the next chapter and are followed by reports of investigations on the other measures used.

Subsequent chapters will then use the resulting conclusions of these investigations in the context of further experimental work on the mediators between the two aspects of pain and the two aspects of disability identified in Chapter 5.

CHAPTER 7

MEASUREMENT - EMOTIONAL DISTRESS

The General Health Questionnaire

INTRODUCTION

Emotional distress is clearly asociated with both pain (e.g. Ackerman and Stephens 1989) and disability (e.g. Main and Waddell 1982). Chapter 3 demonstrated that post programme disability was associated with distress as measured by the General Health Questionnaire (GHQ, Goldberg 1978) and in particular (after social dysfunction which may be an emotional concomitant of disability) with preoccupation with somatic symptoms and anxiety. The mean scores on the subsections of the General Health Questionnaire indicated that the patients endorsed more anxiety than depression items and in Chapter 4 it was found that cognitions associated with depression were not used by the chronic pain patients seen in this setting any more than by non pain controls. It is likely that other aspects of emotion have a greater role in the pain - disability relationship and it is necessary therefore to explore the kind and extent of emotional distress experienced by chronic low back pain patients to elucidate their possible mediating role more fully.

Benjamin et al.(1988) proposed that all patients with chronic pain need psychiatric assessment as part of their clinical evaluation. They found that DSM III criteria for diagnosing mental illnesses were reached in approximately half the patients attending the pain clinic they studied. Two thirds of these had depressive disorders and the remainder somatoform disorders. The distribution of psychiatric diagnoses was not related to organic status assessed by anaesthetists. Benjamin concludes that chronic pain patients require psychiatric assessment as well as physical examination as the basis for relevant management.

Benjamin, Lennon and Gardner (1991) recommend applying a two stage screening procedure to chronic pain patients to identify those with physical problems who also meet the criteria for "caseness" of psychiatric morbidity. They set out to explore whether the GHQ was a suitable instrument for this especially as it was specifically developed for community medical settings. They reported a validation study of the 28 item version of the GHQ in pain clinic patients and identified a cutting score of 10/11 which gave satisfactory sensitivity (true positives) and specificity (true negatives). It had a positive predictive value of 67% identifying 2 "cases" per 3 assessments which is considered more cost effective than sensitivity alone. This 10/11 threhold resulted in 3 (5%) patients with false negative classifications. That is, they were identified by the GHQ as having insufficient psychopathology for "caseness" but were subsequently found by the Clinical Interview Schedule (CIS, Goldberg et al. 1970) to be suffering from treatable depression. However, this was satisfactory when compared with anaesthetists' ability to identify depressive disorders which resulted in a false negative rate of 33%. 10/11 also gives the lowest misclassification rate of all the cutting scores tested against the CIS.

Benjamin et al. conclude that the GHQ 28 is an effective and valid instrument for examining psychological distress in a pain clinic population and although it seems to be rarely reported as the instrument of choice it serves the function of being easy to administer, is acceptable to the patients and is able to identify emotional characteristics of the pain experience needing further investigation in clinical settings.

Previous research on the GHQ based on factor analysis by Goldberg and Hillier (1978) showed that a general factor accounted for 35% of the variance in the unrotated analysis but they were able to differentiate four factors with the expected loadings by varimax rotation. These are somatic symptoms, anxiety and insomnia, social dysfunction and depression.

In the study to be reported it was intended to use Benjamin et al.'s recommended cutting score of 10/11 and to explore the relationships between subsection scores to see if differentiation of the four components suggested by Goldberg and Hillier was equally true of a chronic pain as opposed to a general medical population.

The hypotheses to be tested were:

1. That it could be demonstrated whether or not the majority of a chronic pain population in this setting would show evidence of psychiatric morbidity in spite of intractable pain.

2. That the GHQ would enable differentiation of somatic, anxiety, social dysfunction and depression components of psychological distress associated with chronic pain and disability, rather than just quantify total distress.

3. That depression would be endorsed less frequently than the other aspects of distress accessed by this instrument as was found in the pilot study.

These hypotheses were examined by 2 studies.

METHOD

Subjects - Sample 1

52 chronic pain patients were the subjects. These included the 42 patients in cohort 1 and another 10 consecutively referred patients who had been assessed by the time of this report (cohort 3). (See Appendix A). There were 22 men and 30 women in the sample with a mean age of 42.4 (standard deviation 12.5, range 18-65 years) and duration of pain of 8.1 years (standard deviation 6.5, range 1 - 29 years). All patients suffered from low back pain either as a primary (64%) or a secondary problem (36%).

Sample 2

One hundred newly and consecutively referred pain patients were the replication sample. These are cohorts 5 and 6 (See Appendix A). They had a mean duration of symptoms of 7.2 years (S.D. 7.1 range 1 - 42 years). There were 37 men and 63 women with a mean age of 42.7 years (S.D. 11.6, range 20 - 64 years) with low back pain as a primary (81%) or secondary (19%) problem.

Measures

The GHQ 28 was used as a self administered assessment instrument for all patients. The Questionnaire consists of four groups of seven questions dealing with (A) somatic symptoms, (B) anxiety, (C) social dysfunction and (D) depression. Each item is scored on a Likert type scale from 0 "not at all" to 3 "much more than usual". An alternative method of scoring is to assign 0 to the first two possible responses (not at all: no more than usual) and a score of 1 to the third and fourth possible responses (rather more than usual: much more than usual).

Procedure

The questionnaire was given as a self administered instrument at the initial assessment interview after relevant aspects of the history of the pain problem had been discussed. It was alays given as the third questionnaire and after measures of pain and disability had been taken (see chapters 5 and 6). It was scored by both methods. The Likert scale method of scoring was used giving a possible range of responses from 0 - 84 as a sensitive measure of change was needed for later studies on post programme change and the scaled scoring method was needed to assess "caseness" in line with other studies, as no published reports were found that recommended cutting scores based on Likert scoring. The upper limit of the threshold (11) was used as the cutting score as this is suggested by Benjamin et al. (1991) to be more appropriate for women - the majority of both these patient samples. In order to see if some components were used less frequently than others, a stringent criterion of zero was selected before assigning a "no pathology" decision to any of the subscales.

Analysis

The data were examined for skewness and were found to approximate to a normal distribution, all subscale scores and the total having an acceptable skew between .47 and .83. Both methods of scoring were therefore compared by Pearson correlation using a criterion of significance of p<.01 at most to reduce the possibility of results appearing significant by chance. Intersubscale relationships were also explored by correlation. Frequency analysis was used on all subscales and the total (Norusis/SPSS inc. 1988).

RESULTS - Sample 1

The two methods of scoring correlated very highly (.91, .95, .90, .99 and .96 for the somatic, anxiety, social dysfunction, depression and total scores respectively). All reached a p<.001 criterion. Table 7.1 shows the intercorrelations of the 4 scales. In each case it can be seen that they are highly correlated, though more so using the Likert scoring method.

Table 7.2 shows the means and standard deviations and percentage of patients scoring at the set criterion for the subscales (0) and below the criterion for the total (11). It can be seen that the highest scores are obtained on the social dysfunction scale and the lowest on depression and depression is the least frequently scored. (Hypothesis 3).

The total mean score (using the scaled scoring (0011) method) for this group of patients was 8.4 indicating no overall pathology compared to Benjamin's threshold score of

TABLE 7.1 1ST SAMPLE N = 52

INTERCORRELATION OF SUBSCALES - LIKERT SCORING METHOD

	GHQA	GHQB	GHQC	GHQD	TOTAL
GHQA	-	.61	.64	.64	.84
GHQB		-	.60	.65	.85
GHQC			-	.62	.83
GHQD				-	.87

INTERCORRELATION OF SUBSCALES - SCALED SCORING METHOD

	GHQA	GHQB	GHQC	GHQD	TOTAL
GHQA	-	.54	.49	.54	.79
GHQB		-	.47	.53	.79
GHQC			-	.57	.80
GHQD				-	.82

$p < .001$ for all values

GHQA = General Health Questionnaire - somatic awareness
GHQB = General Health Questionnaire - anxiety
GHQC = General Health Questionnaire - social dysfunction
GHQD = General Health Questionnaire - depression

11. Frequencies carried out on total scores using the cutting score of 11 showed 39 (75%) score below the threshold (hypothesis 1). More importantly, further examination of the type of emotional problem by subdividing the scale into its four components and looking for the frequency of zero scores showed that 18 (35%) of the sample on subscale A, 13 (25%) on Scale B and 14 (27%) on Scale C failed to report scorable symptoms on these factors. However, on Scale D 28 (54%) reached the criterion for no depression. Thus it can be seen that only 25% of this sample of patients had noticeable emotional distress at or above the threshold but that this consisted mainly of somatic awareness, anxiety and social dysfunction. In spite of the intractable nature of this problem, only a minority endorsed any scorable depression items at all.

The Likert equivalent to Benjamin's recommended cutting score of 10/11 was found to be 25 in this small sample by comparing frequencies of scores above the threshold.

Sample 2

As before, the 2 methods of scoring correlated very highly (.90, .93, .90, .95 and .96 for the somatic, anxiety, social dysfunction, depression and total scores

TABLE 7.2 1ST SAMPLE N = 52

MEANS STANDARD DEVIATIONS AND PERCENTAGES AT OR BELOW THRESHOLD FOR THE FOUR SUBSCALES OF THE GHQ

	GHQA		GHQB		GHQC		GHQD		TOTAL	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Likert Scoring	6.6	4.6	7.3	5.4	10.1	4.4	3.8	5.6	27.6	17.1
Scaled Scoring	2.0	2.1	2.4	2.2	2.6	2.4	1.4	2.2	8.4	7.0
% SCORING AT/OR BELOW THRESHOLD	35%		25%		27%		54%		75%	

GHQA = General Health Questionnaire - somatic awareness
GHQB = General Health Questionnaire - anxiety
GHQC = General Health Questionnaire - social dysfunction
GHQD = General Health Questionnaire - depression

respectively). All values of r were significant at $p<.001$.

Table 7.3 summarises the intercorrelations of these four aspects of emotional distress and the total and it can be seen that they are all highly significant, although smaller than those found in the first sample. Table 7.4 shows the means, standard deviations and percentages of this group scoring at or below the set criteria.

In this sample based on scaled scoring the mean total score was 10.0 and 56% failed to meet the criterion for "caseness", having a total score below 11. The four separate components were scored at zero by 24%, 19%, 17% and 44% of the patients respectively. These are lower than the previous cohort and in this case the majority of patients endorse some scorable depression items, though they remain a fewer number than those of the other three subscales. In this data set the mean equivalent Likert cutting score to a scaled score of 11 is 30 suggesting that patients should score 30 or above before emotional distress is considered above the normal range (i.e. into the pathological range) for a pain population.

DISCUSSION

TABLE 7.3 SECOND SAMPLE N = 100

INTERCORRELATION OF SUBSCALES - LIKERT SCORING METHOD

	GHQA	GHQB	GHQC	GHQD	TOTAL
GHQA	-	.48	.43	.37	.73
GHQB		-	.52	.51	.82
GHQC			-	.40	.73
GHQD				-	.78

INTERCORRELATION OF SUBSCALES - SCALED SCORING METHOD

	GHQA	GHQB	GHQC	GHQD	TOTAL
GHQA	-	.44	.43	.39	.71
GHQB		-	.57	.48	.81
GHQC			-	.46	.80
GHQD				-	.77

$p < .001$ for all values

GHQA = General Health Questionnaire - somatic awareness
GHQB = General Health Questionnaire - anxiety
GHQC = General Health Questionnaire - social dysfunction
GHQD = General Health Questionnaire - depression

TABLE 7.4 1ST SAMPLE N = 100

MEANS STANDARD DEVIATIONS AND PERCENTAGES AT OR BELOW THRESHOLD FOR THE FOUR SUBSCALES OF THE GHQ

	GHQA		GHQB		GHQC		GHQD		TOTAL	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Likert Scoring	7.7	4.3	8.8	4.6	10.0	3.6	5.1	5.2	31.6	13.5
Scaled Scoring	2.5	1.9	2.8	2.3	2.9	2.1	1.8	2.3	10.0	6.7
% SCORING AT/OR BELOW THRESHOLD	24%		19%		17%		44%		56%	

GHQA = General Health Questionnaire - somatic awareness
GHQB = General Health Questionnaire - anxiety
GHQC = General Health Questionnaire - social dysfunction
GHQD = General Health Questionnaire - depression

This study has shown that it is possible to explore and exclude some forms of psychological dysfunction in a chronic pain population using the GHQ 28. The majority of patients (75% and 56%) of the two samples failed to reach the "caseness" threshold (hypothesis 1). Although the scores were all highly intercorrelated, the GHQ has been able to show different scores on the components of emotional distress. A large number of patients,(73% and 83%) had scores above zero for social dysfunction but this scale measures satisfaction and speed in achieving tasks of everyday living so is likely to be a cognitive and emotional aspect of the disability associated with chronic low back pain. 72% of the total sample had an above zero score on somatic awareness and 79% achieved at least a score of 1 for anxiety. Only 53% overall (46% and 56% of the individual samples) however endorsed any scorable depression items at all and the mean score was the lowest in both samples. This finding helps to confirm those of the study concerned with the Cognitive Errors Questionnaire (See Chapter 4) and is consistent with other studies showing a depression incidence in chronic pain patients of about 50% (see chapter 1).

From these results it would appear that these back pain patients do not score on overall emotional distress above a diagnostic threshold for chronic pain patients and are most likely to endorse items to do with social dysfunction (or dissatisfaction in achievements and tasks of daily living), anxiety and somatic awareness, but they are less likely to be depressed. Therapeutic programmes could therefore address the anxiety, somatic and satisfaction components particularly, in addition to reducing disability.

Likert scoring is a more sensitive measure by which to evaluate change and some tentative comparisons of the scoring methods suggest that a total Likert score of 25 (the cut off suggested by the first sample as being equivalent to Benjamin's 11 by scaled scoring) may identify those patients who need a more formal and structured psychological input. Since the pain-disability problem is by definition a multidisciplinary one, a combined approach to its management is probably more relevant than psychiatric treatment per se.

However, no published studies are known which have attempted to establish criterion-related validity in each of the 4 subscales so it is not possible to state how accurately the GHQ measures somatic awareness, anxiety, social dysfunction and depression as "pure" constructs. Factor analysis may have helped to elucidate this but the subject to item ratio is at present inadequate for this (Gorsuch 1974). As depression as measured by the GHQ is endorsed least frequently and somatic complaints and anxiety were thought to be important in the pain-disability relationship in the pilot study reported in Chapter 3, further investigation of anxiety especially about somatic symptoms measured by other means (e.g. a Visual Analogue Scale) will be undertaken in proceeding chapters. Since the components are highly intercorrelated the total score only will be used as the measure of emotional distress in the final investigations of the pain - disability association.

CONCLUSION

Emotional distress experienced by chronic low back pain patients has been quantified and elucidated with the GHQ 28. Although the hypotheses concerning the rate of psychiatric morbidity and the relatively lower incidence of depression were upheld, the questionnaire does not enable clear differentiation of the various components of distress as high intersubscale correlations were found.

The following chapter investigates the behaviour of the Multidimensional Health Locus of Control Scale in a similar manner, so that further studies of the mediating role of emotional distress and locus of control can focus on the best use of these measures.

CHAPTER 8

MEASUREMENT - PERCEIVED CONTROL
Multidimensional Health Locus of Control Scale

INTRODUCTION

Perceived control of the pain problem was identified in Chapter 1 as one of the essential cognitive variables in pain-related disability. The pilot study reported in chapter 3 showed that the internal dimension of the Multidimensional Health Locus of Control scale (MHLC) (Wallston et al. 1978) was associated with preprogramme disability. Post programme reduction in disability was associated with an increase in this cognitive variable at follow up.

The aim of this chapter, therefore, is to explore the behaviour of the MHLC in chronic pain patients and particularly to see if the factor structure in this population differentiates one internal and two external dimensions.

Validation of the Health Locus of Control Scale was carried out by Wallston in two studies (Wallston et al 1976). In the first of these 88 college students scored an 11 item version, the Rotter Internal-External (I.E.) scale and a Health Value Scale described by Rokeach (Rokeach 1973). The dependent variable for this study was the number of information giving pamphlets which the subjects chose about a health issue of which they had little prior experience (hypertension). The subjects were classified as internal or external by the median splits on the Health Locus of Control and I.E. Scales and those who ranked health in one of the top four positions of ten possible ranks were classified as having high health value. The results showed that high health value internals chose more pamphlets (information) than all other types of subjects. High value externals did not differ from low value internals or externals. This study would indicate that a combination of value placed on health concerns and internal locus of control is essential for subjects to inform themselves about health issues and may be an important cognitive component in the amount of limitation of function experienced in relation to pain.

