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3.

AN EVALUATION OF COGNITIVE, BEHAVIOURAL AND RELAXATION
TREATMENTS FOR CHRONIC LOW BACK PAIN

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AN EVALUATION OF COGNITIVE, BEHAVIOURAL AND RELAXATION TREATMENTS FOR CHRONIC LOW BACK PAIN

Summary of Thesis

Although there is evidence supporting the use of psychological techniques in the treatment or management of chronic pain, a number of issues regarding the use and efficacy of the techniques remain to be clarified. In part, this is because much of the published evidence on the use of psychological interventions has come from multicomponent pain-management programmes in which psychological interventions have been used in combination with other forms of treatment. This has made it difficult to establish the relative efficacy of the psychological techniques. Evaluation of the efficacy of different psychological techniques has also been hampered by such factors as: limited use of adequate control groups, a lack of consistently used outcome measures between studies, a lack of long-term follow-up evaluations, and doubts over the validity of comparing the treatments of patients experiencing pain in different regions of the body.

Although some 'dismantling' and better-controlled studies with long-term follow-ups have been reported, the small number of such studies means that the generality of the findings remains uncertain. In addition, many of these studies have compared combined psychological techniques, such as cognitive, behavioural and relaxation techniques, with waiting-list control groups. Relatively

few studies have been reported comparing different forms of psychological intervention or comparing psychological interventions with non-psychological interventions. Thus, the efficacy of different psychological techniques, relative to each other and to other forms of treatment, remains unclear.

In the present series of studies evidence for the role of psychological factors in chronic, non-malignant pain and for the use of cognitive, behavioural and relaxation techniques in the management of such pain, particularly chronic low back pain, is reviewed. Three controlled experiments are described in which cognitive and behavioural techniques, separately and in combination, with and without relaxation training, were compared to physiotherapy education on back-care and back-exercises.

The first experiment involved 58 subjects with chronic low back pain who were randomly assigned to 4 treatment and 2 control conditions in a repeated measures design. The 4 treatment conditions consisted of 2 behavioural conditions, one with and one without relaxation training, and 2 cognitive conditions, one with and one without relaxation training. Of the 2 control conditions, one received attention but no information or cognitive/behavioural/relaxation treatment from the Clinical Psychologist while the other had no sessions with the Clinical Psychologist. All conditions received the same back-care education and back-exercise programme from 2 physiotherapists. The dependent measures included self-reported pain levels, self- and other-

reported functional impairment, self-reported depression, anxiety, pain-related dysfunctional cognitions, medication intake and use of coping strategies. The subjects were assessed on four occasions - pretreatment, posttreatment and 6-month and 12-month follow-ups.

The results were analysed using planned contrasts and repeated measures ANOVAs with Bonferroni corrections for the number of dependent variables. The results indicate that while there were significant within subject improvements, which were maintained at 6- and 12-month follow-ups, the treatment conditions improved more at posttreatment than the control conditions on measures of pain, dysfunctional cognitions, and functional impairment. However, apart from dysfunctional cognitions, there were no significant differences in improvement between the treatment and control conditions at the 6- and 12-month follow-ups. The Bonferroni-adjusted results also indicated that the behavioural treatment conditions improved more than the cognitive treatment condition on a measure of functional impairment. However, there were no differences in improvement between them on measures of pain, mood or dysfunctional cognitions.

The second experiment compared a composite programme of cognitive-behavioural treatment, relaxation training and physiotherapy back-care education/back-exercises with a control condition which received the same physiotherapy input but only attention from the Clinical Psychologist. The dependent measures were the same as those in the first experiment and the subjects were assessed at pretreatment, posttreatment and 6-month follow-up.

Twenty subjects with chronic low back pain were randomly assigned to one of the two conditions.

The results were analysed using planned contrasts and repeated measures ANOVAs with Bonferroni corrections for the number of dependent variables. The results indicate there was a significant overall improvement within subjects on a measure of functional impairment. This effect was maintained at the 6-month follow-up. The results also indicate there were significant improvements in the treatment condition over the control condition on measures of use of coping strategies, sense of self-efficacy, functional impairment and use of medication at posttreatment. However, apart from a greater use of coping strategies by the treatment condition, there were no significant differences in improvement between the two conditions at the 6-month follow-up. In addition, there were no significant changes in levels of mean pain intensity, either within subjects or between conditions, at posttreatment or follow-up.

The third experiment examined the effects of omitting the 4 sessions of exercise practice in a heated hydrotherapy pool from the physiotherapy section of the composite programme described in the second experiment. Thirty subjects with chronic low back pain were randomly assigned to one of two conditions. One condition included the same combination of cognitive-behavioural-relaxation procedures and physiotherapy used in the second experiment. The other condition was the same but omitted the four sessions of exercise practice from the physiotherapy component. The dependent measures employed in the

previous two experiments were used again, but the subjects were assessed on only two occasions: pretreatment and posttreatment. The results were analyzed using planned contrasts and repeated measures ANOVAs with Bonferroni corrections for the number of dependent variables.

The results indicated that while there were significant overall improvements on most measures within subjects, there were no significant differences in improvement between conditions.

The results of all three experiments, together with those of a smaller fourth experiment, are reviewed. In general, it is concluded that the cognitive and behavioural treatments, in combination with back-care education and exercises, are more effective than back-care education and exercises alone at posttreatment on measures of pain, dysfunctional cognitions, use of coping strategies, self-efficacy, medication intake and functional impairment. While there is evidence of overall maintenance of treatment effects, maintenance of differential effects between treatments is generally weak. In addition, the combination of cognitive-behavioural-relaxation treatments and physiotherapy education, appear to be more effective at posttreatment than either cognitive or behavioural treatments alone with physiotherapy education.

There are few clear differences in efficacy between the cognitive and behavioural treatments, but where they exist they favour the behavioural treatment. Relaxation does not significantly enhance the cognitive and behavioural treatments. Although the

physiotherapy exercises appear to add little to the results obtained by the combined psychological and physiotherapy treatments, there may be an additive effect between the physiotherapy information and the psychological treatments.

These results, together with the correlations obtained between the dependent measures, are considered to be generally consistent with many of the results of earlier studies. However, there are some discrepancies and these are discussed, along with a number of methodological issues, in the final chapter.

CHAPTER 1

INTRODUCTION

Chronic, intractable, benign pain (i.e. persistent, non-malignant pain) is a problem of considerable proportion. It has been defined as pain which has persisted beyond the expected recovery period (Bonica, 1977) and, for research purposes, as pain which persists for more than 6 months and is resistant to treatment (Black, 1975).

No estimate of the extent of the problem is available in Australia, although Cobbin, Power, Howe, and Ballinger (1981) did report locating 15 pain clinics around Australia, but in the United States it has been estimated by the National Institute of Neurological, Communication Disorders and Stroke (1979) that chronic pain affects as many as 75 million Americans and costs the U.S. economy as much as \$US40m annually. More recently, Sternbach (1986) conducted a nationwide telephone survey of the adult population in the continental United States and reported that 9% of the respondents had had more than 101 days of backache in the previous year. When this figure was related to days lost from work, backaches caused more days lost than any other pain type.

Crook, Rideout, and Browne (1984) surveyed 500 randomly selected households on the roster of a family practice clinic in Ontario, Canada, and found that 16% of the individuals sampled had experienced pain within the two weeks before the survey and that 11% had persistent pain. Furthermore, those with persistent pain used health services more frequently than did those with temporary pain. Chapin (1974) reported that patients suffering from chronic back pain ranked 11th of 194 diagnostic groups in terms of numbers of days spent in hospitals in the U.S.

Thus, not only is there evidence that chronic benign pain afflicts large numbers of people, at least in industrialised societies, but it costs both society and the individuals concerned a great deal as well. McGill (1968), for example, reported that employees in one industry in the state of Washington who had back problems and were absent from work for more than 6 months, have only a 50% chance of ever obtaining employment again. Chapman (1973) also noted that it was common for patients presenting at the University of Washington Pain Clinic to have had as many as 20 to 25 surgical operations, with some patients spending more than \$25,000 on health services annually.

Treatment outcome studies also revealed a rather gloomy picture. Trief (1983), for example, reported that while over 200,000 Americans undergo surgery each year to relieve back pain, data indicate that after 5 years only 10% of these operations provided satisfactory relief.

Because chronic, intractable, benign pain has so frequently proved refractory to medical and surgical interventions, there has been a growing interest in recent years in the psychological functioning of chronic pain patients and the associated development of comprehensive, multi-disciplinary rehabilitation programs, in which patients are assessed and treated by clinicians from a variety of disciplines, such as anaesthetics, neurosurgery, orthopedics, psychiatry, clinical psychology, physiotherapy and social work (Bonica, 1979). Treatment outcome studies have reported encouraging results from this multi-disciplinary approach (e.g. Khatami and Rush, 1982; Cairns, Thomas, Mooney, and Pace, 1976s; Gottlieb, Koller, and Alperson, 1982). However, most reviews of these studies have concluded that little is known of the effectiveness of individual treatment components (Keefe, 1982; Linton, 1982, 1986; Turner & Romano, 1984).

This review of the literature on chronic, intractable, benign pain will firstly examine definitions and models of acute and chronic pain, with particular emphasis on the role of psychological factors in chronic pain. Secondly, issues associated with the assessment of chronic pain will be considered, and thirdly, evidence on the efficacy of cognitive, behavioural and relaxation treatments for chronic pain, especially chronic low back pain, will be critically reviewed.