In the second study (Wallston et al. 1976), subjects in a weight reduction programme, matched on health locus of control scores were randomly assigned to one of two treatments (self directed, internally-oriented, or group directed, externally-oriented). Satisfaction with the type of programme was the dependent variable and it was found that programmes consistent with subjects' expectancies were evaluated more positively. That is, internals were more satisfied with the self directed programme and externals were more satisfied with the group directed programme, although weight loss did not differ between the two groups. This was taken to indicate the construct validity of the instrument.

As noted in Chapter 2, however, the MHLC is not precisely worded for pain patients and this could affect its behaviour in a chronic pain population as opposed to that in those subjects studied in projects more oriented to general health concerns.

MHLC Scale A was used as before, therefore, but it was slightly modified by the current author to make it more specific for the experience of pain. It was intended to demonstrate whether the scores from chronic pain patients could be classified in three dimensions, indicated by intersubscale correlations and factor analysis.

METHOD

Subjects - Sample 1

Forty two pain patients were assessed for this study. These were the patients in cohort 1 who were assessed on admission to a Pain Management Programme, all other treatment options and rehabilitation having been completed. There were 19 men and 23 women in the sample with a mean age of 46.8 years (S.D. 11.7, range 21 - 65) and a mean duration of symptoms of 10.3 years (S.D. 6.9, range 3 - 29). All patients suffered from low back pain either as a primary (32 patients) or as a secondary (10 patients) problem depending on whether they rated pain in their back as the most severe, or that in their neck or leg as worse than the low back pain.

Subjects Sample 2

One hundred consecutively referred chronic low back pain patients formed the replication sample. The majority of these patients were referred before all aspects of rehabilitation were completed. These patients were the 100 experimental subjects labelled cohorts 5 and 6 (see Appendix A). There were 37 men and 63 women with a mean duration of symptoms of 7.2 years (S.D. 7.1, range 1 - 42) and a mean age of 42.7 years (S.D. 11.6, range 20 - 64). All these patients suffered chronic low back pain as a primary 81 (81%) or secondary 19 (19%) problem.

Measures

The instrument used was the Wallston, Wallston and DeVellis (1978) Multidimensional Health Locus of Control Scale (A). In order to make the scale more appropriate for chronic pain patients the words "have a bad time with my pain" were substituted for "get sick" and "wellbeing" was substituted for "health" for the purposes of this study. This is now referred to as the Modified Multidimensional Health Locus of Control Scale (MMHLC). Items were self administered and were presented in a six point Likert scale format with possible scores ranging from 1 - strongly disagree to 6 - strongly agree for each item.

The three dimensions available from the Scale are Internal Health Locus of Control (IHLC), Powerful Others Health Locus of Control (PHLC) and Chance Health Locus of Control (CHLC).

Procedure

All patients were asked to complete the MMHLC as a self-administered scale during their initial assessment interview. It was always presented after the history had been discussed and after the McGill Pain Questionnaire the Oswestry Low Back Pain Disability Questionnaire, and the General Health Questionnaire had been administered. (See chapters 5 to 7). Each sample of patients' scores was analysed separately for replication purposes and then in order to examine the structure of the test to see if three separate factors could be identified, the scores of the two studies were combined to provide a large N of 142.

Analysis

The data obtained from total scores on the Internal, Powerful Others and Chance components were examined for skewness and this was found to be satisfactory, ranging between .2 and .7. Thus, intercorrelation using the Pearson correlation programme from SPSS pc was appropriate. After the samples had been combined, principal components were found from individual item scores with the FACTOR programme from SPSS pc and varimax rotation was applied (Norusis/SPSS inc. 1988). The criteria for the selection of factors were that eigenvalues should be greater than 1 and items should load at least .35 on a single factor.

RESULTS - Sample 1

Table 8.1 summarises the means and standard deviations for each of the three scales achieved by these subjects. As seen in Chapter 3 the highest score is for Internal Locus of Control. In this study the subjects have means of 22, 19 and 21 for Internal (IHLC), Powerful Others (PHLC) and Chance (CHLC) locus of control respectively.

Table 8.1 also summarises the results of Pearson correlations from which it can be seen that IHLC is not significantly related to the other dimensions but that PHLC and CHLC are intercorrelated, sharing about 16% of common variance. This is consistent with Wallston et al.'s (1978) findings on form B of the test which showed a correlation between these two scales of .3.

Results Sample 2

Table 8.2 summarises the means and standard deviations of the three scores obtained from this patient sample. IHLC again has the highest score.

Table 8.2 also shows the intercorrelations. In this case the values of r are all extremely low and fail to demonstrate significant relationships.

TABLE 8.1 Sample 1

MEANS, STANDARD DEVIATIONS AND INTERCORRELATIONS OF SCORES ON THREE ASPECTS OF MMHLC N = 42

	INTERNAL	POWERFUL OTHERS	CHANCE
MEAN (S.D.)	22.1 (8.0)	18.6 (7.6)	21.1 (6.7)
INTERNAL	-	.30	-.01
POWERFUL OTHERS		-	.41*

* p < .01

TABLE 8.2 Sample 2

MEANS, STANDARD DEVIATIONS AND INTERCORRELATIONS OF THREE ASPECTS OF MMHLC N = 100

	INTERNAL	POWERFUL OTHERS	CHANCE
MEAN (S.D.)	21.1 (6.0)	16.0 (5.6)	18.6 (5.4)
INTERNAL	-	-.05	-.05
POWERFUL OTHERS		-	.06

Combined sample

Table 8.3 shows the means, standard deviations and intercorrelations obtained from the data if the two previous data sets are combined. In this case a small but significant ($p<.01$) correlation exists between Powerful Others and Chance.

FACTOR ANALYSIS

The ratio of subjects to items was approximately 1 : 8. FACTOR identified six factors with eigenvalues greater than one, together accounting for 61% of the variance. In order to clarify the results to test the hypothesis, a forced three factor solution was applied.

Table 8.4 shows that the three factor forced solution produced a mixed picture in which Factor 1 contained all the Internal items and accounted for about 17% of the variance. No other item loaded significantly (>.35) on this factor. Factor 2 contained all the Powerful Others items and accounted for a further 15% of the variance. However, this factor also contained three Chance items which exceeded the significant loading criterion. Factor 3 (accounting for an additional 9% of the variance) contained

TABLE 8.3 Combined Sample

MEANS, STANDARD DEVIATIONS AND INTERCORRELATION OF THE THREE ASPECTS OF MMHLC N = 142

	INTERNAL	POWERFUL OTHERS	CHANCE
MEAN (S.D.)	21.8(6.5)	16.7 (6.2)	20.1 (5.9)
INTERNAL	-	.11	-.02
POWERFUL OTHERS	-	-	.23*

*P<.01

four of the original six Chance items, of which one also loaded on Factor 2. The remaining Chance items failed to load significantly on this factor, but instead formed part of Factor 2. Thus, the Internal items form a distinct factor but the other two factors form a combined external dimension.

DISCUSSION

These studies have been able to show that in chronic pain patients, the highest scoring locus of control dimension is the internal one and this was found for both samples. These pain patients however, also score quite highly on chance beliefs which may have an effect on perceived disability resulting from chronic pain. The items on the internal scale (for example, "When I get a bad time with my pain I am to blame") suggest that patients may limit their activity in order to prevent exacerbations in their pain and thus high scores on internal beliefs may result in increased disability. For patients who have been managing a chronic pain problem for many years a high chance belief may be more adaptive in that exacerbations in pain are thought to be relatively independent of activity and thus higher levels of goal achievement may be obtained. Further studies of this relationship need to be undertaken and will

TABLE 8.4

FACTOR STRUCTURE OF MMHLC N = 142

	FACTOR 1	FACTOR 2	FACTOR 3
Variance Explained %	16.7	15.4	9.0
EIGENVALUE	3.0	2.8	1.6
Q1	.49	-.02	-.02
Q6	.57	-.14	-.11
Q8	.70	-.04	.22
Q12	.68	-.08	.05
Q13	.59	.15	-.21
Q17	.74	.33	-.34
Q3	.13	.54	.17
Q5	.04	.69	.09
Q7	.15	.47	.02
Q10	.07	.44	.19
Q14	.03	.63	-.11
Q18	-.20	.58	-.05
Q2	-.12	-.12	.57
Q4	-.04	.22	.49
Q15	-.06	-.16	.55
Q9	-.06	.39	.76
Q11	-.02	.48	.34
Q16	-.08	.49	-.02

be addressed in later chapters. Reliance on powerful others is the lowest scoring aspect though the differences between the scores is not markedly great in either sample.

The results of the intersubscale correlations were inconsistent between the two studies. In the first, a significant relationship was found between the external components indicating that they were not independent. In the second sample with a larger N, this association was not found. It is possible that the smaller sample who were seen on admission to a Pain Management Programme, having not only completed all the medical treatment options available but also having participated in a Rehabilitation Programme aimed at increasing self directed learning, saw chance factors as just as likely to influence pain as others' interventions (or others' interventions to be about as effective as chance occurrences). The second sample were more heterogeneous, the majority being referred for assessment on admission to rehabilitation and before the changes brought about by participation in this programme could have occurred. Although the mean belief in Powerful Others' control was lower in the larger sample, the lack of association between the external dimensions could be explained by patients holding more mixed beliefs about others' interventions and chance factors.

The factor analysis of the data of the combined sample, however, was able to differentiate three factors which strongly supported the association between the external dimensions and separated them from the internal one. This would indicate that Levenson's (1978) argument for two loci of external control is not upheld in this patient population.

The number of subjects (142) is considered satisfactory, approximating to the recommendation of Gorsuch (1974) of ten times the number of subjects to items (where 180 would be needed) but the study still needs to be replicated, preferably in different clinical settings before confidence can be placed in this finding. Nevertheless two factors (internal and external) will be used as dependent and predictor variables in the final experimental report (Chapter 12).

Conclusion

The MMHLC has been used successfully to elucidate perceived control of pain in chronic low back pain patients. It has been shown to have low intercorrelations between the internal and external components but a significant relationship exists between PHLC and CHLC. Two distinct factors were identified.

The next chapter explores the final measures used which are the Visual Analogue Scales and examines their relationships with the psychometric instruments discussed here and in the preceding three chapters.

CHAPTER 9 - THE VISUAL ANALOGUE SCALES: Validity Studies

INTRODUCTION

The purpose of this study was to investigate whether Visual Analogue Scales for the brief communication of amount of pain, disability, anxiety and perceived control over the pain problem would provide valid and reliable measures of these factors so that they could then be used as experimental measures in proceeding studies.

The use of Visual Analogue Scales (VAS's)in medical research has become popular since Huskisson described it in rheumatology in 1974. But the value of the results is limited by presumed sources of error within the scale itself. Although it is assumed that the scale has good sensitivity, there being an infinite number of points between the ends of the scale, Maxwell (1978) points out that it is doubtful whether the results are in fact continuous or interval. In addition, Dixon and Bird (1981) and Hinchcliffe et al. (1985) both suggest that patients have a tendency to cluster their responses about the golden section i.e. 61.8% of the way from each end of the VAS.

Accuracy of VAS scores was studied by Downie et al. (1978) and showed a poor correlation between grip strength when assessed with a partially inflated blood pressure cuff and estimated grip strength on the Visual Analogue Scale with ends marked 30mm of mercury and 300 mm of mercury.

The orientation of the VAS also has an effect on the results. In one study by Scott and Huskisson (1979) lower results were found with horizontal scales when compared with vertical ones. There also seems no clear agreement as to the accuracy of scores when patients are or are not allowed to view their previous results, Scott and Huskisson (1979) for example, suggesting that pain was over estimated when previous scores were unavailable. However, Vandenberg et al. (1984) showed less variation in results from patients who saw their previous scores. Langley and Sheppeard (1985) noticed that results that tended to cluster around the ends of the lines showed a compression effect where there is little room for reporting worsening of the factor under discussion if the mark is already near the right hand end or reduction if the initial mark is already near the left hand end.

Duncan, Bushnall and Lavigne (1989) compared the sensitivity of VAS's and verbal descriptors for quantifying sensory, intensity and affective aspects of experimental pain. They asked eight subjects to rate painful and near painful heat stimuli on intensity and unpleasantness separately. They found that subjective magnitude of both the perceived intensity and unpleasantness increased with the actual physical intensity of the stimulus and that both the VAS and the Verbal Descriptor Scale could accurately differentiate these levels. MANOVA yielded no difference between the two scales. The Verbal Descriptor Scale, however was able to show a greater differentiation between the intensity and unpleasant dimensions. The authors suggest that this is probably because VAS's lose sensitivity at the highest ranges and are more prone to ceiling effects that may conceal true differences in perception. They conclude that verbal descriptor techniques are more sensitive than VAS's in separating the intensity and unpleasantness dimensions of stimuli.

Psychologists such as Berlyne (1971) and Benjafield and Adams Webber (1976) note the reliability of results obtained from VAS's will be marred by the use of the "golden section" which tends to influence responses for aesthetic reasons. This predicts that the subject will place a point on a line which divides it into two segments such that the smaller is to the larger as the larger is to the whole line (ratio = 0.618). However, this particular phenomenon is known to be affected by mood (Peet et al.

1981), being especially sensitive to changes in perception associated with depression.

Dixon and Bird (1981) investigated reproducibility of scores on a 10cm vertical VAS and found that in asking eight volunteers to reproduce positions which they have previously seen on an already marked scale, reproducibility varied along the line. The most difficult position to reproduce appeared to be in the region plus or minus 2cm of the mid point with good reproducibility occurring near the end and at the centre. They also found that subjects tended to estimate short of the actual distance near the mid point and long once the actual bisection they were to reproduce passed the 6cm mark. This seems to suggest that the psychological phenomenon of the golden section tends to influence the estimated distance to the required mark.

In the study to be reported 100 chronic pain patients were asked to use 100mm VAS's to rate intensity of pain, disability, anxiety and perceived control over their pain problem. The patients were also asked to fill in standardised psychometric questionnaires of these variables.

It was intended to investigate whether the VAS scores would tend to cluster at the golden section or be distributed along their length, and whether there would be a close correlation between the scores on the VAS's and their psychometric counterparts. If this were so then the scores would be a valid indication of the subjective quantity of each of the four factors.

METHOD

Subjects

One hundred patients who formed cohorts 5 and 6 (see Appendix A) were the subjects.

There were 37 men and 63 women with a mean age of 42.7 years (S.D. 11.6, range 20 - 64) and a mean duration of symptoms of 7.2 years (S.D. 7.1, range 1 - 42) of whom 81% had low back pain as a primary and 19% as a secondary problem.

Measures

All patients were handed a preprinted sheet of paper on which were marked Visual Analogue Scales (see Figure 9.1). The first was for pain intensity with the anchor words "no pain" and "worst possible pain" on either end. The scale

FIGURE 9.1 - ASSESSMENT SHEET

ASSESSMENT OF PAIN PATIENTS

Name ______________________________ Sex _________

Site ____

Duration ______________________________ Age _________

How much pain do you have at present?

no ____ worst
pain possible pain

How disabled do you think you are at present ?

not ____ as disabled as it's
at all possible to be

How anxious do you feel about your problem at present?

not ____ as anxious as it's
at all possible to be

How much do you believe you are in control of your problem?

not ____ as much in control as
at all it's possible to be

was headed "How much pain do you have at present?". This was followed by a scale headed "How disabled do you think you are at present?" and the anchor words "not at all" and "as disabled as it's possible to be" were on either end. The third scale measured anxiety, was headed "How anxious do you feel about your problem at present?" and used the anchor words "not at all" and "as anxious as it's possible to be". Anxiety was selected to attempt to focus attention on worry about the pain as opposed to depression which the majority of patients did not acknowledge (see Chapters 4 and 7). The final scale measured perceived control of the problem and was headed "How much do you believe you're in control of your problem?" The anchor words "not at all" and "as much in control as it's possible to be" were used on either end of the line.

All patients also completed a McGill Pain Questionnaire (MPQ) (Melzack 1975), an Oswestry Low Back Pain Disability Questionnaire (ODQ) (Fairbank et al. 1980), the 28 item General Health Questionnaire (GHQ) (Goldberg 1978) and a Modified Multidimensional Health Locus of Control Scale (MMHLCS) (based on Wallston 1978) (see Chapter 8 for modification).

PROCEDURE

All patients filled in the four psychometric questionnaires in the order of pain, disability, emotional distress and locus of control at the beginning of the interview after the history had been discussed. They were then asked to place appropriate marks on the sheet of VAS's to indicate how much of each variable they were experiencing at the moment of assessment. This was done in the presence of the examiner and they were able to see their results on all the preceding scales while completing the whole sheet.

ANALYSIS

All variables were examined for skewness and this was found to be adequate for parametric analysis, all scores falling between .02 and -.12. The distribution of responses along the VAS's was examined by frequency analysis and the relationship between VAS scores and scores on the psychometric measures of pain, disability, emotional distress and health locus of control were calculated using Pearson correlation coefficients from SPSS pc (Norusis/SPSS 1988). The factors of pain, disability, emotional distress and locus of control used were those identified by the previous work on these measures (chapters 5 - 8).