1.1 Definitions of Pain

The closest to a generally accepted definition of pain is that of the International Association for the Study of Pain (IASP). The IASP defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (IASP Sub-Committee on Taxonomy, 1979, p.250).

Some definitions have tended to view pain simply as a sensation directly related to injury. Mountcastle (1980), for example, described it as "that sensory experience evoked by stimuli that injure or threaten to destroy tissue. Defined introspectively by every man as that which hurts" (P. 391). However, there is a considerable amount of evidence available that indicates not only a variable link between pain and tissue damage but also that such variables as mood and cognition can play a role in pain experience (Wall and Melzack, 1982; Wall & McMahon, 1986; Bonica, 1977). Consequently, the IASP's definition is widely considered to mostly fit the available evidence on pain, although, as Melzack and Wall (1982), point out, the word "unpleasant" may not be thought to describe the negative-affective qualities of pain adequately.

A further development in the definition of pain was provided by Fordyce (1976), who described pain in terms of "pain behaviour", such as grimaces, groans, complaints of pain, taking medication, and avoiding activity. Fordyce viewed pain behaviour as reflecting the presence of pain, it was the end of a continuum from nociception (a neural response to noxious stimuli) to pain (a conscious perception of nociception) to suffering (negative affective responses generated by pain) to pain behaviours. The advantage of this approach to pain

was that it focussed attention on the behaviour of the pain patient and provided a framework within which the relationship between environmental variables and pain could be studied.

Pain has also been divided into different types. Turk, Meichenbaum and Genest (1983), for example, described five different types of pain:

i) Acute pain, usually self-limiting and lasting less than 6 months, (e.g. post surgical pain, dental pain).

ii) Chronic, periodic pain, acute but intermittent (e.g. migraine headaches).

iii) Chronic, intractable, benign pain present most of the time, with varying intensity (e.g. low back pain).

iv) Chronic, progressive pain, usually associated with malignant diseases.

v) Experimentally induced pain, nociceptive stimulation produced in a laboratory setting (e.g. electric shock, muscle ischemia).

This review will firstly examine neurophysiological models of acute pain and then neurophysiological and psychological models of chronic, intractable, benign pain which will, hereafter be called chronic pain.

1.2 Neurophysiological Models of Acute Pain

1.2.1 Specificity Model

A version of this model was described by Descarte in 1664, but its more modern versions were developed by Muller and Von Frey around the turn of the 20th century. Muller's principal contribution being his doctrine of specific nerve energies which held that the brain receives information about external objects only via sensory nerves. In this view pain was viewed as a variant of the sense of touch (Melzack and Wall, 1982). Von Frey expanded Muller's concept to 4 main cutaneous senses: touch, warmth, cold, and pain, each with each own special projection system or pathway to a brain centre responsible for the appropriate sensation. Von Frey designated free nerve endings in the body tissues as pain receptors.

In this view, pain was seen as function solely of sensory input and it varied according to the quality and intensity of the stimulus (Turk et al., 1983).

However, whilst these pain conduction fibres have been delineated, many other aspects of the specificity model have not been supported by recent evidence. First, the assumption of a one-to-one relationship between the intensity of the stimulus and perception has not been borne out by evidence suggesting that the amount and quality of pain perceived is determined by many physiological, psychological, and even cultural variables (Bonica, 1977). Second, the free nerve endings described by Von Frey have not yet been demonstrated satisfactorily (Bond, 1979). Third, attempts to block or sever the pain pathways by anaesthetic nerve blocks or surgery have frequently

been unsuccessful in eliminating pain permanently (Loeser, 1980; Kerr, 1980). Fourth, the specificity model cannot explain a number of painful conditions such as those associated with deafferentation where pain is not dependent on activity in nociceptors or nociceptive fibres (e.g. phantom pain) (Loeser, 1980; Zimmermann, 1980). Fifth, there is no evidence of discrete cortical "centres" for pain or any other somesthetic experience (Melzack and Wall, 1982).

Thus, whilst there is evidence for some specialisation of nerve fibres, there is little support for the central notions of the specificity model.

1.2.2 Pattern Model

An alternative approach has been taken by a number of other models which have been grouped under the heading of Pattern or Intensity Models. The first of these was developed last century by Goldscheider who proposed that stimulus intensity and central summation of sensory inputs at the dorsal horn cells of the spinal cord are the critical determinants of pain (Melzack and Wall, 1982). He proposed that pain is produced when the total output of the cells exceeds a critical level following either excessive stimulation of receptors that are normally fired by non-noxious thermal or tactile stimuli, or pathological conditions.

In more recent developments of this approach, Crue (1980), and others, have argued that pain is a central percept and not a peripheral primary sensory modality. In this view, there are no pain endings, pain fibres or pain neurons in the peripheral nervous system and there is no such thing as a pain stimulus, only mechanical or thermal stimuli that are painful when they reached a certain level of

intensity. Pain, in this model is the result of the summation of a spatial and temporal pattern of input. Crue (1980), acknowledges, however, that the mechanism by which the dorsal horn neurons function to produce pain sensation is not understood at present. Still, the Pattern models have been able to account for a number of pain conditions, including both those where injury has occurred and those involving pathological pain syndromes, such as neuralgia. However, they could not account for persistent pain after a lesion of a neural pathway (Elton, Stanley, and Burrows, 1983).

That temporal and spatial patterns of nerve impulses provide the basis of a sensory perceptions is well established (Melzack and Wall, 1982). The notions of central summation and input control in pain have received considerable support from clinical studies (Bonica, 1977). However, the pattern model approach has not been supported by the evidence on peripheral specialization (Iggo, 1976). Furthermore, as Melzack and Wall (1982) point out there is a vagueness in the pattern model approach, particularly with regard to specifying the patterns that might be related to pain and possible mechanism for the detection of patterns by central cells, that renders it an inadequate account of pain phenomena.

Thus, as with the specificity model, the pattern models have made valuable contributions to understanding pain phenomena but they clearly have their limitations.

The third major model of pain was proposed by Melzack and Wall (1965), partly as an attempt to combine the established elements of both the specificity and pattern models, as well as to provide a more comprehensive model of pain. This has become known as the

gate-control model and has had a major impact on the study of pain in the last 20 years (Bonica, 1977).

1.2.3 Gate Control Model

This model proposes a mechanism by which noxious sensory input could be modified at the spinal cord level to produce a variety of pain phenomena. According to this model the input from small fibres (A-Delta and C) could be inhibited, mostly presynaptically, by input from large fibres (A-Beta) and this would occur in the substantia gelatinosa and grey matter of the dorsal horns of the spinal cord which would thereby act as a "gate" to transmission of nociceptive information. Thus, small fibre input would "open the gate" (and allow information to flow to the brain) whilst large fibre input would "close it" (and lesser amounts of information would flow to the brain). Pain perception would occur when a critical level of firing was reached by the transmission cells of the substantia gelatinosa.

Furthermore, Melzack and Wall incorporated the notion of central control of the gate by including descending (i.e. from the brain) modulation of the spinal system in their model. Thus, cognitive or psychological processes, such as attention anxiety and memory, could influence the gate.

This model, therefore, incorporated the notions of specialised nerve fibres, a central summing process (for which Melzack and Wall spelt out possible mechanisms) and a cortical influence on transmission of nociceptive information and pain perception.

Since this theory was first enunciated in 1965 it has received considerable criticism and, whilst Wall (1978) did propose some modification to the model, much of the criticism remains. For example, it has been found that both the thin fibre and large fibre input can produce presynaptic inhibition (Zimmerman, 1979; Bogduk and Lance, 1982).

Nevertheless, there is support for the concept that the activity of nociceptive neurons can be modulated by the stimulation of different types of sensory fibres (Bogduk and Lance, 1982). However, the exact mechanism of the gate in the substantia gelatinosa remains to be established.

Similarly, the concept of descending control of pain pathways has received considerable experimental support, although many of the mechanisms remain to be determined (Bogduk and Lance, 1982). While the actual pain pathways become more diffused as they ascend above the brain stem level (Bogduk and Lance, 1982; Liebeskind and Paul, 1977), there is evidence that the regions of the cortex that receive the sensory inflow play a role in affective, attentional, cognitive, motivational and/or visceromotor phenomena associated with pain and that these elements can, in turn, influence various components of pain behaviour (Liebeskind and Paul, 1977; Zimmerman, 1979; Melzack and Wall, 1982). Thus, in this model pain is not viewed as a purely sensory experience with emotions and cognitions as simply reactions to the sensory experience. Rather, such cortical activities are viewed as acting on inputs, to influence the gates, before those inputs give rise to sensory experience (Melzack, 1985). The perception or awareness of pain, in this model, is conceptualized as

"an integrated package of analysed results related to meaning, significance and imperative action" (Wall & McMahon, 1986, p.255).

Thus, whilst there has been considerable criticism of many aspects of the Gate-Control Model and much experimental evidence that is inconsistent with it, there remains considerable support for its conceptualisation of pain. As Bonica (1977) has pointed out, one of its principal contributions has been the demonstration that pain is a much more complex phenomenon than the original specificity model ever suggested.

Comment

The three neurophysiological models described here have been mainly associated with accounts of acute pain and are generally based on clinical and experimental studies of such pain. However, their relevance to the understanding of chronic pain has been increasingly questioned. Bonica (1980) and others (e.g. Liebeskind and Paul, 1977) have reported a number of significant differences between acute and chronic pain which suggest that chronic pain may be a different entity from acute pain - it is no longer simply a symptom of injury or disease, but a syndrome for which the treatments which are normally effective for most kinds of acute pain may not help (Melzack and Wall, 1982).

Chronic pain does not just last longer than acute pain, it is frequently characterised by different responses and consequences for the individual patient. For example, the social and economic consequences of chronic pain are likely to be quite different to those of acute pain, where the patient is likely to be expecting an end to the pain shortly. Sternbach (1974) reported that anxiety is

seen more frequently in acute pain patients than in those with chronic pain. In contrast, reactive depression, hypochondriasis, helplessness, withdrawal from work and social activities, excessive use of medication, excessive use of health services, and inadequate and dependent lifestyles often characterise chronic pain patients (Sternbach, 1974; Fordyce, 1978). However, this is not true of all chronic pain patients, many of whom do seem to adjust to their pain and live productive and useful lives (Sternbach, 1974; Pilowsky and Spence, 1976; Murphy and Fischer, 1983).

There is also evidence of neurophysiological differences between acute and chronic pain. Sweet (1980), for example, reported that surgical lesions in various supratentorial intracranial sites in patients suffering chronic pain from advanced cancer resulted in relief from the chronic pain whilst the sensitivity for acute pain sensation remained intact. Similar findings have been reported in cases where clinical chronic pain has been controlled by electrical stimulation of spinal posterior columns whilst sensitivity to acute pain (e.g. from pin prick) has remained intact (Lindblom and Meyerson, 1976).

As a result of such evidence, Bonica (1980) concluded that the mechanisms of chronic pain are likely to be much more complex than is the case for acute pain and probably involve prolonged dysfunctioning of the neurophysiological and psychological substrates of pain. The next sections will review the neurophysiological and psychological mechanisms believed to underlie chronic pain.

1.3 Neurophysiological Mechanisms of Chronic Pain

A number of possible neurophysiological mechanisms have been proposed to account for the phenomena of chronic pain. This section will review the most prominent.

1.3.1 Compression of Nerves

Nerve impulses can be elicited anywhere along the sensory fibre in the nerve trunk by electrical stimulation or local mechanical distortion. Persistent compression (e.g. by dislocation of intervertebral discs) may produce ongoing discharges in afferent fibres (Zimmerman, 1979). Chronically scarred axons can also fire repetitively after mechanical compression and may well provide the neurophysiologic basis for the radiating pain of sciatica (Loeser, 1980). It is worth noting that minor trauma, even unrecognised by the patient, can result in the hastening of degenerative processes in the intervertebral discs and, hence, compression of nerves and chronic pain (Zimmerman, 1979).

1.3.2 Chemical Excitation and Sensitisation of Nociceptors

Pathological changes of the skin and viscera (e.g. trauma or inflammations) are accompanied by release or increase production of chemical substances (e.g. Serotonin, Bradykinin, Prostaglandin, KCl). Each of which can excite or sensitise Nociceptors. Their production and decomposition is usually slow and may result in long-term excitation of nociceptors. Alternatively, they may result in sensitisation of nociceptors whereby they may cause enhancement of

responses and/or a lowering in the threshold of a nociceptor allowing formerly innocuous stimuli to cause pain (Perl, 1976).

1.3.3 Memory

Nathan (1977) suggested that long lasting and even permanent changes in the central nervous system may be produced by noxious stimulation and that these changes may preserve the effects of stimulation after stimulation has ceased. He described a number of cases in support of this view. However, the neuromechanisms underlying this memory-like activity remain unclear (Melzack and Wall, 1982).

1.3.4 Central-Biasing Mechanism

According to this hypothesis proposed by Melzack (1973), and based on the Melzack-Wall model, a part of the brain stem reticular formation acts as a central biasing mechanism by exerting a tonic inhibitory influence or bias on transmission of nociceptive sensory input at all synaptic levels of the somatosensory system, including the "gate" in the dorsal horn. This inhibitory function is, in part, dependent on normal sensory input. If a loss of normal sensory input occurs, as in peripheral nerve lesions and amputation, this inhibition is reduced and results in chronic pain. The functioning of the central-biasing mechanism can also be impaired by emotional stress and certain drugs (e.g. amphetamines), thus aggravating the spontaneous pain. On the other hand, increased sensory input by mechanical stimulation or by direct electrical stimulation (by transcutaneous electrical nerve stimulator, for example), would increase the inhibition and decrease the pain experienced.

It should be noted, however, that the actual mechanisms involved remain unclear, although there is considerable evidence that direct electrical stimulation can reduce chronic pain for between 30% to 40% of patients (Bogduk and Lance, 1982).

1.3.5 Regenerating Nerves

Nerve transections (e.g. by traumatic lesions, amputations or neurosurgical procedures), can lead to regeneration of the fibres of the proximal stumps. Such sites are often sources of severe pain, especially when a neuroma develops. The processes of regeneration may lead to aberrations in the firing pattern in the somatosensory system proximal to the deafferentation (Bonica, 1977). This may be associated with increased sensitivity of the peripheral nerve tip, neuromas, causalgia (where nerve injury leads to severe pain arising from untouched tissue) (Iggo, 1976).

1.3.6 Motor and Sympathetic Reflexes

Normally, motor and sympathetic reflexes to noxious stimuli are intended to counteract the noxious effect which may protect the organism from injury (e.g. flexor reflex). However, in chronic pain a motor reflex may be set up following a cutaneous or visceral noxious stimulus through activity in muscle or tendon receptors which may result in an increase in the motor reflex and may, eventually lead to a self-sustained reflex muscle spasm and corresponding ongoing pain. However, why muscle spasm causes pain is not yet understood (Loeser, 1980).

A similar vicious cycle is possible in sympathetic reflexes, where the sympathetic reflexes may enhance rather than decrease the excitation of the nociceptors. This may be caused by vasoconstriction and ischemia or vasodilation and an increase in vascular permeability, which would change the extracellular fluid environment (Bonica, 1977).

Thus, persistent noxious stimulation could develop which, in turn, would cause normal firing patterns in closed, self-exciting neuron pools in the spinal cords which, in turn, produce more intense reflex responses and result in increased noxious stimulation (Bonica, 1977). Bonica (1977), also suggested psychological mechanisms could contribute to these mechanisms but did not specify how.

1.3.7 Central Pain Mechanisms

Diseases and lesions of parts of the central nervous system may result in "central pain" (Bonica, 1977) which is characterised by spontaneous burning, aching pain, hyperalgesia, dysesthesia and other parasthesias. Central pain is often associated with thalamic lesions (thalamic pain) and surgical lesions of parts of the pain pathway. The actual mechanisms are not known, but loss of descending inhibition or disturbance of the normal balance between the discriminative and motivational systems have been suggested as possible mechanisms (Bonica, 1977).

1.3.8 Neurochemical Mechanisms of Pain Modulation

In recent years, endogenous neurochemical mechanisms of pain modulation have received considerable attention. A number of

neurotransmitter systems are thought to be involved but the picture is becoming increasingly complex. Philips and Cousins (1986) recently reported evidence of four neurotransmitters thought to be involved in descending inhibition. These included: endogenous opiates (enkephalin), serotonin (5-Hydroxytryptamine), norepinephrine (noradrenaline), and GABA (gamma amino butyric acid). However, the actual role of these neurotransmitters in chronic pain is unclear (Terenius, 1979). It has been reported, for example, that the level of endogenous opiates is reduced in patients suffering from chronic, intractable, benign pain and cancer pain (e.g. Almay, Johansson, Von Knorring, Terenius, and Wahlstrom, 1978).

Comment

While there is evidence for each of the neurophysiological mechanisms mentioned in this section, their relationship to many chronic pain phenomena remains uncertain. Loeser (1980), for example, reported that while localized paravertebral muscle spasm is common in chronic low back pain patients, "we lack any understanding of why muscle or trigger zones actually cause pain" (p. 369). It does seem likely, however, that many neurophysiological mechanisms are involved in chronic pain, rather than one 'cause'. For example, Wall (1984) noted that such common chronic pain phenomena as pain, tenderness, hyperpathia, guarding, abnormal reflexes, and changed motor reflexes often "spread far beyond the region of the original injury ... and not all can be attributed to changes in the original area of damage" (p.24). Wall (1984) argued that while such changes may be secondary to the original injury, they are often an equal source of suffering to the patient and, thus, an important focus of

therapy. However, he concluded that the relative contributions, to the patient's state, of the nervous system's adjustments to injury and higher-level cognitive reactions remained to be understood. In the next section, the role of psychological factors in chronic pain will be examined.

1.4 Psychological Factors in Chronic Pain

The Gate-Control model asserts that pain perception and response are influenced by a range of motivational, emotional and cognitive variables. This section will review the evidence for this assertion in relation to chronic pain. Psychological variables have been associated with chronic pain in three main ways - as causes, as modulating factors, and as maintenance factors. However, before examining these, the concept of 'psychogenic pain' will be briefly examined as it has tended to overshadow attempts to understand the role of psychological factors in chronic pain.