RESULTS

Figures 9.2 to 9.5 show histograms of the distribution of responses along the VAS's of pain intensity, disability, anxiety and perceived control respectively. It can be seen that there was on no occasion any evidence of patients preferring to use the golden section - approximately 62% and 38% along the line (62mm and 38mm respectively). The modal position on the pain VAS was about 73mm. For the disability VAS the modal position was 50mm. On the VAS for anxiety the modal position was 100mm and on the perceived control VAS it was also 100 mm. From this it can be seen that all these scores are different from the expected positions if the golden section were influencing patients' responses on these lines. In particular in the anxiety and perceived control cases the modal responses are at the extreme end of the scale.

Criterion - related validity

Relationships between the VAS's and the psychometric questionnaires were examined by correlations and the results are summarised in Table 9.1. From this it can be seen that the values of r are not very high (.50 is the

FIGURE 9.2

HISTOGRAM OF RESPONSES FOR VISUAL ANALOGUE SCALE - PAIN INTENSITY

```
PAIN VAS

  -10.0 |
   -2.5 |
    5.0 |-----
   12.5 |
   20.0 |-----
   27.5 |----------------------
   35.0 |-------
   42.5 |---------------
   50.0 |--------------------------------
   57.5 |-----------------
   65.0 |--------------------------------
   72.5 |--------------------------------------------------
   80.0 |----------------------
   87.5 |--------------------
   95.0 |------------
  100.0 |-------
        |
        I....+....I....+....I....+....I....+....I....+....I
        0         4         8        12        16        20
                    N. of patients
```

FIGURE 9.3

HISTOGRAM OF RESPONSES FOR VISUAL ANALOGUE SCALE

- PERCEIVED DISABILITY

```
DISABILITY VAS

     2 |-----
     8 |------------
    14 |----------
    20 |----------
    26 |-----------------
    32 |---------------
    38 |--
    44 |---------------
    50 |--------------------------------
    56 |-----------------
    62 |--------------------
    68 |-------------------------
    74 |-------
    80 |---------------
    86 |----------
    92 |----------
    98 |-------------------------
       I....+....I....+....I....+....I....+....I....+....I
       0         4         8        12        16        20
                     N. of patients
```

FIGURE 9.4

HISTOGRAM OF RESPONSES FOR VISUAL ANALOGUE SCALE

- ANXIETY

```
ANXIETY  1VAS

   2 ¦--
   8 ¦------
  14 ¦----
  20 ¦------
  26 ¦--
  32 ¦------------------
  38 ¦----
  44 ¦--
  50 ¦--------------------
  56 ¦--
  62 ¦----------
  68 ¦--------------------
  74 ¦--------------
  80 ¦--------------------
  86 ¦----------------
  92 ¦--------
 100 ¦----------------------------------------------
     I....+....I....+....I....+....I....+....I....+....I
     0         5        10        15        20        25
                 N. of  patients
```

FIGURE 9.5

HISTOGRAM OF RESPONSES FOR VISUAL ANALOGUE SCALE

- PERCEIVED CONTROL

```
CONTROL 1VAS

      2 :------------------------------
      8 :------------
     14 :-----
     20 :-------------------------
     26 :-----
     32 :
     38 :----------
     44 :----------
     50 :------------------------------
     56 :---------------
     62 :-----
     68 :---------------
     74 :-----------------
     80 :-------
     86 :----------
     92 :-------
    100 :---------------------------------------------
        I....+....I....+....I....+....I....+....I....+....I
        0         4         8        12        16        20
                   N. of patients
```

largest) but the VAS's do correlate significantly with their expected counterparts and in most cases the highest correlation is with the expected psychometric variable. The VAS for pain correlates very significantly with Present Pain Intensity (p<.001). The VAS for disability correlates very significantly (p < .001) with the total ODQ score and with Public activities. It also correlates significantly (p < .01) with Private activities. The VAS for anxiety correlates with the GHQ very significantly (p < .001) on scales B and D (anxiety and depression) and total score, and significantly (p < .01) with scale A (somatic symptoms). The correlation is higher with depression than anxiety. The VAS for perceived control correlates significantly (p < .01) with the internal dimension of the MMHLC. The correlation between this VAS and the external factor of the MMHLC is not significant.

Discriminant validity

It is also clear from the table that VAS's for pain, anxiety (as one component of emotional distress) and locus of control show discriminant validity. In all of these three cases there were very few significant correlations with factors other than those directly measured by the relevant VAS. The pain VAS had a small relationship with

TABLE 9.1

CORRELATIONS OF ALL VISUAL ANALOGUE SCALES WITH ALL PSYCHOMETRIC VARIABLES

	MPQ		ODQ			GHQ					MMHLCS	
VAS	PPI	TNWC	PUBLIC	PRIVATE	TOTAL DISAB	A	B	C	D	TOTAL GHQ	IHLC	EXHLC
Pain	.50**	-.08	.24*	.12	.23	.13	.17	.13	.15	.19	-.13	.12
Disability	.40**	.04	.34**	.29*	.42**	.24*	.30*	.25*	.31*	.36*	-.24*	.14
Anxiety	.13	.23	.02	.22	.07	.28*	.33**	.22	.40**	.41**	-.16	.25*
Control	-.05	-.11	-.10	-.04	-.11	.04	-.04	.03	-.04	-.01	-.24*	-.11

* p< .01
** p< .001

VAS = Visual Analogue Scale
MPQ = McGill Pain Questionnaire
PPI = Present Pain Intensity
TNWC = Total number of words chosen
ODQ = Oswestry Low Back Pain Disability Questionnaire
PUBLIC = Public Activities - Factor 1
PRIVATE = Private Activities - Factor 2
TOTAL DISAB = ODQ Total

GHQ = General Health Questionnaire
A = Somatic symptoms
B = Anxiety
C = Social Dysfunction
D = Depression
TOTAL GHQ = Total emotional distress
MMHLC = Modified Multidimensional Health Locus of Control Scale
IHLC = Internal Health Locus of Control - Factor 1
EXHLC = External Health Locus of Control - Factor 2

one disability factor but did not correlate with total disability, emotional distress or locus of control and the control VAS correlated only with Internal Health Locus of Control. The anxiety VAS correlated mainly with emotional distress (though higher with depression) and had only a small correlation with External Health Locus of Control. The disability VAS showed a greater spectrum of correlations and it is clear that this factor, while having some relationship with pain, particularly Present Pain Intensity, and having its largest correlation with disability as measured by the total ODQ score, also relates to emotional distress (particularly the total score) and negatively with Internal Locus of Control.

The results indicate that both criterion-related and some discriminant validity have been established for VAS's of pain intensity, disability, emotional distress and perceived control.

DISCUSSION

From these results it can be seen that in spite of previous findings which raise the question of the reliability of the VAS because of the tendency for scores to cluster in the golden section, there has been no evidence of such a phenomenon in this study. Indeed the tendency was rather to use the extreme end of the scales which may have caused a ceiling effect, but as the histograms show there was a distribution of responses along the length of the scale in all cases.

More importantly, the behaviour of the correlation coefficient has established some criterion-related validity in each case as all the scores from the VAS's are significantly (although not strongly) related to the relevant aspects of their psychometric counterparts. The VAS for pain is evidently measuring pain intensity but is not related to the qualititive aspects of pain. The VAS for disability is clearly related to the total disability score measured on the ODQ. The VAS for anxiety is related to the anxiety, depression and total scores of the GHQ suggesting it is a more general distress measure. This is expected as the 28 item version of the GHQ shows some overlap between the anxiety and depression subscales (Goldberg 1975). It is interesting that this VAS does not relate to Section C of the GHQ which is much more clearly related to disability but is related to External Locus Of Control, which suggests that investing control of the pain problem in external factors is associated with greater anxiety. The VAS for perceived control which was anchored so that the patient was asked to consider personal control over the problem, correlates highly with the internal factor of the MMHLC Scale but not with the external factor. This indicates discriminant validity for the internality designed to be tapped by this measure. The fact that the disability VAS is related most highly to the total ODQ score but then also to pain intensity, emotional distress and Internal Locus Of Control reflects the behaviour of the total ODQ score in the previous study (See Chapter 3) in which it was found that emotional distress and Internal Locus of Control were related to disability.

It is possible that Pearson's correlations, although appropriate for an interval measure such as the VAS, have produced some chance associations, though a maximum criterion of $p < .01$ has been taken. If a more stringent criterion of $p < .001$ were adopted then the pattern of important correlations remains the same suggesting the findings are reliable and not artefactual.

However the values of the correlation coefficients are not high (at best explaining only 25% of the variance). This indicates that VAS's, although simple and acceptable measures, of quantity, are not sufficiently powerful to be convincing by themselves. It is possible that Numerical Rating Scales as recommended by Jensen et al. (1986) would have yielded a higher indication of validity. It is worth investigating this, but beyond the scope of this thesis. It is also clear that neither the VAS for anxiety nor the GHQ are able to differentiate anxiety as a separate component of emotional distress and this has been explored further in later chapters.

CONCLUSION

This study of four Visual Analogue Scale responses by 100 chronic pain patients has shown some evidence of validity of the scales for measuring pain intensity, disability, emotional distress and perceived control of the pain problem. The apparent tendency for scores to cluster at the golden section reported by previous authors was not found.

This study concludes the section on exploration of the measures used and the next section reports the findings of two experiments to investigate the roles of anxiety and locus of control cognitions in pain-related disability.

PART 4

EXPERIMENTAL STUDIES ON THE MANIPULATION OF EMOTIONS AND COGNITIONS AND THEIR RELATIONSHIP TO DISABILITY.

CHAPTER 10

EXPERIMENTAL MANIPULATION OF ANXIETY AND ITS EFFECTS ON DISABILITY

INTRODUCTION

The aim of this study is to examine whether manipulation of anxiety cognitions in a positive or negative direction will directly affect disability on a task of daily living in a chronic pain population.

In Chapter 3 it was found that chronic pain patients who participated in a Pain Management Programme showed reductions in disability associated with changes in emotional distress measured by the GHQ (Goldberg 1978). It would seem that cognitive factors are important in the facilitation of such change and indeed evidence from experimental work in cognitive therapy indicates that mood can be moderated by selective attention to negative or positive stimuli.

The development of cognitive therapy for depression (Beck 1976) and more recently anxiety (Beck et al. 1985) has produced a need for a structured method of studying the mood - cognition relationship in the laboratory in order to investigate how mood affects thought patterns and subsequent behaviours. Only recently has suitable methodology become available to study emotion in a controlled setting using mood induction techniques.

Mood Induction

Mood induction has been investigated by various methods, of which one, the self statement method of Velten (1968) by Teasdale and Russell (1983) showed that reading 12 self-referent mood statements along with the instructions to feel the mood suggested by the statement was sufficient to induce depressed and elated moods. Orton et al. (1983) also found that reading statements such as "what if I lose control of my feelings?" or "I'm feeling more and more jittery", was successful in inducing anxious mood. Autobiographical recall in which subjects are instructed to remember three progressively sadder events in their own lives has been used to evoke depression (Brewer et al. 1980).

Other methods such as hypnotic suggestion in which the subject is asked to recall a relevant emotional personal event and re-experience the associated emotion while in a deeply relaxed state (e.g. Bower 1981), or threat of electric shock, (Herman and Polivy 1975) or informing subjects that they will be asked to speak in front of an audience on a specified topic later in an experiment (Martin 1990) have all been used successfully to induce anxious mood.

The greatest range of methods which have been evaluated has been used for the induction of depression. These have been tested with measures such as the Depression Adjective Checklist (Lubin 1967) and time to count aloud from 1 to 10 (e.g. Clarke and Teasdale 1985).

Only a few studies exist where data are available on the measurement of induction of anxious mood. Martin (1990) was able to show that subjects who experienced the Public Speaking Induction obtained State-Trait Anxiety Inventory (Spielberger et al. 1970) State scores comparable to a group of generalized anxiety disorder patients. She also found that following anxiety induction, scores on Visual Analogue Scales of mood were indistinguishable from levels of anxiety reported by students undergoing the "naturally occurring" anxiety of selection for undergraduate places.

Mood induction procedures are likely to work via the production of relevant cognitions. Beck (1967) described how negative cognitions can play a causal role in producing symptoms of depression and subsequently it is possible that a vicious circle is constructed involving a reciprocal relationship between emotion and cognition. Mood induction techniques such as Threat and Public Speaking focus primarily on the cognitive aspect of the circle and the Self Statement technique which includes instruction to feel the relevant mood probably accesses both cognitive and emotional aspects of the relationship (Martin 1990).

Cognitive schemata (Beck and Rush 1978) which are organised clusters of stored knowledge, beliefs and assumptions are used to perceive and evaluate current information. Thus instructions to recall autobiographical mood-evoking events may activate schemata in which depressed or anxious mood has been experienced and thus lead to the experience of depression or anxiety in an otherwise neutral situation. Although autobiographical recall has not been reported for the generation of anxiety, it was the method of choice in this study because of its relevance to the normal clinical interview. In order to investigate the phenomena of cognition, mood and activity in more detail an experiment was designed to test the effect of manipulating anxiety on disability.

It was hypothesised that increasing anxiety in one group and decreasing it in another would have the effect of increasing and decreasing disability respectively.

METHOD

Patients performed the disability assessment task which was carrying a chosen weight, before and after manipulation of their anxiety. These manipulations were carried out in the normal clinical interview as part of the assessment procedure prior to the development of a rehabilitation programme.

The time taken to replace the weight on a table was the variable under investigation. Changes from base line after the appropriate manipulation of anxiety were measured and their relationship to the other factors of pain, disability, baseline anxiety and locus of control was analysed.

Subjects

The 50 subjects in cohort 5 (See Appendix A) were the experimental subjects.

The mean age of this cohort was 42.3 years (S.D. 11.3, range 21-64). The mean duration of pain was 6.8 years (S.D. 7.4, range 1-42). There were 21 men and 29 women, and 43 (86%) had low back pain as a primary symptom, with the remaining 7 (14%) reporting it as a secondary complaint.

Measures

1) Anxiety

All patients were asked to mark a 100 mm Visual Analogue Scale (VAS) for anxiety with the anchor words "Not at all anxious" and "As anxious as it's possible to be " on either end, to indicate how much anxiety they were experiencing about their pain problem at the moment of assessment.

2) Behavioural Measure of Disability (BMD)

Patients were required to stand and to hold as many 250 gram weights (packets of rice) as they chose until they felt discomfort and wished to put it down. Measures of the weight chosen (BMD weight) and the time it was held (BMD time) were recorded.

3. Psychometric measures

In addition patients completed a McGill Pain Questionnaire (MPQ), (Melzack 1975) an Oswestry Low Back Pain Disability Questionnaire, (ODQ) (Fairbank et al. 1980) the 28 item General Health Questionnaire (GHQ) (Goldberg 1978) and the Modified Multidimensional Health Locus of Control Scale (MMHLC) (based on Wallston et al. 1978) (See Chapter 8). They also checked 100 mm VAS's of pain, disability, and perceived control. Anchor words on either end were "no pain" and "worst pain" (pain VAS) and "not at all disabled/in control" and "as disabled/in control as it's possible to be" for the disability and perceived control VAS's respectively. (See Figure 9.1 for the assessment sheet). The instructions given were those appropriate for each of the questionnaires and for the VAS's those quoted in chapter 9.

Procedure

During the normal clinical interview, after initial information had been obtained, patients were asked to complete the four questionnaires in the order given above and then the VAS's. They were then asked to perform the BMD before being allocated to one of two experimental manipulations.

Patients were asked to stand and were handed a weightless plastic carrier bag which was then filled with as many 250 gram weights (packets of rice) as they felt able to hold comfortably. The instructions were, "I am going to put these packets of rice into the bag one at a time. Please tell me to stop as soon as the amount of weight feels as much as you want to hold. Now please hold the weight for as long as it feels comfortable. Please put it on the table as soon as it becomes a problem or feels uncomfortable in any way". The weight chosen and time it was held were recorded (see Chapter 5).

Mood Induction Task (MIT)

The subjects were assigned to one of two groups on a random basis. Group 1 was designed to look at the effect of increasing anxiety about somatic symptoms and Group 2 looked at the effect of decreasing this anxiety. Randomisation was carried out by preprinting the instructions on 25 forms for each group. The forms were shuffled and each one was placed in a sealed envelope by an assistant. The next envelope at the top of the pile was used for each new patient and was not opened until the VAS assessment was started. Patients were given one of the following instructions designed to induce the relevant mood depending on the first of these tasks on the preprinted form.

Group 1 Increase Anxiety

"Tell me what are the most upsetting things about having this problem? What's the most worrying thing about it? What's the thing that makes you most anxious and distressed about it? Please give me some examples".