1.4.1 Psychogenic Pain

The term 'Psychogenic Pain' is frequently found in the pain literature (e.g. Wolkind, 1976; Bond, 1979), however, as Lewis (1972) noted, the definitions of 'psychogenic' may be characterised by a "shimmering ill-focussed quality" (p.190). Lewis (1972) reported that the term 'psychogenic' has been used to mean disorders which originate in mental conditions, disorders caused by environmental events and also disorders without demonstrable external cause. He also argued that the terms 'psychogenic' and 'neurotic', 'psychogenic' and 'reactive', 'psychogenic' and 'non-organic' have been used as if they were synonyms. Given such problems of

definition and use, Lewis concluded that "it would be as well at this stage to give it [psychogenic] a decent burial" (1972, p. 190).

Despite Lewis' (1972) exhortations, the term 'psychogenic pain' can still be found in the pain literature. Bond (1979), for example, stated that psychogenic pain was "pain occurring without an obvious physical cause" (p96) and later "pain primarily due to psychological causes" (p97). Bond also suggested that it is commonly linked to neurotic traits or neurotic disorders, but may also be linked to major mental disorders, such as depression or schizophrenia.

DSM-III also includes the classification of Psychogenic Pain Disorder, the criteria for which include: severe and prolonged pain as the predominant disturbance; pain which is inconsistent with the organic findings or grossly in excess of what would be expected from the organic findings; evidence for psychological factors in the aetiology of the pain; and pain which is not due to another mental disorder (American Psychiatric Association, 1980). According to DSM-III, psychological factors may be involved in the aetiology of pain in three ways: (i) a psychological conflict or need, which may be related to an environmental stimulus, may initiate or exacerbate the pain; (ii) the pain may enable the person to avoid an unpleasant activity; and (iii) the pain may enable the person to get environmental support.

While some aspects of the DSM-III approach may be considered an improvement on earlier uses of 'psychogenic', for example, the diagnosis should not be based on the absence of organic findings alone, it does seem to presuppose that organic findings can adequately account for pain. Such an assumption would, of course, be

inconsistent with the recent neurophysiological findings that pain perception is related to an interaction of various psychological, central and peripheral nervous system mechanisms (Wall & McMahon, 1986).

Many writers have also noted that the use of the term 'psychogenic' has frequently been used in a pejorative sense which may unnecessarily complicate the problem of understanding the chronic pain patient and, of course, it may well sour relations between the patient and health professional concerned and cause additional suffering for the patient (Fordyce, 1976). In addition, an implication in the use of the term can be that somehow 'psychogenic pain' is not as real or as bad as 'organic pain' (Fordyce, 1976). Not only have doubts about the severity of 'psychogenic pain' been disputed (e.g. Sternbach, 1978), but the notion that there can be 'real' pain and 'less real' pain has also been questioned (e.g. Merskey, 1978).

It would seem, therefore, that in the light of recent neurophysiological findings the concept of psychogenic pain has limited explanatory of therapeutic utility. Consequently, it may be more fruitful to examine the possible roles of psychological factors in chronic pain without making assumptions about neurophysiological mechanisms. Ultimately, of course, an integration of the psychological and neurophysiological factors in chronic pain would be desirable, but with present knowledge such an integration can only be limited. The next sections will examine the three ways in which psychological factors are thought to be associated with chronic pain.

1.4.2 Psychological Causes of Chronic Pain

When no obvious physical cause for pain is found, such as injury or degeneration, a number of psychological formulations have been proposed to account for the reported pain. These psychological formulations include depression, which may be masked and present as pain (Blumer & Heilbronn, 1982); conversion disorder where pain may be one of a number of symptoms which are believed to occur because they reduce excessive levels of emotion although the patient is usually unaware of the connection (Bond, 1979); anxiety, which is thought to lead to muscle tension which may eventually cause pain (Hall, 1981); hypochondriasis, which may be associated with depression and anxiety but which essentially implies fear of disease, pre-occupation and amplification of bodily sensations (Barskey & Klerman, 1983); schizophrenia, where it may be one of a number of vague and often bizarre hypochondriacal complaints (Bond, 1979); and malingering which, like hypochondriasis, has been conceptualised as "abnormal illness behaviour" (Pilowsky, 1975) which he defined as the persistence of inappropriate or maladaptive modes of perceiving, evaluating and acting in relation to one's state of health despite medical reassurance to the contrary.

Whilst some of these formulations (e.g. depression, anxiety, hypochondriasis) have also been related to the consequences of chronic pain, evidence for their role in causing pain is generally conflicting.

(a) Depression

An association between chronic pain and depression has been widely reported (Sternbach, 1978; Bond, 1979; Wolkind, 1976).

However, whether the depression is the result of the chronic pain or the cause of it remains controversial. Those who argue a causal role for depression usually discuss chronic pain in terms of 'masked depression', where the depression is masked by the absorption in somatic symptoms (Sternbach, 1978).

Blumer and Heilbronn (1982) went even further and argued that "both the bodily agony and the frankly depressive symptoms are part and parcel of a basic mood disorder, in pain-prone individuals" (p384). They also differentiated this basic mood-disorder from other types of depression and suggested that the pain is "the somatic expression of an unresolved psychic pain" (p385). Blumer and Heilbronn argued that the "pain-prone individual" was most likely to have the characteristics of alexithymia, which is the inability to recognise and to verbalise feelings, and consequently, in such individuals emotions are believed to be experienced somatically (i.e. as bodily sensations).

Evidence for a causal role for depression has been hard to find. A number of recent literature reviews (e.g. Roy, Thomas & Matas, 1984; Turk & Salovey, 1984; Romano & Turner, 1985) generally concluded that while there is much evidence of an association between chronic pain and depression, there is no methodologically sound evidence to support the view that depression causes chronic pain or that chronic pain is a form of depression.

A number of authors have reported that pain is a symptom in 30% to 100% of patients with depressive disorders (e.g. Gallemore & Wilson, 1969; Ward, Bloom & Friedel, 1979). However, others (e.g. Pilowsky, Chapman, Bonica, 1977) reported finding that

significant treatable depression affected only 10% of their pain clinic population. Furthermore, other authors have noted that depressed patients will often speak of their pain symptoms only when asked about them (Williams and Spitzer, 1982). In other words persistent backaches or headaches may be only one of many concomitants of depression. Of course, such findings do not constitute evidence for a causal role for depression.

Treatment studies in which the chronic pain has been treated with anti-depressant medication have produced equivocal results. Pilowsky, Hallett, Bassett, Thomas and Penhall (1982), for example, in a double-blind controlled cross-over study of amitriptyline versus placebo carried out on patient with chronic pain and no demonstrated organic cause found no difference between groups after 6 weeks of treatment.

On the other hand, Blumer, Heilbronn, Pedrazza, and Pope (1980) reported significant improvement in a group of patients with chronic pain (and without significant physical symptoms) who were treated by 1 of 3 antidepressants. However, this study was primarily of pre-post design with no control group, no blind administration of drugs and no placebos used. Clearly their findings must be viewed with caution. Furthermore, as Rosenbaum (1982) points out, even if chronic pain does respond to anti-depressants, as found by Ward et al. (1979), it does not mean that chronic pain and depression are the same thing, they may simply have similar neurochemical substrates. However, Romano and Turner (1985) recently reported that while promising, the research into a common physiological basis for pain and depression is still only preliminary.

Williams and Spitzer (1982) also noted two significant differences between chronic pain of obscure origin and depression. Chronic pain is usually unremitting over a period of many years whilst major depression is normally episodic and most cases will remit within two years. Also, psychotic features such as depressive delusions do not seem to be associated with pain-prone disorder although they are common in patients with major depression.

In sum, there seems little evidence for the proposition that chronic pain is caused by depression, although pain may be a symptom of depression. However, there is evidence that chronic pain and depression are often temporally associated.

(b) Anxiety

Anxiety is believed to cause pain because it may lead to muscle tension or muscle spasm which, in turn, can cause pain (Bond, 1979). However, whilst there is evidence that many pain patients report symptoms of anxiety, especially in the more acute phases (Sternbach, 1974), evidence that prolonged anxiety causes chronic pain is equivocal. Holmes and Wolff (1952) found that patients with back pain had generalised over-activity of trunk muscles in situations involving conflict and insecurity or feelings of hostility, frustration and guilt. However, more recently Philips (1980), demonstrated that the assumptions of a consistent correlation between "tension headache" and measured muscle tension is not supported by the evidence. Similar results have been found with chronic low back pain patients, with some having elevated paraspinal EMG levels and others having reduced levels (Wolf, Nacht, & Kelly, 1982).

Of course, as Hall (1980) pointed out, where a correlation is found between muscle tension and pain it is just as likely that the muscle tension is a response rather than a cause of the pain.

(c) Conversion Disorder

Conversion disorders according to DSM-III, are a sub-type of the Somatoform Disorders, whose essential features are "physical symptoms suggesting physical illness... for which there are no demonstrable organic findings to explain the symptoms" (Kaplan and Sadock, 1981, p457). The conversion disorders have been divided into four main categories: motor disturbances, sensory disturbances, conversion symptoms simulating physical illness and conversion symptoms complicating physical illness.

When a conversion symptom occurs in isolation, the diagnosis is conversion disorder. When it is part of a major syndrome such as schizophrenia, or somatisation disorder, the primary diagnosis is that of the major syndromes (Kaplan and Sadock, 1981). Somatisation disorder being defined, in part, by recurrent and multiple somatic complaints for which medical attention is sought. The symptoms are not adequately explained by physical disorder or injury, begin before the age of 25 to 30 years, and have a chronic but fluctuating course (Kaplan and Sadock, 1981). The diagnosis of conversion disorder is established by both excluding organic disease and demonstrating the presence of relevant psychological criteria (Lazare, 1981). However, in practice, such a process is often quite difficult. A number of studies, have, for example, reported finding organic disease, particularly organic brain disorders in many patients formerly diagnosed as having conversion symptoms. Whitlock (1967), for example, found that 63.5% of patients diagnosed as 'hysteria' in

psychiatric units in Australia and England had co-existing or antecedent organic brain disorders.

In the case of the relevant psychological criteria, the evidence is also doubtful, there being little empirical data available. The evidence that is available suggests that where somatisation disorder has already been established, where there is a high incidence of concomitant psychopathology, where a model for the symptom has been available, and where emotional stress before the onset of symptoms has been established, then the likelihood of the symptom in question being conversional rather than organic is increased (e.g. Gatfield and Guze, 1962; Barnett, 1971; Lazare, 1978; Merskey, 1982).

Whether pain can be seen as a conversion symptom is controversial (Lazare, 1981). Wise (1977), for example, wrote that "pain is the most commonly utilised conversion phenomenon seen presently" (p.775). Ziegler, Imboden and Meyer (1960) reported that in 75 of 134 patients with conversion symptoms in their study, pain was the primary complaint. On the other hand, Lloyd, Wolkind, Greenwood and Harris (1979) reported that pain is a symptom of hysterical neurosis only occasionally. In addition, Gatfield and Guze (1962) and Raskin, Talbott, and Meyerson (1966), in their respective studies on conversion reactions specifically excluded those patients whose presenting problem was primarily pain because of the difficulty in making a definitive diagnosis in such cases.

It should be noted, of course, that where pain is thought to be a conversion symptom, it typically occurs as one among many complaints, as in somatisation disorder, or in patients suffering from a wide variety of psychiatric, neurological and medical

conditions (Gatfield and Guze, 1962; Guze and Perley, 1963; Guze, et al., 1971). In other words, it seldom presents as the sole complaint. Finally, as Lazare (1978) pointed out, most of the published material on conversion reactions and hysteria has been concerned predominantly with semantics and conceptualisation. There have been relatively few empirical studies.

In summary, given the controversy over whether or not pain can be a conversion symptom, the difficulty in making a definitive diagnosis, the ever-present possibility that an organic basis for the pain may be found (particularly given the rapid advances being made in CT scanning), and the fact that when it is thought to be a conversion symptom it is typically only one of many complaints made by the patient, it would seem prudent to treat the proposition that a complaint of chronic pain is a conversion reaction with considerable caution.

(d) Malingering

Various authors have distinguished between those patients with somatoform disorders and those with malingering or factitious disorders on the basis of the voluntary control of behaviour (Adler, 1981). The behaviour of the patient with somatoform disorder is considered to be involuntary in nature, whereas it is thought to be voluntary in those with malingering or factitious disorders. Such a view, of course, reflects an adherence to psychodynamic explanations of behaviour and presents the problem of untestability.

The emphasis in notions of malingering is on the various gains the patient is presumed to be seeking. This ranged from

the rather obvious one of monetary gain to the less tangible ones, such as the manipulation of family members (Hall, 1982). However, empirical evidence on this type of pain problem is generally restricted to an anecdotal accounts (Mendelson, 1982).

It should be noted, of course, that under the concept of secondary gain financial compensation for injury can be included as a motivating factor (albeit unconscious) in conversion disorders. All of which suggests as Fordyce (1976) and others have pointed out (e.g. Weisenberg, 1977) that it might simply be more parsimonious to ignore notions of voluntary versus involuntary control of illness behaviour and instead focus more on the study of possible controlling variables irrespective of whether the pain is considered psychogenic or organic in origin. Such an approach has the additional advantage of avoiding the difficulties of body-mind dualism to which the psychogenic notions can give rise.

Comment

Evidence that psychological variables can cause chronic pain remains conflicting, partly because of the retrospective nature of much of the data. Where psychological disturbance is evident, it can be argued that it is just as likely to have resulted from the pain as to have caused it. Furthermore, it is possible to differentiate between chronic pain syndromes and the pain reported by those people diagnosed with somatoform disorders or depression. Thus, while there is evidence of an association between chronic pain and various forms of psychological disturbance in many people, the proposition that psychological variables can cause chronic pain remains unproven.

1.4.3 Modulation of Chronic Pain by Psychological Variables

Melzack and Wall (1972) described pain as a category of complex experiences, rather than a sensation produced by a specific stimulus, and they related its perception and reaction to a range of motivational, emotional, and cognitive variables. This view has generally been supported by studies of experimentally induced pain and acute clinical pain. In particular, studies of experimentally induced pain have demonstrated that using pain threshold (i.e. the point at which pain is first perceived) and pain tolerance (i.e. the maximum pain the subject would tolerate) as dependent measures, pain perception and reaction can be modified by such variables as coping style (Davidson and Bobey, 1970) anxiety (Bowers, 1968), modelling (Craig and White, 1972), relaxation (Elton and Stanley, 1976), a sense of control (Staub, Tursky and Swartz, 1971), and cognitive variables, such as cognitive-dissonance (Zimbardo, Cohen, Weisenberg, Dworkins and Firestone, 1956) and attribution theory principles (Davidson and Valins, 1969). Other studies of experimentally-induced pain have also shown that various coping strategies such as distraction, cognitive re-appraisal, coping self-statements, and stress-inoculation training can also modify and reduce pain perception and reaction (Kanfer and Goldfoot, 1966; Chaves and Barber, 1974; Johnson, 1974).

Studies of acute pain patients have reported similar sorts of results (e.g. Andrew, 1970; Klusman, 1975; Koudas and Scetnicka, 1972; Schmitt and Wooldridge, 1977; Wernick, Jaremko and Taylor, 1981). They have also found that personality variables, such as extroversion and neuroticism, can influence pain perception and

response, with neuroticism being positively correlated with reported pain severity (Bond, Glynn and Thomas, 1976) and extroversion being positively correlated with pain complaint and, often, the consequent receipt of analgesics (Bond, 1973).

However, whilst the studies of experimentally-induced pain and acute pain have generally demonstrated the complex ways in which psychological variables can modulate pain perception and reaction, their relevance to chronic pain generally remains to be established. As authors such as Bonica (1980) and Sternbach (1978) have pointed out, there are many significant differences between acute and chronic pain. It is, of course, much harder to experiment with chronic pain. Most chronic pain studies in this area have either studied correlates of the pain, such as personality variables, activity level, or affect, or studied the effects of different treatment regimens or environmental manipulations on such variables and various pain dimensions. This section will review the main findings of these studies.

(a) Personality Studies

Whilst many writers have referred to a particular personality as characteristic of chronic pain patients (e.g. Engel, 1958; Westrin, Hirsch, and Lindegard, 1972), this notion of homogeneity of chronic pain patients has been questioned by the findings of numerous studies which have reported considerable variability in the attributes of chronic pain patients (e.g. Bradley, Prokop, Gentry, Van Der Heide, & Prieto, 1981; Sternbach, 1974).

A number of studies have reported elevations in the Hypochondriasis, Depression, and Hysteria Scales of the MMPI with

chronic pain patients (e.g. Gentry, Shows, Thomas, 1974) suggesting the presence of disturbed personality functioning in these patients. However, evidence of such disturbed personality functioning has been found as frequently in patients with a clear organic basis to their pain as in those without (e.g. Woodforde and Merkey, 1972) which makes it unlikely that the pain was caused by the personality disturbance.

Some studies have also reported a reduction in such measures of personality disturbance following successful surgery and reduction of pain (e.g. Timmermans and Sternbach, 1975), suggesting that the disturbance was the result of the pain rather than the cause. However, Pilowsky and Spence (1976) questioned these results when they found no significant relationship between the illness behaviour of patients with pain, as measured by their Illness Behaviour Questionnaire (1975), and the length of time the pain had been endured. They interpreted these results to indicate that the experience of pain itself does not cause consistent changes in personality and affective functioning. They related the behaviour of the pain patient to pre-existing personality factors. However, Gentry et al. (1974) did find differences in MMPI profiles of patients with chronic low back pain according to duration of pain and Sternbach, Wolf, Murphy, and Akeson (1973) reported similar differences between groups of pain patients according to duration of pain.

Other studies have also reported variability in MMPI profiles of chronic low back pain patients according to sex (e.g. Maruta, Swanson, & Swenson, 1976) and pending litigation (Sternbach, 1974). Bradley, Prokop, Margolis and Gentry (1978) used multivariate cluster

analysis to identify four MMPI profile subgroups among low back pain patients, indicating different types of response to chronic low back pain. Bradley et al. (1978) suggested that such findings could have implications for treatment. However, this has not yet been substantiated. In a recent review of the MMPI literature, Love and Peck (1987) reported that although much of this work was still in the preliminary stages, differences have been found between Bradley et al's. (1978) subgroups in terms of pain-related behaviour.

Studies of neuroticism and extraversion, as measured by the Eysenck Personality Inventory, in chronic pain patients have also reported variable results with neuroticism being positively associated with the experience of chronic pain in some studies (e.g. Bond, 1971, 1973, 1976) but not in others (e.g. Merskey, 1972). Bond (1971, 1973, 1976) also reported that scores on the extraversion scale were positively associated with verbal pain behaviour, such as request for analgesic medication. However, Folkards, Glynn and Lloyd (1976) reported a relationship between the report of pain and the degree of extraversion in chronic pain patients which fluctuated according to the time of day.