Group 2 Reduce Anxiety

"Tell me what are the good things about your life at present? What are the things you achieve well? What are you good at in spite of having this problem? Please give me some examples".

Where patients tended to give examples which were opposite to those required (e.g. focusing on what they did not achieve because of their pain rather than what they did in spite of it) they were reminded of the task until a minimum of three examples of appropriate activity were obtained.

On completion of the MIT each patient was asked to mark a new VAS of anxiety to test whether the manipulation had been effective. The patients were then asked to repeat the BMD using the same weight as for the baseline and the time the weight was held was recorded again.

For clinical reasons (it was necessary to record both relieving and exacerbating factors for all patients during assessment) the opposite factors were discussed at the end of the interview. For Group 1 this involved focusing attention on the aspects of the self with which the patients were satisfied in spite of the pain problem. For Group 2 this involved focusing on the most distressing aspects. This allowed the opportunity to take further VAS's to see whether this manipulation resulted in returning the measure at least to baseline. All subjects were reassured that their sense of anxiety about their pain problem would be managed as part of the treatment process and that programmes would be specifically designed to reduce it wherever necessary.

Analysis

All variables were examined for skewness. Except for duration of symptoms, they all fell between .02 and 1.4 so the distribution was considered to approximate to normality (>-1.5 and < +1.5). Duration of symptoms was skewed (2.6) so this was transformed by taking the logarithm to the base 10. This then gave satisfactory skewness (.18). MANOVA (Norusis/SPSS 1988) was then carried out between the two groups to see whether there were significant differences in age, duration of symptoms, scores on the MPQ, the ODQ, the GHQ or the MMHLC, their baseline equivalent VAS'S, on BMD (time) or on BMD (weight). The factors used were those identified by the studies on the measures (see Chapters 5 - 9) except for ODQ in which only Total disability and section 3 (lifting) were used in the investigation of variables associated with baseline BMD (time and weight). Since section 3 is part of the Public Activities Factor of the ODQ, examination of the relationship between factors would have been invalid without it.

Change in anxiety and change in BMD (time) were analysed with MANOVA, as was reversal of anxiety following the alternative mood induction.

Relationships between changes in time and anxiety were analysed by Pearson correlation and by multiple regression.

Results

1. Equivalence of groups

MANOVA showed there was a significant difference on BMD (time) (F (1,48) 5.2 p < .05). Otherwise no differences were found. Analyses of covariance were used subsequently to look at the main effects of changes in anxiety and time holding the weight with BMD (time) as a covariate.

Table 10.1 summarises these data.

2. Change in anxiety after cognitive manipulation

Both the experimental manipulations significantly altered anxiety in the expected direction. Table 10.2a summarises the analysis of variance between the baseline and post manipulation VAS's of anxiety. From this it can be seen that group 1 increased on anxiety VAS scores from a mean of 65.5 to 81.7 (F (1,24) 27.8 p<.01) and group 2 decreased their scores from 67.9 to 52.8 (F (1,24) 8.8 p<.01). Table 10.3a shows this effect to be significant

TABLE 10.1

MEANS, STANDARD DEVIATIONS AND VALUES OF F (MANOVA) FOR ALL BASELINE VARIABLES BETWEEN GROUPS 1 AND 2

	GROUP 1		GROUP 2		
	Mean	Std Dev	Mean	Std Dev	F(1,48)
AGE	40.36	9.69	44.24	12.61	-1.5
DURATION	7.36	9.24	6.28	4.98	.1(T)
VASP	62.64	24.62	64.48	21.28	.1
PPI	2.68	1.22	3.08	1.22	-1.3
TNWC	17.64	5.68	17.68	4.54	.0
VASD	53.72	28.52	57.48	26.44	.0
PUBLIC	16.96	4.43	18.58	3.90	1.3
PRIVATE	6.15	3.18	6.00	2.29	.0
TOTAL DISAB	52.84	13.22	55.60	13.66	.5
VASANX	65.48	25.40	67.92	29.78	.0
TOTAL GHQ	31.00	13.12	31.76	15.22	.0
VASC	63.40	31.34	45.76	34.67	1.8
IHLC	21.91	5.68	20.96	6.09	.3
EXHLC	36.91	7.13	33.50	10.38	1.3
WEIGHT (GRAMS)	1360.00	612.71	1240.00	618.63	.6
TIME (SECS)	39.20	27.20	24.92	10.30	5.2*

* $p < .05$

DURATION(T) - Log 10 transformation of duration of symptoms
VASP - Visual Analogue Scale - pain
PPI - McGill Pain Questionnaire - Present Pain Intensity
TNWC - McGill Pain Questionnaire -Total Number of Words Chosen
VASD - Visual Analogue Scale - Disability
PUBLIC - Oswestry Low Back Pain Disability Questionnaire - Factor 1
PRIVATE - Oswestry Low Back Pain Disability Questionnaire - Factor 2
TOTAL DISAB - Total score for Oswestry Low Back Pain Disability Questionnaire
VASANX - Visual Analogue Scale - Anxiety
TOTAL GHQ - General Health Questionnaire - Total score
VASC - Visual Analogue Scale - Perceived control
IHLC - Modified Multidimensional Health Locus of Control Scale - Factor 1. Internal
EXHLC - Modified Multidimensional Health Locus of Control Scale - Factor 2. External

TABLE 10.2a

MANOVA VALUES OF F BETWEEN BASELINE AND POST MANIPULATION VAS'S OF ANXIETY AND BMD (TIME) BEFORE AND AFTER MANIPULATION.

	VAS					Time (secs)				
	Baseline		Post Manipulation			Baseline		Post Manipulation		
	Mean	SD	Mean	SD	F(1,24)	Mean	SD	Mean	SD	F(,24)
Group 1(anxiety inc.)	65.5	25.4	81.7	17.1	27.8**	39.2	27.2	33.6	24.8	6.93*
Group 2(anxiety dec.)	67.9	29.8	52.8	27.2	8.8**	24.9	10.3	32.2	17.5	7.89**

TABLE 10.2b

MANOVA VALUES OF F BETWEEN BASELINE AND FINAL VAS'S OF ANXIETY

	VAS				
	Baseline		Final		
	Mean	SD	Mean	SD	F (1,24)
Group 1	65.5	25.4	54.3	24.3	3.7 NS
Group 2	67.9	29.8	65.0	27.1	0.3 NS

* p < .05
** p < .01
NS = No significant difference

even with the differences in BMD (time) accounted for (F (1,48) 12.7 p<.01).

Change in anxiety was computed for both groups together and was found not to be related to psychometric measures of pain, disability, emotional distress or locus of control. Baseline anxiety was significantly related to change (r = .56 p < .001). Table 10.4 shows these data.

Analysis of covariance was carried out, therefore, to check that change in anxiety was significantly achieved with the effect of baseline anxiety accounted for. This was found to be true and the analysis is summarised in Table 10.5.

3. Change in BMD (time) after cognitive manipulation

Table 10.2a also summarises the F ratios between the baseline (BMD time) and post manipulation time (BMD time 2) spent holding the weight. These were also significantly different in the expected direction. The mean time for group 1 decreased from 39.2 to 33.6 seconds (F (1,24) 6.9 p < .05) and the mean time for group 2 increased from 24.9 to 32.2 seconds (F (1,24) 7.9 p < .01). Because the two groups were significantly different

TABLE 10.3a

ANALYSIS OF COVARIANCE OF CHANGE IN ANXIETY WITH BMD (TIME)

SOURCE OF VARIATION	SUM OF SQUARE	DF	MEAN SQUARE	F-RATIO
Covariate				
BMD (Time)	2955.48	1	2955.48	3.9
Main Effects CHANGE IN ANXIETY GROUP	9646.20	1	9646.20	12.7**
Explained	12601.68	2	6300.84	
Residual	35236.50	47	749.71	
Total	47838.18	49	976.29	

TABLE 10.3b

ANALYSIS OF COVARIANCE OF CHANGE IN TIME WITH BMD (TIME)

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO
Covariate				
BMD (Time)	1028.19	1	1028.19	7.4
Main Effects CHANGE IN TIME GROUP	1387.52	1	1387.52	10.0*
Explained	2415.71	2	1207.86	8.7**
Residual	6525.96	47	138.85	
Total	8941.68	49	182.48	

*p<.05
**p<.01

TABLE 10.4

RELATIONSHIP OF CHANGES IN ANXIETY AND BMD (TIME) WITH BASELINE MEASURES

			MPQ		ODQ			GHQ					MMHLC		
	BMD (Time)	VASANX	PPI	TNWC	PUBLIC	PRIVATE	TOTAL DISAB	A	B	C	D	TOTAL	IHLC	EXHLC	CHANGE IN ANXIETY
Change in Anxiety	-.19	-.56**	-.06	.20	.04	.21	-.01	-.09	.10	.09	.31	.15	.25	.17	-
Change in BMD (Time)	.28	-.23	.09	.03	-.15	-1.3	-.21	.08	.03	.01	.01	.08	-.06	.19	-.43*

* p < .01
** p < .001

BMD (TIME) - Baseline time holding weight
VASANX - Visual Analogue Scale - Anxiety
MPQ - McGill Pain Questionnaire
PPI - McGill Pain Questionnaire Present Pain Intensity
TNWC - McGill Pain Questionnaire Total Number of Words Chosen
ODQ - Oswestry Low Back Pain Disability Questionnaire
PUBLIC - Public Activities Factor 1
PRIVATE - Private Activities Factor 2
TOTAL DISAB - Total score for ODQ

GHQ - General Health Questionnaire
A - Somatic symptoms
B - Anxiety
C - Social Dysfunction
D - Depression
Total - Total emotional distress
MMHLC - Modified Multidimensional Health Locus of Control Scale
IHLC - Factor 1 - Internal
EXHLC - Factor 2 - External

TABLE 10.5

ANALYSIS OF COVARIANCE OF CHANGE IN ANXIETY WITH BASELINE ANXIETY

SOURCE OF VARIATION	SUM OF SQUARE	DF	MEAN SQUARE	F-RATIO
Covariate				
VASANX	16602.3	1	16602.38	38.6***
Main Effects CHANGE IN ANXIETY				
GROUP	11035.1	1	11035.1	25.7***
Explained	27637.4	2	13818.7	32.5***
Residual	20200.8	47	429.8	
Total	47838.2	49	976.3	

*** p<.001

VASANX = Baseline Visual Analogue Scale Anxiety on the BMD (time), analysis of covariance was carried out. Change in time was found to be significant with differences in BMD (time) accounted for (F (1,48) 10.0 p < .01). Table 10.3b summarises this analysis.

Change in BMD (time) was computed and this was found to be not significantly correlated with psychometric measures of pain, disability, emotional distress or locus of control. (See Table 10.4).

4. Relationship between change in anxiety and change in time

A Pearson correlation was calculated between change in BMD (time) and change in anxiety for both groups together. It was seen that there was a significant negative relationship between changes in time and anxiety (r = -.43 p < .01). (Table 10.4). This indicates that post manipulation time on the task was influenced by the change in anxiety brought about by the MIT. This assertion was tested with a multiple regression on these data using change in time as the dependent variable and using BMD (time), baseline anxiety, Pain Quality (TNWC), Pain Intensity (PPI) and VAS pain intensity, and change in anxiety as predictor variables. Change in time was found to be predicted by change in anxiety (R = .46 t -.36 p <.001)

TABLE 10.6

STEPWISE MULTIPLE REGRESSION

PREDICTION OF CHANGE IN TIME.
VARIABLES ENTERED BMD (TIME), VASANX, VASP, TNWC, PPI (CHANGE IN ANXIETY

STEP I	R	R^2	BETA	T
CHANGE IN ANXIETY	.46	.21	-.46	-.36***

*** $p < .001$

No other variables met criterion

VASANX = Baseline VAS for anxiety
VASP = VAS for pain
TNWC = Pain Quality - McGill Pain Questionnaire
PPI = Present Pain Intensity - McGill Pain Questionnaire

and this accounted for about 21% of the explained variance (Table 10.6). All other variables failed to reach the .05 criterion to be included in the equation.

5. Reversal of cognitive manipulation

Final VAS's of anxiety after reversal of cognitive manipulation successfully showed return to baseline levels. In neither case was the difference between the initial and final VAS significant. These data are summarised in Table 10.2b. This indicates that changes in anxiety were probably achieved via the cognitive task required of the patients.

6. Relationship of BMD (time and weight) with psychometric measures

BMD (time) was investigated in terms of its relationship to the other variables of pain, disability, emotional distress and locus of control. There was a significant negative relationship with the Total disability score of the ODQ (r= -.44 p, <.01) but no other significant correlations were found. BMD (time) correlated highly (r = .82 p <.001) with the BMD (time 2) but this second measure of time was

TABLE 10.7

CORRELATIONS OF BMD (TIME), BMD (WEIGHT) AND BMD (TIME 2) WITH BASELINE MEASURES OF PAIN, DISABILITY, EMOTIONAL DISTRESS AND LOCUS OF CONTROL

		MPQ			ODQ			GHQ						MMHLC		
	VASP	PPI	TNWC	VASD	3	TOT DISAB	VASANX	A	B	C	D	TOTAL	VASC	IHLC	EXHLC	BMD (TIME)
BMD (Time)	-.24	-.27	.09	-.13	-.22	-.44*	-.05	.04	-.13	-.34	-.13	-.17	.21	.02	-.11	-
BMD (Weight)	-.07	-.17	-.00	-.17	-.45**	-.60**	.16	.00	.04	-.08	-.08	-.04	.12	.05	.16	.41*
BMD (Time2)	-.23	-.32	.07	-.08	-.17	-.31	.08	.00	-.15	-.34	-.19	-.21	.04	.05	-.01	.82**

* p < .01
** p < .001

VASP - Visual Analogue Scale - pain
MPQ - McGill Pain Questionnaire
PPI - McGill Pain Questionnaire - Present Pain Intensity
TNWC - McGill Pain Questionnaire - Total Number of Words Chosen
VASD - Visual Analogue Scale Disability
ODQ - Oswestry Low Back Pain Disability Questionnaire
3 - Lifting
TOT DISAB - Total disability score
VASANX - Visual Analogue Scale - Anxiety

GHQ - General Health Questionnaire
A - Somatic
B - Anxiety
C - Social Dysfunction
D - Depression
Total - Total emotional distress
VASC - Visual Analogue Scale - Perceived control
MMHLC - Modified Multidimensional Health Locus of Control Scale
IHLC - Factor 1 - Internal
EXHLC - Factor 2 - External

not related to pain, disability, emotional distress or locus of control.

BMD (time) correlated significantly with BMD (weight) ($r=.41$ $p < .01$) but was not significantly related to section 3 (lifting) of the ODQ. BMD (weight) did correlate significantly ($r = -.45$ $p <.001$) with section 3 (lifting) and with Total disability ($r = -.60$ $p <.001$). These findings corroborate those of Chapter 5, in which it was also found that weight chosen was related to the score on section 3 but the time it was held was not related.

Table 10.7 summarises these correlations.

Discussion

As predicted, subjective experience of anxiety is modifiable by the cognitive strategies of mood induction via selective attention and recall of relevant autobiographical material. These were successful in producing the desired change in this variable in both the increase and decrease conditions. Change in disability as measured, by time spent holding the weight also occurred in the predicted direction for both groups, and it is clear that it was change in the anxiety experience that was related to change in time, in spite of baseline time being significantly different between the groups.

These findings are important as they have implications for the maintenance of disability and possibly for the modus operandi of pain management programmes which are able to show increases in activity in spite of unchanged pain. Since time on the task (disability) was directly related to changes in anxiety, then it is possible to suggest that patients' negative cognitions about the future (e.g. "If I walk too far now, my pain will worsen and in a short while I shall be able to do even less"), triggered by perceived increases in pain intensity and also by other negative life events, will result in increased anxiety and in a steady reduction of activities judged to be pain related in order to prevent greater anxiety. Eventually this process will encompass most physical, work and social behaviours. Traditional learning theory would then predict that avoidance of such activities would be negatively reinforced by this reduced risk of increased anxiety.

Mathews (1990) suggests that anxious subjects maintain high levels of vigilance for personal danger and selectively attend to threatening or 'interpretable as threatening' information. They thus maintain high trait anxiety levels. Emotional distress therefore can selectively influence attention to beliefs and interpretations which tend to maintain the distressed condition. Attending to alternative stimuli can modify mood and resulting behaviour.

Barber and DeRubeis (1989) in a review of studies of models for describing the process of cognitive change in cognitive therapy, conclude that compensatory skills are learned which enable subjects to question and revise previously automatic beliefs and attend to a wider array of alternative interpretations of events.

Graded exposure to a broader range of behaviours, once instigated in a purpose designed, credible pain management programme, then, can have the effect of allowing anxiety to habituate from which cognitive and behavioural changes will follow.

It is clear that cognitive manipulations are effective in this process and indeed may enhance it. They need to be included as a central activity in the learning programme.