To summarise, whilst there is evidence that a large proportion of chronic pain patients have abnormal levels of neurotic and emotional problems, there is no consistent evidence for the notion of a single chronic pain personality profile. Instead, it seems that there is evidence for the existence of different subgroups in the personality profiles of chronic pain patients which may vary according to such factors as sex, chronicity, and aetiology of pain, and assessment measure used. It must, however, be remembered that

the personality studies are usually group studies and the generality of their findings to different groups and individuals is uncertain.

(b) Affective Disturbance

The presence of affective disturbance has frequently been reported in studies of chronic pain patients (e.g. McCreary, Turner, and Dawson, 1977; Watson, 1982; Ward et al., 1979; Roy et al., 1984). As mentioned previously, there is much controversy about the exact relationship between affective disturbance and chronic pain, although recent reviews have generally concluded that the evidence favours the view that the affective disturbance follows the onset of pain (Roy et al., 1984; Turk & Salovey, 1984; Romano & Turner, 1985). Romano and Turner (1985) did, however, counsel caution on this point because of the poor methodological quality of many of the studies in this area and the absence of adequate tests of the competing theories.

The principal forms of affective disturbance found have included anxiety, depression, and various associated neurotic features such as hypochondriasis, low self-esteem, apathy, somatisation, and hostility (Leavitt & Garron, 1979; McCreary et al., 1977; Elton, Stanley, & Burrows, 1978; Mendelson, 1984; Lipton & Marbach, 1983; Shachan, Dar & Cleeland, 1984; Armentrout, 1979).

Whilst a number of studies have reported anxiety associated more with acute pain and depression with chronic pain (e.g. Sternbach, 1975), others (e.g. McCreary et al., 1977; Mendelson, 1984) have reported elevation of both anxiety and depression in chronic pain patients. Garron and Leavitt (1979) even found a small positive relationship between anxiety and pain intensity measures, but no relationship between depression and the pain measures. In part, some

of these varying results may be due to different measures used and different objects measured (e.g. Bradley et al., 1981).

Whilst there does seem to be some variability and the correlations between different measures of chronic pain and affective disturbance, there is evidence that patients with psychological disturbance describe their pain differently to those who are not so disturbed. Leavitt and Garron (1979), for example, found that psychologically disturbed patients used more words to describe their pain (on the Back Pain Classification Scale), distributed these words over more pain factors, and endorsed significantly more pain descriptors of the affective and skin pressure variety. Perhaps importantly, these effects were independent of whether or not the patients had a diagnosable disease. Similarly, McCreary et al. (1977) found that patients with high levels of emotional disturbance, as measured on the MMPI, portrayed their pain as more intense, frightening, unbearable, and burdensome. Lipton and Marbach (1983) using patients with intractable facial pain and Shacham et al. (1984) using patients with chronic back pain reported similar findings.

From a different point of view, a number of treatment studies have reported corresponding changes between description of pain and affective disturbances. The use of anti-depressant medication to treat chronic pain patients with significant depression has produced variable results, as mentioned earlier, but it has been found in some studies that those patients who did respond to anti-depressants, responded in both measures of depression and pain, whether in terms of increased pain tolerance (e.g. Bradley, 1963) or actual reduction in pain intensity to the point of relief (e.g. Ward et al., 1979).

Psychological treatment studies have found similar corresponding reductions in affective disturbance with reduction in pain reports.

Turner (1982), for example, in a controlled study, found that chronic low back pain patients treated with both relaxation training and cognitive-behavioural therapy improved significantly on measures of pain, depression, and disability, whilst patients in a waiting-list control group did not. Using a different approach, Elton (1978) reported considerable improvement in 75% of her chronic pain patients when treatment was aimed solely at improving their self-esteem and generalised coping abilities, rather than focusing on pain coping skills per se. However, other than anecdotal accounts, there have been no controlled studies published of such an approach since Elton's (1978) study. Clearly, more evidence is required to support this assertion.

To conclude, whilst different studies have used different measures of affective disturbance and, often, pain, there is reasonably consistent evidence that, irrespective of the origin of the pain, patients with more affective disturbance tend to describe their pain as more severe and disabling to them than those with less affective disturbance. Furthermore, there is evidence that reduction in either pain intensity or affective disturbance appears to be related to changes in the other. However, the exact nature of this relationship remains unclear, although the evidence tends to favour the view that affective disturbance is usually secondary to the onset of pain rather than the reverse.

(c) Coping Strategies

Evidence that the methods people use to deal with their pain, or coping strategies, such as relaxation or distraction, can

significantly alter pain tolerance or even reduce reported pain intensity has been repeatedly demonstrated in laboratory conditions with experimentally-induced pain (e.g. Beers and Caroly, 1979; Chaves and Barber, 1974). Recent clinical studies have also reported that coping strategies can have an important modulating influence with chronic pain patients as well. A case study analysis by Murphy and Fischer (1983), for example, revealed that those patients who continue to report their back pain as totally debilitating even though their physicians have considered them ready to return to work, were characterised by: a belief that their prior able-bodied lives were the only acceptable way of being; a belief that their limitation questioned their worthiness; and a tendency to focus almost wholly on the present, particularly on their pain. In contrast, Murphy and Fischer found that the more adaptive patients tended to be much less concerned with issues of worth, to minimise the impact of the injury and were able to make modifications in their lives that enabled them to move forward.

A more systematic study by Rosenstiel and Keefe (1983) of 61 chronic low back pain patients using their Coping Strategy Questionnaire revealed that three factors: cognitive coping and suppression, helplessness, and diverting attention or praying, were predictive of measures of behavioural and emotional adjustment to chronic pain above and beyond what could be predicted on the basis patient history variables and the patient's tendency to somatise. Their results suggested that the use of some strategies is related to poorer adjustment. For example, patients high on the helplessness

factor (i.e. reported a frequent use of catastrophizing as a response to pain) were not adjusting well as assessed by depression and anxiety measures. In contrast, patients high on diverting attention and praying had more functional impairment and pain.

Rosenstiel and Keefe interpreted their results, in the light of previous studies, to indicate that success in dealing with pain was less a function of using a particular coping strategy than avoiding the use of a catastrophizing strategy. These results have since been largely corroborated by Turner and Clancy (1986) and also by Keefe and Dolan (1986). Turner and Clancy (1986), in fact, found that following successful cognitive-behavioural treatment, their sample of chronic low back pain patients reported reduced use of catastrophizing - thus providing further evidence of the importance of catastrophizing in coping with chronic pain.

Evidence concerning praying and hoping as coping strategies, however, seems more conflicting. While Rosenstiel and Keefe (1983) and Keefe and Dolan (1986) found praying/hoping positively associated with impairment in daily activities and pain intensity ratings, Turner and Clancy (1986) found increased use of praying/hoping significantly related to reductions in pain intensity ratings. However, following factor analysis, Turner and Clancy (1986) reported that praying/hoping appeared with attention diversion in a factor which had a positive correlation with pain. Turner and Clancy suggested that this finding could simply reflect the ineffectiveness of distraction techniques with chronic pain rather than the ineffectiveness of praying/hoping.

Recently, Brown and Nicassio (1987), using a different questionnaire to that used by Turner and Clancy (1986), found that responses like wishful thinking and praying were associated with increased pain intensity, higher depression, more functional impairment and lower general self-efficacy in a large sample (N=361) of rheumatoid arthritis patients. Brown and Nicassio (1987) characterized responses to pain like wishful thinking, praying and dependence on others as passive forms of coping, while they characterized responses to pain like staying busy, reading, engaging in some form of exercise, and distracting attention from pain as active forms of coping. In contrast to passive forms of coping, Brown and Nicassio (1987) found that active coping responses were associated with less pain, less depression, less functional impairment and higher general self-efficacy.

It would seem, therefore, that while there are consistent findings with regard to the use of catastrophizing as a response to pain, the evidence concerning other coping strategies or responses is less consistent. Although the differences in findings between studies may relate to differences in patient samples and measures used, more research is clearly required to assess these possibilities.

Lethem, Slade, Troup and Bentley (1983) proposed a model of exaggerated pain perception which emphasised fear and avoidance of pain. They argued that fear of pain might be seen as a normal response to repeated attacks of pain than that people would react to this fear either by confrontation or avoidance, or some combination of both. They suggested that those who took a confrontation approach would resume an increasing range of physical and social activities as

the organic basis for the pain resolved, whilst those who took an avoidance approach would progressively reduce their activity level and, possibly, drift to an invalid status and exaggerated pain perception. They argued that the personal coping strategy each individual develops for coping with pain played a large role in determining whether or not the pain becomes both exaggerated and chronic.

A preliminary study by Slade, Troup, Lethen, and Bently (1983) of 165 university students revealed that of the 91 who reported previous back pain, 35 gave a history of decreasingly severe attacks and 28 increasingly severe. Furthermore, the coping strategies of the latter group for internally-produced pain (e.g. headache) were significantly more passive than was the case for the former group. In addition, the ratings for severity of back pain correlated significantly with measures of avoidance strategies. Slade et al. interpreted these results as supportive of their model although they did note that the subjects were not examined clinically or physically tested and thus the study did not constitute a direct clinical test of their model.