It is also clear from this study that disability as measured, by BMD (time) is related to other measures of disability as measured by the ODQ (as was found in Chapter 5) but is not related to pain, locus of control or emotional distress measured by the psychometric tests or by their respective VAS's. From this it may be hypothesised that although deliberate manipulation of anxiety to facilitate performance on a task is effective, achievement of the task in an assessment setting and with free choice over the amount of discomfort to be tolerated, is relatively independent of baseline anxiety, pain or locus of control (either internal or external). This may be further evidence of the discontinuous nature of the pain and disability variables.

However, caution must be applied to the interpretation of these data. While it has been demonstrated that time on the task (a simple example of disability) has been influenced by manipulation of anxiety, the experimental situation was by its very nature highly controlled and artificial. The patients were given clear instructions to focus on anxiety producing or reducing cognitions and then to mark off a new VAS measuring the anxiety variable. The demand characteristics of the situation probably contributed to the expected change. If some automated measure of arousal sensitive to minor changes had been employed and monitored by some observer other than the experimenter and without feedback to the patient, then this eventuality might have been mitigated. However, this was not attempted as one of the clinical aims of the assessment was to demonstrate to the patients that cognitions and emotions were under their own control. Indeed most outcome results in cognitive therapy have relied on self report measures of mood following intervention to modify it but reliability and validity of these results have been deemed satisfactory (e.g. Robinson, 1990). The clinical demands of the situation prevented exploration of the hypotheses in any less reactive way and also prevented the cross over design for the experiment. Reversal of the mood state was done and incidentally measured in order to fulfill the requirements of a comprehensive assessment in which both pain reducing and increasing factors were discussed. The experimental bias of the interview served to structure and randomise the order in which anxiety producing or reducing cognitions were generated, but a third attempt at the BMD was not requested. This was intended to spare the patients excess stress and fatigue and in any event it would have been difficult to predict the outcome of a second manipulation after the first had been completed. This may be worth exploring but for ethical reasons may need to be done on volunteer non pain patients first. The results of this experiment remain interesting if not without reservations in their interpretation.

Conclusion

This study supported the hypothesis that emotional state plays a direct role in enhancing or reducing disability.

The next chapter investigates the role of perceived control in an analogous experiment.

CHAPTER 11

EXPERIMENTAL MANIPULATION OF PERCEIVED CONTROL AND ITS EFFECT ON DISABILITY

The purpose of this study is to examine whether manipulation of perceived control of a chronic pain problem will directly affect disability on a task of daily living.

INTRODUCTION

The belief that one can determine one's own internal states and behaviour, influence one's environment and bring about desired outcomes (Wallston et al. 1976) is the essence of perceived internal locus of control. In Chapter 3 it was found that the internal dimension of the Multidimensional Health Locus of Control Scale (MHLC, Wallston et al. 1978) was associated with pre programme disability and that increases in internal MHLC were related to decreases in disability at follow up.

Internal locus of control (LOC) has been reported as being associated with beneficial outcomes for spinal injury patients (Shadish et al. 1981) and for severe accident victims (Bulman and Wortman 1977). Partridge and Johnston

(1989) using a specially designed Recovery Locus of Control Scale found that internal LOC predicted recovery from stroke-related disability. It is possible that perceived control influences the effort expended by patients to achieve optimal outcomes. Burhans (1973) found internal LOC participants in a weight reduction programme performed more of the recommended behaviours than external LOC subjects. It is also possible that increasing perceived control can improve adherence to exercise programmes as found by Kaplan et al. (1984) in patients with chronic obstructive airways disease, which may mediate minimization of disability. Johnston et al. (1992) found that improving perceived control in physiotherapy patients could be achieved by using information designed to increase expectations of self directed effort. However, it is not known whether increasing perceived control does influence achieved recovery.

There is very little published work available on the effect of increasing perceived control on health issues such as chronic pain and no studies were found that looked at the relationship between manipulating perceived control and disability.

This study therefore set out to test the hypothesis that increasing perceived control of a pain problem would decrease disability (time on a carrying task) and decreasing such control would increase this disability in a chronic pain population.

This study was analogous to the one reported in Chapter 10, but in this case locus of control was manipulated instead of anxiety.

METHOD

Patients performed the disability assessment task, carrying a chosen weight, before and after manipulation of their sense of internal LOC.

The time taken to replace the weight on a table was the dependent variable. Changes from base line after the appropriate manipulation of the psychological variable were measured and their relationship to the other factors of pain, disability, baseline anxiety and perceived control was analysed.

Subjects

The 50 chronic low back pain patients, described as cohort

6 (see Appendix A) were the experimental subjects.

There were 16 men and 34 women with a mean age of 43.4 years (S.D. 12.0 range 20-64) and a mean duration of symptoms of 7.6 years (S.D. 7.0, range 1-41).

38 (76%) of the patients had low back pain as their predominant problem and 12 (24%) had leg or neck pain with back pain as a secondary problem.

Measures

1. Perceived Control

All patients were asked to mark 100 mm Visual Analogue Scales (VAS's) of perceived control of their pain problem with the Anchor words "Not at all in control" and "As in contol as it's possible to be" on either end to indicate the amount of control they thought they had over their pain problem at the moment of assessment.

2. Behavioural Measure of Disability - (BMD)

As reported in Chapter 10, patients were asked to stand and were handed a weightless plastic carrier bag which was then filled with as many 250 gram weights as they felt able to hold comfortably. They were then required to hold the weight until they complained of discomfort when they were advised to put it down. Measures of the weight chosen and the baseline time it was held were recorded.

3. Psychometric measures

All patients completed a MPQ, an ODQ, GHQ 28, MMHLC and VAS's for pain, disability and anxiety (see Chapter 10).

Procedure

As described in Chapter 10, patients were asked to complete the four questionnaires in the order shown above and the VAS's as part of their initial clinical assessment. They were then asked to perform the BMD before being randomly allocated to one of two experimental manipulations. Randomisation was again achieved by the system of sealed envelopes.

Group 1 was to look at the effect of increasing perceived control over the pain problem. Group 2 looked at the effect of decreasing this perceived control. Following the baseline measure on the BMD the patients were given one of the following sets of instructions.

Group 1 Increase Perceived Control

"We know that one of the things that influence how well you can do everyday tasks is your sense of control over your problem. The more control you believe you have, the better you will succeed at the things you try and do. If you feel optimistic and able to make the best of your situation, you will do very well. Tell me about times when you have felt in control and achieved things well. Please give me some examples."

Group 2 Reduce Perceived Control

"We know that one of the things that influence how well you can do everyday tasks is the current state of your problem. If it is particularly bad today, you may not do as well as you might on a better day. Variability is a normal part of problems such as yours and you might think you can't do much about that aspect. Tell me about times when you have felt out of control and unable to achieve something you set out to do. Please give me some examples."

Patients were reminded of the task where necessary until a minimum of three examples of appropriate activity were obtained.

For each group a VAS of the perceived control variable was taken again to test whether the manipulation had been effective. The patients were then asked to repeat the BMD using the same weight as for the baseline and the time the weight was held was recorded again.

Following this, and to achieve a comprehensive assessment the opposite factors were discussed. Group 1 were asked to focus on the random nature of fluctuations in the problem and Group 2 were asked for examples from their experience which explored a sense of optimism and control over the problem. Further VAS's were taken to see whether this manipulation resulted in returning the measures at least to baseline. All patients were reassured that increasing their sense of mastery and control would be an integral part of any subsequent rehabilitation programme.

Analysis

As before, duration of symptoms was transformed to the logarithm to the base 10 to normalise the distribution and MANOVA (Norusis/SPSS Inc. 1988) was carried out between the 2 groups to see if there were significant differences in age, duration of symptoms, scores on the psychometric instruments, the VAS's or on BMD (time) or (weight).

Change in perceived control and change in BMD (time) were also analysed by MANOVA.

Relationships between changes in time and perceived control were analysed by Pearson correlation and by multiple regression.

Results

1. Equivalence of groups

MANOVA showed a significant difference on age F (1,48) 5.5 p < .05) between the groups. Otherwise no differnces were found. Analyses of covariance were subsequently used to allow for this effect. Table 11.1 summarises the means and F values for these data.

2. Change in perceived control after cognitive manipulation

The experimental manipulations changed perceived control significantly in the expected direction. For group 1 perceived control increased from 51.0 to 69.0 (F (1,24) 21.0

TABLE 11.1

MEANS, STANDARD DEVIATIONS AND MANOVA VALUES OF F FOR ALL BASELINE VARIABLES BETWEEN GROUPS 1 AND 2

	GROUP 1		GROUP 2		
	Mean	Std Dev	Mean	Std Dev	F (1,48)
AGE	46.84	10.77	39.24	12.14	5.5*
DURATION	8.72	8.61	6.56	4.67	.3(T)
VASP	55.72	22.25	65.84	19.56	2.9
PPI	2.88	1.05	2.64	.99	.7
SENSORY	6.64	2.18	7.40	2.12	1.6
AFFECT	3.80	2.66	3.16	1.43	1.1
EVAL	.92	.28	.96	.20	.3
TNWC	19.60	8.08	17.44	5.12	1.3
VASD	51.08	29.66	52.64	26.99	.0
PUBLIC	16.64	3.52	17.64	2.86	1.2
PRIVATE	7.25	5.97	6.63	3.16	.6
TOTAL DISAB	56.00	14.30	55.24	9.90	.8
VASANX	71.08	28.27	64.64	28.97	.6
TOTAL GHQ	33.00	13.93	30.76	12.33	.3
VASC	50.96	34.10	49.52	34.55	.0
IHLC	20.48	6.03	21.63	6.30	.4
EXHLC	35.56	5.97	32.13	6.94	3.5
WEIGHT (GRAMS)	1700.00	1174.82	1280.00	650.80	2.4
BASELINE TIME	30.00	20.82	40.16	26.51	2.3

* $p < .05$

DURATION (T)- Log 10 transformation of duration of symptoms
VASP - Visual Analogue Scale - Pain
PPI - McGill Pain Questionnaire - Present Pain Intensity
TNWC - McGill Pain Questionnaire - Total Number of Words Chosen
VASD - Visual Analogue Scale - Disability
PUBLIC - Oswestry Low Back Pain Disability Questionnaire - Factor 1
PRIVATE - Oswestry Low Back Pain Disability Questionnaire - Factor 2
TOTAL DISAB - Total score for Oswestry Low Back Pain Disability Questionnaire
VASANX - Visual Analogue Scale - Anxiety
TOTAL GHQ - General Health Questionnaire - Total Emotional Distress
VASC - Visual Analogue Scale - Perceived control
IHLC - Modified Multidimensional Health Locus of Control Scale - Factor 1 Internal
EXHLC - Modified Multidimensional Health Locus of Control Scale - Factor 2 External

p < .01) and for group 2 it decreased from 49.5 to 32.2 (F (1,24) 9.33 p < .01). These data are shown in Table 11.2a. This was not affected by the difference in age. Table 11.3a summarises the results of analysis of covariance which showed a significant difference even with difference in age accounted for.

Change in perceived control VAS's was computed for all 50 subjects and was found not to be related to psychometric measures of pain, emotional distress, disability or LOC. There was a high correlation with baseline control (r .60 < .001) but no other significant associations. Table 11.4 summarises these correlations. Change in perceived control was therefore analysed by MANOVA with baseline perceived control as the covariate. Although baseline control was significantly different between the groups in this analysis, change in control was also seen to be significant with this effect accounted for. (Table 11.5)

3. Change in BMD (time) after cognitive manipulation

BMD (time) changed significantly in each group in the expected direction. In group 1 it increased from 30.0 to 39.0 seconds (F (1,24) 6.2 p < .05) and in group 2 it decreased from 40.2 to 31.7 seconds (F (1,24) 5.3 p<.05).

TABLE 11.2a

MANOVA VALUES OF F BETWEEN BASELINE AND POST MANIPULATION VAS'S OF PERCEIVED CONTROL AND BMD (TIME) BEFORE AND AFTER MANIPULATION

	VAS					BMD Time (secs)				
	Baseline		Post Manipulation		F	Baseline		Post Manipulation		F
	Mean	SD	Mean	SD	(1,24)	Mean	SD	Mean	SD	(1,24)
Group 1 Control inc.	51.0	34.1	69.0	23.4	21.0**	30.0	20.8	39.0	22.6	6.16*
Group 2 Control dec.	49.5	34.6	32.2	25.0	9.33**	40.2	26.5	31.7	18.7	5.28*

TABLE 11.2b

MANOVA VALUES OF F BETWEEN BASELINE AND FINAL VAS's OF PERCEIVED CONTROL

	VAS				
	Baseline		Final		
	Mean	SD	Mean	S.D.	F (1,24)
Group 1	51.0	34.1	47.6	28.4	0.20 NS
Group 2	49.5	34.6	58.3	31.3	1.91 NS

 * p < .05
** p < .01
NS = No significant difference

Table 11.2a summarises these analyses. Age was not an important factor in this effect, the results of analysis of covariance showing that the change was significant with the initial difference in age between the groups accounted for. Table 11.3b summarises this analysis.

Change in BMD (time) was computed and this was not found to be significantly correlated with psychometric measures of pain, disability or emotional distress. It did correlate, though not significantly (p > .01) with baseline internal LOC on the MMHLC and negatively with the external factor suggesting a weak association accounting for about 10% of the variance. There was a significant correlation with baseline time (r .59 p < .001). Table 11.4 shows these correlations.

4. Relationship between change in control and change in time

A correlation coefficient was calculated between change in BMD (time) and change in perceived control. The correlation was small (r .28) and failed to reach the criterion of p<.01 (see Table 11.4). Multiple regression was carried out with change in BMD (time) as the dependent variable and baseline time, baseline perceived control, change in perceived

TABLE 11.3a

ANALYSIS OF COVARIANCE OF CHANGE IN PERCEIVED CONTROL WITH AGE

Source of Variation	Sum of Squares	DF	Mean Square	F
Covariate AGE	229.490	1	229.490	.3
Main Effect - Change Control GROUP	15976.033	1	15976.033	19.4***
Explained	16205.523	2	8102.762	9.8***
Residual	38728.257	47	824.005	
Total	54933.780	49	1121.098	

TABLE 11.3b

ANALYSIS OF COVARIANCE OF CHANGE IN BMD (TIME) WITH AGE

Source of Variation	Sum of Squares	DF	Mean Square	F
Covariate AGE	490.991	1	490.991	1.4
Main Effect - Change Time GROUP	3351.908	1	3351.908	9.8**
Explained	3842.899	2	1921.450	5.6**
Residual	16127.181	47	343.132	
Total	19970.080	49	407.553	

** p<.01
*** p<.001

TABLE 11.4

RELATIONSHIP OF CHANGES IN PERCEIVED CONTROL AND BMD (TIME) WITH BASELINE MEASURES

			MPQ		ODQ				MMHLC		
	BMD (Time)	VASC	PPI	TNWC	PUBLIC	PRIVATE	TOTAL DISAB	TOTAL GHQ	IHLC	EXHLC	CHANGE IN PERCEIVED CONTROL
Change in perceived control	.19	.60**	-.06	-.18	.02	-.11	.12	.01	.22	-.08	-
Change in BMD(time)	.59**	.07	-.11	-.12	.05	.01	-.07	-.21	.32	-.30	.28

** p< .001

BMD (TIME) = Behavioural measure of Disability - Baseline time holding weight.
VASC = Visual Analogue Scale - perceived control
MPQ = McGill Pain Questionnaire
PPI = Present Pain Intensity
TNWC = Total number of words chosen
ODQ = Oswestry Low Back Pain Disability Questionnaire

PUBLIC = Public Activities - Factor 1
PRIVATE = Private Activities - Factor 2
TOTAL DISAB = Total score for Oswestry Low Back Pain Disability Questionnaire
TOTAL GHQ = General Health Questionnaire - Total Emotional Distress
MMHLC = Modified Multidimensional Health Locus of Control Scale
IHLC = Factor 1 - Internal
EXHLC = Factor 2 - External

control, TNWC and PPI from the MPQ and VAS pain intensity as predictor variables. The only significant predictor was found to be baseline time (R = .57 (t = 4.8 p < .001). This accounts for about 32% of the variance. Change in perceived control failed to reach a significant level for inclusion in the equation, as did baseline perceived control and the pain measures. Table 11.6 summarises the multiple regression.

5. Reversal of cognitive manipulation

After the second attempt at holding the weight patients were asked to give examples of the opposite condition to that initially required. Final VAS's of perceived control after this procedure successfully showed return to baseline levels. In neither case was the difference between the initial and final VAS significant (see Table 11.2b).

6. Relationship of BMD (time and weight) with baseline

BMD (time) was investigated in terms of its relationship to the other variables of pain, disability, emotional distress, LOC and age. There was a significant negative correlation with the external factor of the MMHLC (r = -.36 p < .01) but no significant relationship with the internal factor. BMD

TABLE 11.5

ANALYSIS OF COVARIANCE OF CHANGE IN PERCEIVED CONTROL WITH BASELINE CONTROL

Source of Variation	Sum of Squares	DF	Mean Square	F
Covariate VASC	19577.3	1	19577.3	48.3***
Main Effect Change Control GROUP	16285.8	1	16285.8	40.1***
Explained	35863.1	2	17931.6	44.2***
Residual	19070.7	47	405.8	
Total	54933.8	49	1121.1	

*** p <.001

VASC = Baseline Visual Analogue Scale - Perceived Control

TABLE 11.6

STEPWISE MULTIPLE REGRESSION

PREDICTION OF CHANGE IN BMD (TIME)
VARIABLES ENTERED BMD TIME, VASC, CHANGE IN PERCEIVED CONTROL, TNWC, PPI, VASP

STEP I	R	R^2	BETA	T
BMD (TIME)	.57	.32	.59	4.8***

*** $p < .001$

No other variables met criterion

VASC = Baseline VAS for perceived control
TNWC = Pain Quality - McGill Pain Questionnaire
PPI = Present Pain Intensity - McGill Pain Questionnaire
VAS = VAS for pain intensity

(time) correlated highly (r = .61 p < .001) with the post manipulation time to hold the weight (BMD time 2), but this second measure of time was not related to pain, disability, emotional distress or LOC. Neither BMD (time) nor BMD (time 2) was related to age, so this difference between the groups is unlikely to influence results.

As has been found before (see Chapters 5 and 10), BMD (time) was not significantly related to section 3 (lifting) of the ODQ but BMD (weight) did correlate significantly (r = -.54 p < .001). The weight chosen also correlated negatively with the total ODQ score (r = -.34 p <.001). BMD (time) and (weight) also intercorrelated (r = .34 p < .01). These results are all summarised in Table 11.7.

Discussion

Although there was a difference in age between the two groups this failed to relate to any of the findings relevant to the hypotheses under investigation.

It has been possible to show that perceived control can be successfully manipulated by using the cognitive strategies of focused attention and selective recall of examples of appropriate behaviour. In the first group, asking for

TABLE 11.7

CORRELATIONS OF BMD (TIME), BMD (WEIGHT) AND BMD (TIME 2) WITH BASELINE MEASURES OF PAIN, DISABILITY, EMOTIONAL DISTRESS, LOCUS OF CONTROL AND AGE

		MPQ			ODQ					MMHLC			
	VASP	PPI	TNWC	VASD	3	TOTAL DISAB	VASANX	TOTAL GHQ	VASC	IHLC	EXHLC	BMD (time)	AGE
BMD (Time)	-.25	-.00	-.03	.07	-.08	-.07	.01	-.27	.08	.27	-.36*	-	-.04
BMD (Weight)	-.13	-.16	-.05	-.21	-.54**	-.34*	.05	-.26	-.03	.09	.11	.34*	.04
BMD (Time 2)	-.18	.11	.08	.01	-.15	-.01	.07	-.12	.03	.00	-.13	.61**	.09

* p < .01
** p < .001

VASP = Visual Analogue Scale - Pain
MPQ = McGill Pain Questionnaire
PPI = Present Pain Intensity
TNWC = Total Number of Words Chosen
VASD = Visual Analogue Scale Disability
ODQ = Oswestry Low Back Pain Disability Questionnaire
3 = Lifting
TOTAL DISAB = Total score for Oswestry Low Back Pain Disability Questionnaire

VASANX = Visual Analogue Scale - Anxiety
TOTAL GHQ = General Health Questionnaire - Total Emotional Distress
VASC = Visual Analogue Scale - Perceived Control
MMHLC = Modified Multidimensional Health Locus of Control Scale
IHLC = Factor 1 - Internal
EXHLC = Factor 2 - External

occasions when a sense of internal control had enabled task achievement had the effect of increasing internal control. In the second group, asking for occasions when apparently random fluctuations in the pain problem had prevented task achievement reduced the sense of internal control. The fact that both of these were successfully reversed by asking for opposite examples to those initially required indicates that the cognitive manipulations were probably responsible for achieving the desired change. The significant correlation between change in control and baseline control suggests that for group 1 the higher the initial sense of control the greater the increase, and for group 2 the lower the sense of control, the greater the reduction. This may have important clinical implications, as it would seem that patients with little confidence in their own ability to control their pain problem might be more vulnerable to perceiving random fluctuations as evidence of their own ineffectiveness. The findings of Chapter 3 would indicate that this is undesirable and should be addressed as a specific therapeutic issue.

This study has also shown that achievement of a task of daily living has been affected in the expected direction following these cognitive strategies. In the group whose sense of control was increased, time spent performing the task also increased. In the other group, decreased time on the task followed from decreasing perceived control. This change in time was related more to both the internal and external factors of the MMHLC than to the baseline VAS of perceived control, suggesting that although the control VAS was shown to be significantly related to the internal MMHLC in Chapter 9, this is not consistent when it is used as a measure of control in relation to a behavioural measure of disability.

The relationship between the two variables of change in time and change in perceived control is worthy of considerable exploration. There was no statistically significant correlation between change in perceived control and change in time on the task ($r = .28$ $p > .01$). This indicates that change in beliefs about internal control do not have much influence on modifying disability behaviour in this experiment in spite of the findings in Chapter 3.

The small value of the correlation of change in BMD (time) with change in perceived control, accounting for less than 10% of the explained variance suggests that it has not behaved as a powerful moderator of disability in this experiment. This is also the conclusion of the multiple regression analysis which shows that the strongest predictor of change in disability was not change in perceived control, or initial control, or pain but baseline ability at the task.

Although there was a negative relationship between external LOC and BMD (time), the facts that a stronger relationship existed between baseline carrying time and change in carrying time than between change of perceived control (on the VAS) and change in time, and that there is no significant relationship between BMD (time) and internal LOC on the MMHLC or the control VAS, suggest that these measures of control are not sufficiently specific to be elucidating the actual phenomenon under investigation. The MMHLC focuses on control of well being in general and exacerbations and reductions in pain, but not on reducing limitation of function. It may be the case that a VAS asking specifically about perceived control over reduction in activity because of pain rather than control over the pain problem per se may have shown a more direct relationship. It is also possible that an instrument such as the Pain and Impairment Relationship Scale (PAIRS) (Riley et al. 1988) would help to explore the relevant issues in more detail as it focuses specifically on beliefs about reduction in pain being a necessary precondition of increase in activity. Low scores on this measure indicate disagreement with these beliefs and follow from endorsement of self control statements such as "I can still be expected to fulfill my work and family responsibilities despite my pain". This may tap a sense of internal control more directly. As well as this, Skevington (1990) discusses the need for a pain as opposed to a health locus of control scale, and if sufficiently tailored to a chronic low back pain population, such a scale may be able to give stronger evidence of a relationship between control and disability.

It is also true that the original study reported in Chapter 3 showed that internal LOC was associated with concurrent disability on admission but post treatment change in disability, which is more closely related to the dependent variable in this study, was not associated with baseline internal control. Change in disability did have a negative relationship with change in internal control, but post treatment disability had its highest correlation with emotional distress.

However, the results indicate that the more responsibility is vested in external forces (powerful others and chance) the greater the initial disability in this study as measured by time on the task. It is this initial limitation which is the most influential factor in achieving change and therefore therapeutic programmes aimed at reducing disability need to consider whether reducing reliance on Powerful Others' interventions is a necessary prerequisite. In this case it seems that the belief in the role of random fluctuations may also need to be minimized because of the association between baseline control and change in control.

As in the previous chapter, reactivity of the measure and the cognitive manipulation task needs to be considered. Clinical constraints once again, prevented appropriate blind assessment of change but the results serve as pointers to replicate the study with more precise measures and more detailed examination of the role of external control.

Conclusion

This study has shown that chronic low back pain patients are able to change their sense of perceived control over their pain problem by manipulations of attention to internal factors (optimism and determination to achieve a specific task) or external factors (random fluctuations) and their time on a task. The relationship between these findings is discussed.

This chapter concludes the reports of the experimental investigations. In the following chapter a replication study is reported in which the findings of chapter 3 are explored again with a larger cohort of patients.

PART 5

REPLICATION AND CONFIRMATION OF THE ROLE OF THE MEDIATING VARIABLES.

CHAPTER 12

FURTHER EXPLORATION OF THE MEDIATION BETWEEN PAIN AND DISABILITY: A QUASI-REPLICATION STUDY

INTRODUCTION

In Chapter 3 it was found that disability and post treatment reduction in disability were related to internal locus of control and emotional distress rather than pain, but the number of subjects was very small. A replication study was therefore required to test the stability of these results in a larger population of patients.

Given these findings and the failure of the Cognitive Errors Questionnaire to relate strongly to either pain or disability (Chapter 4), this study was undertaken to explore whether emotional distress and/or locus of control as opposed to cognitive distortion could indeed be mediating variables between pain and disability, as was previously suggested.

Patients attending for a Rehabilitation Programme, rather than a Pain Management Programme, participated. These patients were available in larger numbers since they were new to the service but in fact nevertheless had few new treatment options available to them. They had suffered chronic low back pain for many years and had received many courses of physical treatments including surgery, osteopathy and acupuncture. The main aim of the Rehabilitation Programme was to reduce pain and disability by a vigorous exercise programme. As discussed in Chapter 3 in some cases previously untried treatments including transcutaneous neurostimulation or cognitive behavioural therapy for depression were instituted during this time. Therefore this programme differs from the Pain Management one in having slightly less emphasis on self management techniques and some opportunity for individually tailored treatments. Nevertheless, many patients received only advice and graded exercises. The programme for each individual patient was about three weeks long and was followed by a three month review assessment following which other treatment plans such as referral to the Pain Management Programme were discussed if necessary.

Following the results of the experiments on anxiety and locus of control reported in Chapters 10 and 11, the hypotheses to be tested were:

1. That disability would reduce even if pain did not.

2. That admission disability would be related to emotional distress and internal locus of control.

3. That post treatment change in disability would also be related to emotional distress and internal locus of control rather than pain.

4. That emotional distress would relate to both pain and disability and thus would be the main mediating variable between them.

METHOD

Patients referred to the Psychology Department were assessed on admission to their rehabilitation programmes and again at three month follow up. Measures of pain, disability, emotional distress and locus of control were taken. Changes in these measures at the three month follow up were computed and their relationships explored.

Subjects

The patients who participated in this study were the majority of those reported in Chapters 10 and 11 and who formed cohorts 5 and 6 (see Appendix A). Of the 100 patients 73 subsequently completed a Rehabilitation

Programme. Of the other 27, 13 were referred for psychological assessment towards the end of their programmes so no admission data were available, and 14 were not considered suitable or were unwilling to undergo a Rehabilitation Programme during the period of this study. The main reason for this was ability to attend work in spite of the pain problem and insufficient self perceived disability to warrant extended hospital admission. Of the programme participants, 54 had been seen for their three month follow up by the time of this report. Of the 19 people not reassessed, 8 had been referred for other investigations because of concurrent medical illness, or psychological treatment because of severe depression or family problems, which was still ongoing at the three month point. Six did not attend for their clinic appointments, nor did they respond to questionnaires sent in the post with a letter explaining the need for follow up data and 5 were discharged without follow up by their own request. Those patients who participated in the Rehabilitation Programme did not differ from the non participants and those who attended for follow up did not differ from those not followed up on any of the demographic or baseline psychological variables used. (See table 12.1).

The 54 patients upon whom both admission and follow up data were available had a mean age of 41.3 years (S.D. 11.3,

TABLE 12.1

MEANS (STANDARD DEVIATIONS) AND MANOVA VALUES OF F FOR PROGRAMME PARTICIPANTS WHO DID AND DID NOT ATTEND FOR FOLLOW UP

Variable	Followed mean (S.D.)	Not followed mean (S.D.)	F(1,71)
Age	41.3 (11.3)	44.3 (11.8)	.6
Duration	7.3 (7.3)	7.1 (7.0)	.2
Total	54.5 (12.3)	55.4 (13.3)	.1
Public	17.0 (3.7)	18.0 (3.7)	.1
Private	6.1 (3.0)	6.9 (3.1)	.8
PPI	2.8 (1.1)	3.2 (1.4)	.1
TNWC	18.0 (5.2)	19.0 (6.2)	.3
Total GHQ	31.2 (11.6)	32.2 (15.6)	.4
IHLC	20.9 (5.5)	21.7 (6.6)	.4
EXHLC	33.9 (8.0)	35.3 (8.2)	.3

No significant differences.

Total = Oswestry Low Back Pain Disability Questionnaire - Total Score
Public = First disability factor - public activities
Private = Second disability factor - private activities
PPI = McGill Pain Questionnaire - Present Pain Intensity
TNWC = McGill Pain Questionnaire - total number of words chosen.
Total GHQ = Total Emotional Distress
IHLC = Modified Multidimensional Health Locus of Control - Factor 1 Internal
EXHLC = Modified Multidimensional Health Locus of Control - Factor 2 External

range 20 - 62) and a mean duration of symptoms of 7.3 years (S.D. 7.3, range 1 - 41). There were 20 men and 34 women. All had chronic low back pain as a primary (87%) or secondary (13%) problem.

These patients, however did show some differences from those previously reported in the Pain Management Programme study as they were younger and had a shorter duration of symptoms than those previously studied. They also had lower scores on External Locus of Control, but did not differ on disability, pain, Internal Locus of Control or emotional distress. (See table 12.2).

Measures

As before the measures used were the ODQ, the 28 item version of the GHQ and the MMHLC (see Chapter 8). The measure of pain used was the MPQ.

Procedure

Patients were assessed by the author at referral in order to elucidate psychological factors in their perception of their pain-disability problem that could be used to

TABLE 12.2
MEANS (STANDARD DEVIATIONS) AND MANOVA VALUES OF F, PAIN MANAGEMENT AND REHABILITATION PROGRAMME PARTICIPANTS COMPARED

Variable	PMP mean (S.D.)	RP mean (S.D.)	F (1,94)
Age	46.8 (11.7)	41.9 (11.7)	7.0*
Duration	10.3 (6.9)	7.3 (7.8)	7.1*(T)
Total	51.8 (12.5)	54.5 (12.3)	3.0
Public	16.2 (4.8)	17.1 (3.7)	0.4
Private	6.7 (2.8)	6.1 (3.0)	0.0
VASP	70.6 (18.6)	64.4 (20.8)	2.4
Total GHQ	31.8 (16.6)	32.0 (12.7)	0.3
IHLC	21.5 (7.1)	21.1 (5.5)	1.1
EXHLC	42.6 (11.5)	34.1 (8.0)	18.2**

* $p < .05$
** $p <. 01$

PMP = Pain Management Programme
RP = Rehabilitation Programme
Duration (T) = Log to base 10 transformation of duration of symptoms
Total = Oswestry Low Back Pain Disability Questionnaire - Total Score
Public = First disability factor - public activities
Private = Second disability factor - private activities
Total GHQ = Total Emotional Distress
IHLC = Modified Multidimensional Health Locus of Control - Factor 1 Internal
EXHLC = Modified Multidimensional Health Locus of Control - Factor 2 External

potentiate change during the rehabilitation programme. The questionnaires were given as self administered instruments in the order MPQ, ODQ, GHQ and MMHLC. If necessary, and if the patient wished, psychological treatment to improve relaxation or cognitive skills was given as an added component to the programme.

Three months after discharge, patients were reassessed in the outpatient clinic, again by being handed the questionnaires by the author and being asked to fill them in according to the instructions while they were waiting. They were collected by the clinic nurse and returned to the author for scoring.

Analysis

In the preceding Chapters (5, 6, 7 and 8) various characteristics of the measures used were explored. The conclusions reached were that the ODQ consisted of two identifiable factors called Public and Private Activities, as well as a Total Disability score, that the MPQ provided two measures, Pain Quality or the Total Number of Words Chosen (TNWC) and the Present Pain Intensity (PPI), the GHQ had four subsections so closely intercorrelated that it seemed justifiable to use a total score (Total Emotional

Distress - Total GHQ) and that the Locus of Control Scale had two independent dimensions (internal and external - IHLC and EXHLC). The analysis of the results of this study therefore used MANOVA to explore differences from admission to follow up on all these measures together and relationships between them were explored with Pearson correlations taking $p<.01$ as the maximum criterion of significance to reduce the possibility of random association being significant chance. Factors predicting all aspects of disability and change in disability were examined by multiple regression. (Norusis/SPSS inc. 1988). Change scores were calculated on all those variables which significantly reduced by computing differences between admission and follow up results. These were then used as dependent and predictor variables.