In a similar vein, Philips and Jahanshahi (1986) presented evidence that avoidance behaviour, especially avoidance of social interactions, was the most common response to pain in a large sample of chronic headache patients. In a subsequent controlled treatment study with a heterogeneous chronic pain patient sample, Philips (1987a) found that avoidance behaviour was negatively associated with self-efficacy beliefs. Philips (1987a) suggested that this finding indicated that as chronic pain patients avoided pain more the less they felt they could control it. More recently, Philips (1987b)

argued that such evidence, together with earlier findings in self-efficacy research, suggested that cognitions about one's ability to control pain and memories of previous painful events play a major role in determining pain behaviour.

The results of some treatment studies have indicated that training in specific cognitive coping strategies can lead to improvements, in terms of pain descriptions and pain behaviours. Rybstein-Blinchik (1979), for example, in a controlled study with chronic pain patients in a rehabilitation ward found that those patients trained in one of three cognitive coping strategies (reinterpretation of pain sensation, diversion of attention, and somatisation or describing the sensation exactly) improved significantly more than did the attention-control group, in terms of improved pain description and fewer pain behaviours, such as complaints about pain. Other treatment studies using these, and other cognitive coping strategies have reported similar findings, although, so far, there have not been enough controlled studies to reach definite conclusions with regard to the relative efficacy of the different strategies (e.g. Rybstein-Blinchik & Grzesiak, 1979; Varni, Gilbert & Dietrick, 1981; Levendusky & Pankratz, 1975; Khatami & Rush, 1978; Moore & Chaney, 1985).

It seems, therefore, that many chronic pain patients adopt maladaptive coping strategies which may play a role in their poor adjustment. There is evidence that those who have adopted, or have been taught, more adaptive coping strategies, or at least avoid reactions of helplessness, catastrophizing and withdrawal from activities, adjust better to their pain and experience, less psychological disturbance and less pain.

(d) Environmental Variables

One of the first studies to suggest a possible link between environmental variables and pain perception and reaction was that of Beecher (1959) who found that 65% of soldiers who were severely wounded in battle reported feeling little or no pain for hours or days after the injury. In contrast, he found that only 20% of civilians similarly injured in motor vehicle accidents reported little or no pain. Furthermore, the soldiers requested considerably less medication than the civilians, yet pin-pricks indicated that they could still feel pain. Beecher (1959) interpreted these differences in pain perception and reaction in terms of differences in the meaning of the pain for the two groups; for the soldiers it probably meant escape from battle and possible survival; the civilians, in contrast, viewed their circumstances as a disaster and showed a high level of anxiety.

However, it could equally be argued that the differences between the two groups were related to different environmental cues and consequences, rather than appealing to the concept of 'meaning'. Such an uncontrolled study cannot, of course, exclude other possible explanations, such as differences in levels of endorphines or adrenalin.

Since Beecher's study pain has also been conceptualised in behavioural terms. Fordyce's (1976) conceptualization of pain in terms of pain behaviour was described earlier but will be amplified here. In addition to conceptualising pain behaviour as the end of a progression from nociception to pain to suffering to pain behaviour,

Fordyce further classified pain behaviour as either operant or respondent on the basis of its apparent controlling stimuli.

Pain behaviour was considered to be respondent if its onset and frequency of occurrence were related to antecedent stimuli, such as tissue damage or irritation. Fordyce considered that respondent pain behaviour, such as crying, moaning, and grimacing, was characteristic of acute pain patients, in particular.

Pain behaviour was considered to be operant if its occurrence was related more to its consequences and, like all operant behaviour, it continued to recur because it was contingently followed by reinforcing consequences, such as social attention, avoidance of unpleasant work, etc. Furthermore, such operant behaviour would also be subject to stimulus control (i.e. the behaviour would tend to occur more in the presence of a stimulus or cue which indicated certain reinforcing consequences were likely to follow). Whilst discussion of the role of conditioning principles will be left for the next section, it is pertinent to look at the evidence for stimulus control in this section.

Studies such as Beecher's (1959) and other, more anecdotal observations (e.g. Melzack & Wall, 1975, 1982; Merskey, 1978), have suggested that environmental conditions or stimuli can play a role in modulating pain behaviour. However, there have been few experimental studies of stimulus control of pain behaviour. One of the few experimental studies was reported by Block, Kremer, and Gaylor (1980) and it is especially noteworthy as because used chronic pain patients. Block et al. (1980) found that those patients who reported that their spouses were relatively solicitous when pain

behaviours were emitted reported marginally higher levels of pain when told their spouse was observing them through a one-way mirror during a structured interview than when told that a neutral observer (the ward clerk) was doing so. In contrast, those patients who reported that their spouses were relatively non-sollicitous in responding to pain behaviour, reported significantly lower pain levels in the spouse-observing condition than in the neutral-observing condition. Block, et al. interpreted these findings as supporting the notion that discriminative cues can serve to modulate pain report.

In a similar vein, Cinciripini and Floreen (1983) also demonstrated that the stimulus characteristics of a situation can influence the pain behaviour observed in chronic pain patients. Using a structured interview setting, Cinciripini and Floreen found higher rates of defined pain behaviours when the interview focussed on the patients' illness compared to when more neutral topics were the subject of discussion. Evidence of the influence of exposure to social models on response to pain in experimental settings with normal subjects (e.g. Prkachin & Craig, 1986) could also be viewed as consistent with the notion of stimulus control of pain and response to pain.

Thus, although somewhat limited, there is some experimental evidence that situational variables can influence reports of pain intensity and observed pain behaviour. Evidence indicative of environmental factors influencing chronic pain has also come from larger, demographic studies.

(e) Demographic Variables

There is a considerable amount of evidence that people from different cultures and social groups differ in their reactions to pain. Zborowski (1969), for example, described Mediterranean cultures as approving of free expression of pain and exhibiting more pain behaviour than others. Sternbach and Tursky (1965) reported differences in pain tolerance levels between people of different ethnic origin. They found that American women of Italian descent tolerated less electric shock in a laboratory setting than American women of Anglo-Saxon or Jewish origin. More naturalistic observations have suggested that members of some cultures appear able to undergo seemingly painful procedures, often in the form of ritual, without apparent evidence of being in pain (Melzack and Wall, 1982). However, some studies have even found no difference in experimental pain reactions between subjects of different ethnic origin (e.g. Merskey & Spear, 1964).

It must be noted, however, that much of the evidence in this area comes from studies with seriously flawed methodology. For example, Chapman and Jones' (1944) study employed very loose criteria of ethnic origin, such as 'Northern European Stock' and 'Mediterranean races'. Frequently, the number of subjects used has been extremely small, yet generalisations have been made to an entire ethnic group on the basis of such small numbers (Zborowski, 1969). Frequently, the ethnic origin of the experimenter has not been controlled for (e.g. Woodrow, Friedman, Siegelauvs & Collen, 1972), raising the possibility that this variable could have influenced the outcome (e.g. Weisenberg, 1977).

In what might be seen as a more informative approach to this area, Elton and Stanley (1982), studied not only differences in

reaction to pain between pain patients of different ethnic origin, but also differences in the reactions of the families of those patients. They found that Australians of European origin displayed more hopelessness and desire for help from others than Australians of Anglo-Saxon origin. Furthermore, the Anglo-Saxons were substantially more positively disposed towards psychological treatment for their pain than were the Europeans. However, when Elton and Stanley also looked at the patients' families, they found that the European families were almost wholly over-protective of the pain patients whilst the Anglo-Saxon families were spread across a number of reactions (mostly 'concerned' rather than 'overprotective' or 'punitive'). On the basis of such findings, Elton and Stanley (1982) and others, such as Weisenberg (1977) and Craig (1984), have pointed to the role of a patient's cultural and family environment in modelling and reinforcing different pain reactions.

Age and sex have also been studied in relation to pain measures. Most studies of age have found a progressive increase in pain threshold and tolerance with age (e.g. Chapman & Jones, 1944; Procacci, Bozza, Buzzelli, & Della Corte, 1970). However, Clark and Mehl (1971) suggested that most of the increase in pain threshold with age could be accounted for by a reluctance to label noxious stimuli as pain, rather than a change in sensitivity. In relation to lower back pain, Kelsey and Ostfeld (1975) found that males in the 30 to 34 year age range were most affected, whilst it was the 40 to 44 years range for females. Weisenberg (1977) suggested that age maybe an important factor in assessing pain reaction and treatment approach, although a review of the chronic pain literature suggests

that apart from selecting subjects in the 20-60 year age bracket, few studies seem to consider it.

Evidence on sex differences in relation to pain is conflicting. Woodrow et. al (1972), for example, found that females had a lower pain tolerance than males to pressure on the Achilles tendon. Wolff and Jarvic (1965), however, found that although women had a lower mean pain threshold than men, the difference was not statistically significant. Notermans and Tophoff (1967), in contrast, found no sex differences for threshold but did for tolerance, with males being more tolerant than females. Clinical data suggest that there is a sex difference in the propensity for certain types of pain. Laskan (1969), for example, reported that temporo-mandibular joint pain or myofacial pain dysfunction syndrome has been found to occur mostly in females in the age range 20-40 years. Bakal (1975) reported data showing that females have more headache pain than males in ratios from 1.7:1 to 40:1. However, the significance of sex differences remains to be established and it may, for example, relate more to other factors, such as cultural or social variables, than to sex per se.