RESULTS

Post Treatment Changes

All variables were examined for skewness and were found to be satisfactory (between -.02 and +.98) except for duration of symptoms which was 2.09. This was transformed by taking the logarithm to the base 10 and thus skewness was corrected to .04. Table 12.3 summarises the means and

TABLE 12.3
MEANS (STANDARD DEVIATIONS) AND MANOVA VALUES OF F BETWEEN ADMISSION AND FOLLOW UP MEASURES

Variable	Admission mean (S.D.)	Follow up mean (S.D.)	F(1,52)
Total	54.5 (12.3)	46.9 (15.5)	18.3***
Public	17.1 (3.7)	15.7 (4.6)	7.4**
Private	6.1 (3.0)	5.6 (3.2)	3.7
PPI	2.8 (1.1)	2.8 (1.1)	.01
TNWC	18.0 (5.1)	15.8 (5.5)	12.5**
Total GHQ	32.0 (12.7)	28.1 (14.1)	5.6*
IHLC	21.1 (5.5)	22.2 (6.6)	2.0
EXHLC	34.1 (8.0)	32.8 (8.4)	1.6

Total = Oswestry Low Back Pain Disability Questionnaire - Total Score
Public = First disability factor - public activities
Private = Second disability factor - private activities
PPI = McGill Pain Questionnaire - Present Pain Intensity
TNWC = McGill Pain Questionnaire - total number of words chosen.
Total GHQ = Total Emotional Distress
IHLC = Modified Multidimensional Health Locus of Control - Factor 1 Internal
EXHLC = Modified Multidimensional Health Locus of Control - Factor 2 External

* p<.05 ** p<.01 *** p<.001

standard deviations and MANOVA values of F for each of the measures compared between admission and follow up. From this it can be seen that the first factor of disability (the Public Activities of lifting, walking, sitting, standing, socialising and travelling) significantly reduced ($p<.01$). The second factor of disability (Private Activities of self care, sleeping and sex) did not significantly differ. Total Disability as measured by the sum of all the subsections of the ODQ reduced very significantly ($p<.001$) and while it is clear that of the pain measures, the TNWC reduced significantly ($p<.01$), Present Pain Intensity did not. (Hypothesis 1). Emotional Distress, as measured by the total of the four GHQ subsections significantly reduced ($p<.05$). Neither of the two components of the Locus of Control Scale changed.

Relationship between variables

1. Admission Disability

Table 12.4 summarises the relationship between the measures used. It is clear that on admission Total and Public factors of disability are not related to pain. Private disability has a relationship with TNWC but no disability factor is related to PPI. In contrast, however, all factors of disability are related to Total Emotional

TABLE 12.4
CORRELATIONS BETWEEN DISABILITY, PAIN, EMOTIONAL DISTRESS AND LOCUS OF CONTROL ON ADMISSION

a) Relationship of Disability to Pain, Emotional Distress and Locus of Control.

	Disability		
	Total Disability	Public	Private
PAIN			
PPI	.25	.16	.03
TNWC	-.04	.12	.39**
Total GHQ	.38**	.34*	.49**
LOCUS OF CONTROL			
Internal	-.31*	-.21	-.23
External	-.16	-.10	-.03

b) Relationship of Pain to Emotional Distress and Locus of Control

	EMOTIONAL DISTRESS	LOCUS OF CONTROL	
	Total GHQ	Internal	External
PAIN			
PPI	.33*	-.10	.22
TNWC	.41**	.07	.23

c) Relationship of Emotional Distress to Locus of Control

	EMOTIONAL DISTRESS Total GHQ
LOCUS OF CONTROL	
Internal	-.21
External	.26

* p<.01 **p<.001

Distress. Total is also significantly negatively related to IHLC. (Hypothesis 2).

2. Post Programme Disability

Table 12.5 summarises the relationships between the three factors of disability at follow up with admission and concurrent measures of pain, emotional distress and locus of control. It also shows the change measures of those factors which significantly reduced. It can be seen that none of the admission variables is significantly related to the follow up or change scores in any aspect of disability. Private and Total Disability at three months post programme are significantly related to Total Emotional Distress at follow up. Post programme Total Disability is related to follow up Pain Intensity, but the amount of variance explained by this correlation is exceeded by that explained by Internal Locus Of Control. Follow up Internal Locus Of Control is also significantly negatively related to Public Disability at three months. Change in Total Disability is associated with Change in Pain Quality but there is a stronger relationship with Change in Total Emotional Distress. Change in Public Disability is only associated with change in Total Emotional Distress (Hypothesis 3).

TABLE 12.5

CORRELATIONS OF POST PROGRAMME DISABILITY WITH ADMISSION AND FOLLOW UP MEASURES OF PAIN, EMOTIONAL DISTRESS AND LOCUS OF CONTROL

	(F.U.) TOTAL	(F.U.) PUBLIC	(F.U.) PRIVATE	(C) TOTAL	(C) PUBLIC
PPI	.23	.07	.36	.01	-.05
TNWC	-.27	-.13	-.04	.15	-.01
TOTGHQ	.13	.14	.26	.24	.24
IHLC	-.19	-.23	.11	-.19	-.06
EXHLC	-.07	-.09	-.01	-.15	-.07
(F.U.)PPI	.37*	.33	.30	-.27	-.26
(F.U.)TNWC	-.04	-.01	.05	-.15	-.17
(F.U.)TOTGHQ	.37*	.22	.45*	-.32	-.25
(F.U.)IHLC	-.41*	-.39*	-.31	.15	.23
(F.U.)EXHLC	.18	.17	-.05	-.33*	-.29
(C)TNWC				.34*	.15
(C) TOTGHQ				.53**	.46**

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

Total = Oswestry Low Back Pain Disability Questionnaire - Total score
Public = First Disability Factor - Public Activity
Private = Second Disability Factor - Private Activity
PPI = McGill Pain Questionnaire - Present Pain Intensity
TNWC = McGill Pain Questionnaire - Total Number of Words Chosen
TOTGHQ = Total Emotional Distress
IHLC = Modified Multidimensional Health Locus of Control Factor 1 - Internal
EXHLC = Modified Multidimensional Health Locus of Control Factor 2 - External
(F.U.) = 3 Month (Post programme) Follow up
(C) = Change from admission to follow up

TABLE 12.6

CORRELATION OF ADMISSION SCORES WITH CHANGE SCORES ON OTHER VARIABLES WHICH SHOWED REDUCTION AT FOLLOW UP

	TOTGHQ	TNWC	(C)TOTGHQ	(C)TNWC
TOTGHQ	-	.41**	.47**	.12
TNWC		-	.27	.49**
(C)TOTGHQ			-	.33*

* p < .01

** p < . 001

TOTGHQ = Total Emotional Distress
TNWC = McGill Pain Questionnaire - Total Number of Words Chosen
(C) = Change from admission to follow up

3. Prediction of concurrent and change in disability

Admission

Table 12.7 summarises the results of the multiple regressions and shows that of the variables Pain Intensity, Pain Quality, Total Emotional Distress and locus of control (internal and external), Total Emotional Distress is the main predictor of all aspects of disability on admission. Step 2 produces External Locus Of Control as a secondary predictor of Total Disability and Pain Quality of Public Disability. At step 3 Internal Locus Of Control explains a significant proportion of the remaining variance in Total Disability.

Follow-up

No admission scores predicted follow up disability as is shown in Table 12.5. Table 12.8 shows that Total and Public Disability at follow up are predicted at step one by follow up IHLC. Follow up Total Emotional Distress is the main predictor of Private Disability at follow up. On step

TABLE 12.7
RESULTS OF STEPWISE MULTIPLE REGRESSION ANALYSES

Prediction of disability on admission.
Variables entered: PPI, TNWC, TOTGHQ, IHLC, EXHC

	Total					Public					Private			
	R	R^2	Beta	T		R	R^2	Beta	T		R	R^2	Beta	T
Step 1														
TOTGHQ	.38	.14	.40	3.6***	TOTGHQ	.34	.12	.46	3.9***	TOTGHQ	.49	.24	.49	3.6***
Step 2														
EXHLC	.46	.21	-.27	-2.6*	TNWC	.44	.19	-.29	-2.5*	No Sig. Predictor				
Step 3														
IHLC	.52	.27	-.25	-2.4*	No Sig. Predictor					No Sig. Predictor				

* p<.05 ***p<.001

Total = Oswestry Low Back Pain Disability Questionnaire - Total Score
Public = Oswestry Low Back Pain Disability Questionnaire - Factor 1 - Public Activities
Private = Oswestry Low Back Pain Disability Questionnaire - Factor 2 - Private Activities
PPI = McGill Pain Questionnaire - Present Pain Intensity
TNWC = McGill Pain Questionnaire - Total Number of words chosen
TOTGHQ = Total Emotional Distress
IHLC = Modified Multidimensional Health Locus of Control Factor 1 - Internal
EXHLC = Modified Multidimensional Health Locus of Control Factor 2 - External

TABLE 12.8
RESULTS OF STEPWISE MULTIPLE REGRESSION ANALYSES

Prediction of disability at follow up.
Variables entered (F.U.) PPI, (F.U.) TNWC, (F.U.) TOTGHQ, (F.U.) IHLC (F.U.) EXHLC

	(F.U.) Total					(F.U.) Public					(F.U.) Private			
	R	R^2	Beta	T		R	R^2	Beta	T		R	R^2	Beta	T
Step 1 (F.U.) IHLC	.41	.17	-.35	-2.8**	(F.U.) IHLC	.39	.15	-.34	-2.6*	(F.U.) TOTGHQ	.45	.20	.45	2.8**
Step 2 (F.U.) PPI	.51	.26	.30	2.4*	(F.U.) PPI	.47	.22	-.26	-2.0*	No Sig. Predictor				

* p < .05 ** P < .01

Total = Oswestry Low Back Pain Disability Questionnaire - Total Score
Public = Oswestry Low Back Pain Disability Questionnaire - Factor 1 - Public Activities
Private = Oswestry Low Back Pain Disability Questionnaire - Factor 2 - Private Activities
PPI = McGill Pain Questionnaire - Present Pain Intensity
TNWC = McGill Pain Questionnaire - Total Number of Words chosen
TOTGHQ = Total Emotional Distress
IHLC = Modified Multidimensional Health Locus of Control Factor 1 - Internal
EXHLC = Modified Multidimensional Health Locus of Control Factor 2 - External
(F.U.) = Scores at 3 month follow up

2, Pain Intensity at follow up explains a significant amount of the remaining variance on Total and Public (but not Private) follow up Disability.

Change

Change in disability computed from admission to follow up is not predicted from any admission measures, PPI, TNWC, Total GHQ, IHLC and EXHLC all failing to reach the $p < .05$ inclusion criterion. However, change scores computed similarly on those factors which significantly reduced after the Rehabilitation Programme produce the variables (C) TNWC and (C) TOTGHQ. Of these, only change in emotional distress ((C) TOTGHQ) predicts change in disability both in the Total score and in the Public Disability factor. Change in Pain Quality ((C)TNWC) fails to reach the .05 criterion for inclusion in the equation. (Hypothesis 3). (See Table 12.9).

4. Other relationships

Both measures of pain significantly relate to Total Emotional Distress (PPI $p < .01$ and TNWC $p < .001$) but neither is related to the two dimensions of locus of control. (See table 12.4).

TABLE 12.9
RESULTS OF STEPWISE MULTIPLE REGRESSION ANALYSES

Prediction of change in disability from change in admission variables.
Variables entered (C)TNWC, (C)TOTGHQ

	(C) Total					(C) Public			
	R	R^2	Beta	T		R	R^2	Beta	T
(C) TOTGHQ	.53	.28	.53	4.4***	(C) TOTGHQ	.44	.19	.44	3.4**

** P < .01 *** p < .001

Total = Oswestry Low Back Pain Disability Questionnaire - Total Score
Public = Oswestry Low Back Pain Disability Questionnaire - Factor 1 - Public Activities
Private = Oswestry Low Back Pain Disability Questionnaire - Factor 2 - Private Activities
PPI = McGill Pain Questionnaire - Present Pain Intensity
TNWC = McGill Pain Questionnaire - Total Number of words chosen
TOTGHQ = Total Emotional Distress
IHLC = Modified Multidimensional Health Locus of Control Factor 1 - Internal
EXHLC = Modified Multidimensional Health Locus of Control Factor 2 - External
(F.U.) = Scores at 3 month follow up
(C) = Change from admission to follow up

Neither of the two dimensions of locus of control has a significant correlation with Total Emotional Distress. (Table 12.4).

Hypothesis 4 has therefore been upheld in that disability is not strongly associated with pain but is quite highly correlated with emotional distress which is associated with both aspects of pain. Locus of control is not related to either pain or emotional distress but internal control has a small negative correlation with Total disability.

Change in Pain Quality and Emotional distress are intercorrelated (r=.33, p<.01). However, the main predictors of change in both Pain Quality and distress are their respective baseline scores. Changes in these variables are not related to the opposite baseline scores (Table 12.6).

DISCUSSION

This study has attempted to replicate and further explore the relationship between disability, pain, emotional distress and locus of control.

The two cohorts of patients are not exactly comparable as those of the present study were younger and had a shorter duration of pain than those reported in Chapter 3. This is to be expected as they were participating in an earlier treatment option than the end stage patients reported before, but nevertheless similar findings have emerged. The rehabilitation patients in this study had a lower score on the external dimension of locus of control but the internal dimension did not differ between the groups. There was no difference either on pain (measured by a simple VAS), or disability or emotional distress.

The programme was able to reduce disability and this was highly significant for the Total Disability score and that on Public activities such as standing, walking, sitting, travelling and socializing. This result is not only statistically significant but also clinically relevant as patients reported greater ability at chosen tasks such as voluntary work, evening classes and family outings. One aspect of pain also reduced - that of the Pain Quality and this was unexpected because of the previous intractable nature of the pain. Pain Intensity did not change as was expected.

Emotional Distress reduced and this variable was clearly related to admission Total Disability and post programme changes in disability. External Locus of Control accounted for a significant proportion of the remaining variance in admission scores of Total disability and Internal Locus of Control predicted a significant amount of the residual variance in Total Disability.

Pain Intensity did not predict any aspect of disability, although TNWC did account for some residual variance in Public Disability on admission. Change in TNWC did not significantly relate to post programme disability reduction. It appears in the main, therefore, that disability is not a function of pain (as was also found in Chapter 5 where the analgesia section of the ODQ did not load on either factor of disability) but is mediated by psychological distress and the cognitive variable of locus of control. The relative importance of these two measures (distress explaining more variance than locus of control in the results of correlations between the variables) reflects the results of the experiments reported in Chapters 10 and 11 where it was discovered that change in anxiety predicted change in disability on a carrying task, but in the perceived control study the main predictor of change in disability was not change in perceived control but baseline ability.

For this population of chronic back pain patients, then, it seems that emotional distress is one of the main predictors of disability and is also the main mediator between pain and disability measured both by performance on a simple task and also on a comprehensive measure of limitation in activities of daily living.

Pain is related to some aspects of disability but not to the same extent as it is related to emotional distress. Disability and emotional distress share the greatest amount of common variance, with a small additional contribution from Internal Locus of Control. There is no relationship between pain and locus of control in this study, which is of variance with the findings of other authors (e.g. Dolce et al. 1986) but most other studies have been carried out on rheumatoid arthritis patients who have some expectation of intermittent reduction in symptoms.

As before, there remains the issue of appropriateness of the measures. The MHLC is not specifically aimed at pain patients and it is possible that the changes in the wording ("a bad time with my pain" being substituted for "get sick" and "well being" being substituted for "health") has still not resulted in an adequate measure. The internality dimension includes items which seem to imply self-generated exacerbation in pain (e.g. "when I get a bad time with my pain, I am to blame") and thus may not be endorsed, causing an overall lower internal score than may be the case if it were measured with less apparently punitive items. Clearly a relationship would be expected if self efficacy as described by Bandura (1977) is used as an aid to coping as most other authors suggest. This variation from the majority of published findings should form the basis of further work.

The results of the correlations point in the direction predicted by the pilot study but are not strikingly high. Although the main relationships seem to be between Total Emotional Distress and disability the highest amount of explained variance does not exceed 35%. Again more sensitive measures may have elucidated this further. It is not possible at this stage to be confident about the complete differentiation of anxiety and depression, as no criterion-related study has been undertaken on the GHQ to assess how well this instrument is tapping different aspects of distress. It is possible that most of the explained variance is being accounted for by the strong relationship between subsection C (social dysfunction) and disability discussed in Chapter 7. Nevertheless, this is in itself an emotional variable as opposed to those measured by the ODQ which are behavioural ones.

A final caution concerns the loss of about 26% of programme participants to follow up. This has reduced the numbers to a smaller cohort than was originally intended, and although there were no demonstrable baseline differences between those who did and did not attend at three months, the results of the multiple regressions cannot be accepted as confidently as was hoped. Further replication is needed as is longer term follow up to test the stability of programme effectiveness.

CONCLUSION

The results of this study have shown some similar findings to those of the previous treatment outcome report. Disability has reduced and the main predictor of this effect are emotional distress and Internal Locus of Control and change in distress after the programme. Exploration of the relationships between the variables of disability, pain, emotional distress and locus of control has shown that pain and disability are not strongly associated in this chronic pain population but that the mediator between them is emotional distress. The final concluding chapter examines other possible hypotheses about the emotional, cognitive and behavioural relationships.

PART 6

CONCLUSIONS AND RECOMMENDATIONS.

CHAPTER 13

GENERAL OVERVIEW AND CONCLUSIONS

The starting point for this thesis appeared with the observation that a small number of patients completing a Pain Management Programme were able to show changes in disability, although a simple measure of pain did not change. It was hypothesised that there must be some mediating variable which allowed for a change in the way pain was evaluated to account for reductions in limitation of function. Effort then became concentrated on attempting to identify the mediating variable between pain and disability that would explain this process. Cognitive distortion (Lefebvre 1981) seemed a likely candidate but a test of this factor failed to show the required relationships. In retrospect, this is not now surprising given that this particular form of cognitive appraisal is related to depression, which throughout the more recent chapters of the thesis has not been strongly in evidence. On reviewing the data from Chapter 3, it seemed as if anxiety as a mood variable, and locus of control as a cognitive one, may have played more prominent roles. First it was necessary to validate and explore the behaviour of the measures of disability, pain, emotional distress and locus of control in more detail in order to increase their explanatory and predictive power.

The studies on validation of the ODQ were the first known attempts to relate this self report measure to actual performance of behavioural tasks. These studies found not only criterion-related, discriminant and factorial validity, but also showed it was possible to carry out all the necessary procedures in the context of a single assessment interview for clinical purposes. Since this is a questionnaire specifically designed for patients with low back pain who form the majority of the people in pain rehabilitation units, this work could have generalised utility throughout the country. The finding of two types of disability could also help to focus the therapeutic effort and look for differential outcomes depending on the targeted factor.

In Chapter 6 attention was directed to attempting to improve the scoring of the McGill Pain Questionnaire to make possible the differentiation between sensory and emotional aspects of pain. In common with other researchers (e.g. Turk 1985) this was found to be impossible even if percentage scores were used. It would seem that new item pools may need to be generated if there is ever to be any true discrimination between the sensory aspects of pain and their surrounding emotional and evaluative context. Nevertheless two independent aspects of pain were identified which had differential outcomes following treatment.

In examining the behaviour of the General Health Questionnaire 28 it was found that significant intercorrelations between the four subscales existed so that a Total Emotional Distress measure was likely to be the most stable. By scoring this questionnaire by two different methods it was possible to suggest a cut off of 25 in the Likert scoring method to indicate the need for further examination of psychopathology in line with Benjamin's (1991) recommendation of 10/11 being the threshold for further psychological examination based on scaled scoring. By using a total GHQ score obtained by Likert scoring which was sensitive to change, it was possible to understand more about the role of emotional distress as a mediator between pain and disability.

Chapter 8 undertook a similar exercise in looking at the factorial structure of the Multidimensional Health Locus of Control Scale. This was modified slightly to make it more acceptable for a pain population but it is considered still not entirely satisfactory in elucidating the importance of the perceived control cognitive variable. It was found to have only two distinct factors, Powerful Others and Chance elements combining to form one external component.

Contrary to expectation and previous literature on the use of Visual Analogue Scales, the validation study in Chapter 9 was able to show no evidence of perceptual or aesthetic distortion of 100 mm lines as a quick method of communicating pain, perceived disability, anxiety and perceived control over the pain problem. Correlations with the psychometric variables of these factors produced evidence for some criterion-related and discriminant validity though these were not very convincingly demonstrated. The scales were found to be useful for the change measures needed for the experimental studies but there was a significant ceiling effect and it is not recommended that they be used as the only measures of these factors. Numerical rating scales may have yielded more conclusive information.

Having completed the exploratory work on the measures used, it was then possible to design two experiments to test the relative roles of anxiety and perceived control in modification of disability. In the first of these anxiety was manipulated using a known mood induction task - that of autobiographical recall but this is the first known instance of its use in the context of testing its effect on pain-related disability. This experiment showed clearly that the mood induction procedure was successful and the resulting changes in the performance on a behavioural task were dependent on the mood changes. In the analogous experiment exploring the role of locus of control, it was noticed that there were no published studies on modifying this cognitive variable relative to baseline, and it was established that this was also possible to achieve using autobiographical recall concentrating on internal or external (Chance) control examples. This procedure was successful in modifying perceived control in the expected direction. This experiment also showed the predicted changes in achievement of the behavioural task. In this case, however, perceived control did not act as a powerful predictor variable.

From the findings so far it would seem that disability is not strongly related to pain, but that it is influenced by Internal Locus Of Control and more especially by emotional distress. These hypotheses were put to the test in the final chapter in which a second programme evaluation study was reported intending to replicate and refine the conclusions of the pilot study on the Pain Management Programme. Indeed it was found that of all the variables used in the factors suggested by the previous exploratory work, Total Emotional Distress, but not particularly depression, did explain the greatest amount of variance in the pain - disability relationship and was able to predict admission and post programme disability in nearly all its aspects along with Internal Locus of Control. This is consistent with the work of Lethem et al. (1983) which proposed that avoidance of activity is associated with fear of pain, rather than pain per se (though their assertion that pain behaviour is "exaggerated" by this process is questionable).

The overall conclusion from all of this work is that pain-related disability is mainly determined by anxiety. This may be about further increasing the pain and tissue damage by engaging in activities which exacerbate discomfort. By a process of negative reinforcement anxiety is reduced and disability increased by limiting activity, although pain may be unaffected. At least one effective component of pain programmes such as the ones described here, may be the challenge to the anxiety cognitions both indirectly by vigorous exercise and more directly by anxiety management components such as deep muscular relaxation and education.

However, other possible explanations exist and must be considered especially in view of the fact that in both programme outcome studies no admission measures were found to predict change in disability which seemed to be independent of preprogramme pain, emotion and locus of control. It is not emotional distress per se but its reduction that is associated with increased levels of function. Watson and Pennebaker (1989) discuss other relationships between negative emotion (affectivity), health problems and disability.

According to them there are three possible ways in which the variables can be associated. The first of these is a variant of the "psychosomatic hypothesis" and states that high levels of emotional distress (or negative affectivity) with its correspondingly elevated levels of anxiety, tension, anger and depression cause health problems. Secondly, the "disability hypothesis" states that health problems cause high negative emotionality and since illness is associated with a number of adverse consequences including chronic pain, physical disability and impairment of social and/or occupational functioning, then emotional distress is simply another negative consequence of disease. Alternatively, the "symptom perception hypothesis" argues that individuals differ in their perception of and responses to bodily sensations. Thus patients with high negative affectivity will attend more vigorously to physical sensations and this attentional factor may magnify emotional-related differences in actual health status.

These hypotheses are not mutually exclusive and disentagling the various causal pathways is, according to Watson and Pennebaker, frequently impossible. However, in reviewing literature on coronary heart disease and cancer, they find no support for the psychosomatic hypothesis. This was also true in a review of general health studies in which it was concluded that although high negative affectivity subjects reported more physical complaints, and physical complaints were strongly linked to the occurrence of illness, negative affectivity itself was unrelated to illness.

The disability hypothesis seems similarly unsupported as studies by Watson and Pennebaker and others (e.g. Sainsbury, 1964) found that patient groups do not have consistently high negative affectivity scores and emotionality seems unrelated to the severity of the patients' medical conditions.

Since there appears to be little evidence that health problems lead to emotional distress, the third hypothesis deserves attention. Watson and Pennebaker's conclusion is that the hypervigilance of people with high negative affectivity may help to explain their increased somatic complaining in two ways. Firstly they may be more likely to notice and attend to normal body sensations and secondly they may interpret normal symptoms as painful because of their high anxiety. (Gray (1985) has developed a comprehensive model of anxiety postulating the existence of a Behavioural Inhibition System (BIS) which compares actual to expected stimuli. If an unexpected pattern occurs the BIS identifies certain aspects of the stimuli as being particularly important and needing especially careful checking which in turn leads to increased anxiety. Thus hypervigilance maintains anxiety as is also concluded by Mathews (1990).

If the psychosomatic hypothesis were true in chronic pain patients then high levels of emotional distress (the cause) would be associated with high levels of pain (the effect). This was not upheld by the results of the GHQ study (Chapter 7) in which 63% of all patients scored below the criterion of high emotional distress in spite of a modal VAS pain intensity score of 72. Change in distress would also be necessary for change in pain to occur and this was not found in the first study in which pain did not change although distress did, nor in the experimental study in which pain had no association with anxiety-related change in function.

If the disability hypothesis were true, then a strong relationship between pain (the cause) and distress (the effect) would be expected. There is some evidence in favour of this in Chapter 12 (although causal directions cannot be concluded from a correlational design), but the change in distress should have been associated primarily with change in pain and this has not been found as the relationship was stronger between baseline distress and change in distress than between change in pain and change in distress.

If the psychosomatic and disability hypotheses are similarly unfounded in chronic pain problem as in Watson and Pennebaker's other health studies, therefore, then a possible explanation of the pain-emotion-disability relationship, drawing on their model would be that acute pain excites the BIS which leads to prolonged scanning of all stimuli associated with pain and to chronically raised anxiety levels as the pain duration increases. Anxiety and its behavioural responses which may include disability (by the negative reinforcement principle discussed in Chapter 10) can then become associated independently of the pain per se. Reduction in anxiety may be a necessary precursor of change in disability behaviours. This seems to have been upheld by the conclusions of the preceding chapters.

However, all the findings can only be considered tentative at this stage. In the event, the numbers for both treatment outcome studies were smaller than originally intended and the changes, though significant and analysed by the customary methods for these kinds of data to reduce the risk of Type I errors, were small. Uncontrolled sources of variance such as selecting only referred patients when the decision to refer could not be articulated, and the lack of blind measurement may all have contributed to the results appearing as they have. With improvement in these aspects and better developed measures as described below, replication studies could help to untangle the associations between pain, emotion and disability more convincingly.

Recommendations for other future research

It is important, in order to be more confident in these findings, that a more precise measure of anxiety is developed in place of the GHQ. Of those which currently exist (e.g. the Beck Anxiety Inventory - Beck 1985) there is a considerable proportion of items to do with physical symptoms which may in themselves be pain related, so that the measure confounds pain and anxiety. Recently, McCracken et al. (1992) have discussed the development of the Pain Anxiety Symptoms scale. This is partly in the right area, though the items tend to imply that the pain is intermittent, and is clearly pain rather than disability related. A more general scale might be more appropriate. The GHQ28 may be adequate if validated against an appropriate criterion. Similarly, a more focused measure of Internal Locus Of Control over the pain problem could possibly enhance the importance of this cognitive variable.

The ODQ can be recommended as a valid measure of back pain-related disability but needs to be developed to scale the items more accurately. If it were used in pain populations other than back pain ones and its performance were found to be valid and reliable then it could have more general utility.

The issue of measuring pain accurately remains to be resolved. It is possible that a new item pool may enable the MPQ to differentiate sensory and emotional aspects. If this were true, then differential correlations with the anxiety measure may be expected, thus lending further weight to the conclusions of this thesis. While the two components of Pain Quality and Pain Intensity which have been identified and used here may be sufficient, the 77 descriptors of the MPQ seem a cumbersome route to a total score and short forms (e.g. Melzack 1987) may be considered instead.

As already mentioned in the previous chapter, the MMHLC needs to be developed to explore internality of locus of control more directly, or another scale such as Skevington's (1990) Beliefs in Pain Control Questionnaire substituted with appropriate amendment to make it more suitable for chronic pain subjects.

What is important is the appreciation of pain-related disability as a motivational phenomenon dependent on choices and contingencies, on emotions and cognitions and not directly determined by the pain itself. Some early work may not have received all the acknowledgement it deserved but it pointed in the right direction. In 1960 Beecher said,

"Many investigators seem grimly determined to establish that for a given stimulus there must be a given response ...... This fundamental error has led to enormous waste ...... There is no simple relationship between stimulus and subjective response..... It is evident that the reason for this is the interposition of ..... the processing component, of the psychic reaction ...... This component merits and must have extensive consideration".

It is hoped that this thesis has gone some way to following this recommendation and has resulted in a clearer conceptualization of Chapman and Wykoff's elephant.

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APPENDIX A

DESCRIPTION OF SUBJECTS

The Royal National Orthopaedic Hospital Trust (RNOH) is a major UK Centre specialising in spinal conditions of all kinds. It has an international catchment area but of the British patients referred the large majority are tertiary referrals - that is they have undergone all usual treatments in local hospitals following advice from their GP'S before being assessed by consultant physicians and surgeons at the RNOH. Chronic low back pain patients form about 8% of all the referrals in a year and of these about 130 (21%) per year are referred to the Clinical Psychology Department. Since patients came from all over the country the precise characteristics of the referrals to the Rehabilitation Unit cannot be described except to say that the chronic pain problem is intractable to locally available treatments and that the patients come with an expectation of more comprehensive expertise than has previously been offered to them. Clinical Psychology input is seen by the clinicians as one way of meeting this expectation and indeed very few patients have ever experienced it prior to arrival at the RNOH. It has not been possible to define how the decision is made to refer the particular patients for whom psychological intervention is requested but it is important to stress that there is no attempt made to dichotomize patients into "organics" or "functionals". Ideally all pain patients would be seen to exploit emotional, behavioural and cognitive attributes in the minimisation of the pain problem but as the author is usually single-handed in clinical practice some selection process is required though it remains unformulated. It is therefore not possible to say what selection biases may be operating and the specialist nature of the hospital makes comparison with other units' patients of doubtful validity. The results of the studies reported here must be interpreted with this in mind, as well as recognition of the fact that clinical constraints have made the selection of ideal numbers impossible within a reasonable time span for each study.

However, it would seem that some characteristics of these patients are common to those of most published studies. For example, the majority are women and they are of similar age to those quoted by Keefe et al. (1981). Their duration of symptoms is about the same as that reported in a study by Cinciripini and Floreen (1982) though is considerably longer than the three years quoted by Follick et al. (1985). Many studies do not include duration and age in their standard subject description so it is not possible to be sure how comparable groups are between settings.

COHORTS

Cohort 1 (see Table 1) consisted of 42 Pain Management Patients. These were chronic pain patients (all suffering from some degree of back pain but possibly involving the neck or legs as a more intense problem) who had completed the Rehabilitation Programme at the RNOH and who remained significantly distressed and disabled by their symptoms. It was considered that they needed a specifically designed self management programme with no "therapy" component to enable the best possible education in independent goal achievement and control of the problem. Pain Management Programmes are held twice yearly at the RNOH for groups of about six patients at a time. At the time of this report data on the initial 42 patients were available.

Cohort 2 consisted of 40 referred rehabilitation patients and 11 volunteers (pain patients in the rehabilitation programme at the time of the study but not referred for psychological assessment). A larger sample would have been preferred but was not easily available.

Cohort 3 were a small number of patients referred during their rehabilitation programmes but who were subsequently considered suitable for further assessment by a surgeon.

Aspects of their psychological evaluation aimed at designing self directed change were not therefore undertaken.

Cohort 4 consisted of the records of all available previously referred patients to whom the McGill Pain Questionnaire had been administered. They were all patients in pain rehabilitation programmes but were not all suffering from low back pain as at the RNOH there is also a large practice in patients with brachial plexus lesions and painful amputation stumps (patients with phantom pain were not included). The largest available pool of records was needed to minimise the possibility of Type I errors in the correlational design and so all complete records were used.

Cohorts 5 and 6 were the experimental subjects and were selected from referred patients to meet the needs of the designs. They were 100 consecutively referred patients who completed all required aspects of assessment. This number was considered just sufficient for statistical purposes.

Data from these patients formed the replication sample for studies on the McGill Pain Questionnaire, the Oswestry Low Back Pain Disability Questionnaire, the General Health Questionnaire and the Multidimensional Health Locus of Control scale. They also provided the data for the Visual Analogue Scale study in Chapter 9 and performed the experiments in the manipulation of anxiety and locus of control cognitions. They were all rehabilitation patients referred mostly at the beginning of their programmes and were therefore able to supply admission and follow up data for the investigations of post programme change in pain, disability and their mediators.

The table summarises which patients participated in each study. The numbers in each one were largely determined by those whose data were available at the time of the report.

APPENDIX A TABLE 1

Patient cohorts

Study	1 N42	2 51	3 10	4 95	5 50	6 50	Tot for each study
3.1	*						42
4.1		*					51
5.1	*	*(40)	*				82
5.2					*	*	100
5.3	*	*(40)			*	*	182
6.1		*(30)	*	*			135
7.1	*		*				52
7.2					*	*	100
8.1	*						42
8.2					*	*	100
8.3	*				*	*	142
9.1					*	*	100
10.1					*		50
11.1						*	50
12.1					*(30)	*(43)	73

Total N = 298