In summary, there is a considerable ammount of evidence that psychological variables, such as affect, use of different coping strategies, discriminative stimuli and modeling are associated with variations in pain report and pain behaviours. There is also some evidence, albeit inconsistent, that these relationships may also be influenced by such demographic variables as age, sex, and ethnic origin. While no conclusions can be made on the direction of causality between the psychological variables and chronic pain, the evidence is at least consistent with the view that psychological

variables can modulate many of the phenomena associated with chronic pain.

1.4.4 Psychological Factors in the Maintenance of Chronic Pain

Theories concerning the role of psychological factors in the maintenance of chronic pain have tended to revolve around the psychodynamic concepts of primary and secondary gain (e.g. Bokan, Ries & Katon, 1981), and the similar behavioural concept of reinforcement (e.g. Fordyce, 1976). This section will deal with the behavioural approaches.

Fordyce asserted that however pain may have originated (e.g. trauma, degeneration), it persists beyond the usual period of repair because of various consequences. As mentioned previously, Fordyce (1976) conceived of pain in terms of 'pain behaviours' which, to some extent, reflect underlying experienced pain. The types of reinforcement contingencies which he claimed may maintain pain behaviour included; direct, positive reinforcement, such as attention from a spouse; negative reinforcement or avoidance learning in which pain behaviours are maintained by avoiding aversive stimuli, such as unpleasant work; and, thirdly, by non-reinforcement of 'well behaviour' (e.g. higher levels of social and work activities), by for example, employers refusing to take on a worker because of his history of low back pain.

However, while Fordyce's conceptualisation of chronic pain in behavioural terms has provided a major impetus to the study and treatment of chronic pain, some aspects of this model have come under criticism. Sanders (1979), for example, claimed there was a

vagueness in Fordyce's discrimination between nociception, pain, and pain behaviour and that his definition implied that overt pain behaviour was only part of chronic pain and the nature of its relationship to other aspects was not clearly specified. Sanders also suggested that Fordyce's division of pain behaviour into operant and respondent classes was too simple as it was possible that both classes could apply to a number of pain behaviours - where, for example, a pain behaviour, like a grimace, was elicited by a painful stimulus and then maintained by reinforcement, such as attention. However, it should be noted that Fordyce's more recent accounts of his model would seem to include this possibility (e.g. Fordyce, 1982).

Sanders then proposed his own classification of pain into three classes of pain behaviours - overt, covert, and physiological, where overt refers to such events as speech and movement, covert to thoughts and feelings, and physiological to biological reactions such as muscle tension.

Sanders then redefined pain behaviour as "that interacting cluster of individualised overt, covert, and physiological responses that are capable of being produced by relevant tissue damage or irritation and may also be produced and maintained by other antecedent or consequent stimulus conditions" (p.252). In addition to tissue damage and irritation, therefore, this definition allows for the possibility that pain behaviour may be produced and maintained by other antecedent or consequent stimulus conditions. Furthermore, this definition does not suggest that the three modes of response are necessarily correlated - in other words, desynchrony may

occur as suggested by Hodgson and Rachman (1974), Philips (1977), Martin and Matthews (1978).

Sander's conceptualisation, although containing the same concepts of reinforcement contingencies as in Fordyce's model, may be seen as more complex in its identification of different modes of pain behaviour. Certainly, Sander's model is more consistent with conceptualisations of behaviour in terms of overt, covert, and physiological responses (e.g. Borkovec, 1976; Hersen & Bellack, 1976; Philips, 1977; Rachman, 1976). Fordyce's model on the other hand, focused on overt pain behaviour only and thus may be seen as unnecessarily limited. Furthermore, there is also a considerable amount of evidence to support the utility of Sander's approach from headache research (e.g. Philips & Hunter, 1980) and anxiety research (Rachman, 1977).

Evidence in support of the claim that chronic pain can be maintained by its consequences, comes from anecdotal accounts, experimental studies and treatment studies.

Compensation payments have long been cited as a source of reinforcement for the maintenance of chronic pain (e.g. Miller, 1961, 1966). However, whilst there is some evidence that it may play a role, there have been many conflicting findings. Miller (1961, 1966), for example, claimed that once the compensation case was settled the pain complaint invariably abated. However, Mendelson (1982), and others (e.g. Encel & Johnston, 1978), have shown that this is not the case in a large proportion of cases. Mendelson (1984) also found no difference between two groups of chronic low back pain patients with and without compensation claims in terms of

pain severity, pain description and measures of psychological disturbance. Some studies have, however, reported that chronic pain patients receiving compensation payments tend to be less responsive to conventional medical treatment than those not receiving compensation (e.g. Kertesz & Kormos, 1976). However, others have found no difference (e.g. White, 1966; Chapman, Brena & Bradford, 1981).

Evidence for the influence of social reinforcers is more consistent. Elton and Stanley's (1980) study suggested that the response of family members to the patient's pain was a significant variable in maintaining various pain behaviours. More recently, Gil, Keefe, Crisson and Van Dalfsen (1987) reported that observer-rated pain behaviour and pain ratings varied as a function of level of satisfaction with social support. Chronic pain patients who reported a high level of satisfaction with the support they were receiving from significant others displayed a higher level of pain behaviours, such as guarding or rubbing, and rated their pain as more severe on the McGill Pain Questionnaire compared to those patients reporting a lower level of satisfaction with the support they were receiving. Interestingly, no differences in pain behaviour or pain ratings were related to availability of social support, suggesting that it was the reinforcing qualities of the support that made the difference.

Experimental evidence has also indicated that pain behaviours can be modified by manipulation of such consequences as the attention of the physiotherapist and performance feedback (e.g. Cairns & Pasino, 1977; Fordyce, Caldwell & Hongadorom, 1979).

Treatment studies have also demonstrated changes in pain behaviours following the use of such techniques as reinforcement for increasing activity levels, non-reinforcement of inactivity and other pain behaviours, and reinforcement for developing more adaptive cognitive and behavioural coping strategies (e.g. Fordyce et al. 1973; Linton & Gøtestam, 1984; Moore & Chaney, 1985; Roberts & Reinhardt, 1980; Roberts, 1983; Sanders, 1983;).

Further evidence in support of the maintenance concept was provided by a recent treatment study using recent-onset back pain patients. Fordyce, Brockway, Bergman, and Spengler (1986) randomly assigned the patients to two treatment conditions, one employing interventions on a pain behaviour-contingent basis (so-called traditional methods) and the other on a time-contingent basis (behavioural methods) which included programmed restoration of activity level. At 6-weeks follow-up no differences were found between the conditions, but at 9-12 months the traditional condition group were rated as more 'sick' and reported more functional impairment at follow-up compared to preonset (of pain), while the behavioural condition group reported return to preonset levels of functioning at follow-up. Fordyce et al. (1986) concluded that "the prevention of chronicity in recent-onset back pain is furthered by distinguishing between pain and healing and designing regimens based on healing, not report of pain" (p.139).

Fordyce (1976) also suggested that medication use could be viewed as pain behaviour which was maintained by its short-term consequences, such as temporary pain relief or assistance in getting to sleep. Interestingly, there is some correlational evidence that those chronic pain patients who use high doses of medication,

particularly both narcotic and sedative medications, suffer more disability and have less successful treatment outcomes than those chronic pain patients who use little or no medication - independent of original tissue damage (e.g. Maruta, Swanson & Finlayson, 1981; Turner, Calsyn, Fordyce & Ready, 1982; Ziesat, Angel, Gentry & Ellinwood, 1979).

To conclude, there is a substantial amount of evidence that reinforcement variables can play a role in the maintenance of many of the phenomena associated with chronic pain, such as functional impairment and overt pain behaviour. Whilst evidence of the role of such widely accepted reinforcers as insurance compensation payments remains conflicting, there is more consistent evidence that social attention, performance feedback, and treatment regimens can act as reinforcers of pain behaviour and well behaviour. Certainly, the treatment studies indicate that when an increase in well behaviours is reinforced and reinforcement for pain behaviours is withheld, changes in the respective behaviours can occur.

1.4.5 Comment on Psychological Factors in Chronic Pain

Despite various methodological shortcomings and difficulties, different measures, and different conceptualisations of pain, the evidence presented in this section does provide general support for the claims that psychological factors play a role in chronic pain irrespective of cause. Whilst the question of psychological causes of chronic pain remains contentious, there is good evidence that psychological factors such as affective disturbance, coping strategies, and environmental cues can play a role in the modulation

of chronic pain. There is also good evidence that chronic pain syndromes can be maintained by the reinforcement of pain behaviours and the non-reinforcement of well behaviours.

Although more experimental research is clearly required in each of these categories, the present evidence is strong enough to warrant attempts to alter the psychological factors believed to be involved in chronic pain syndromes in the hope that the severity of pain, affective disturbance, pain behaviours and general functional impairment associated with chronic pain might be reduced. A review of the cognitive and behavioural treatment methods for chronic pain will be described after the chapter on assessment issues.

CHAPTER 2ASSESSMENT OF CHRONIC PAIN

Before reviewing the cognitive and behavioural treatment outcome studies, current approaches to the assessment of chronic pain will be examined. As Syrjala and Chapman (1984) pointed out in their review of clinical pain measurement, the assessment of pain must be based on a conceptual model of pain which both "identifies its important attributes and permits quantification of those attributes" (p. 71). Turk and Kerns (1984) also argued that the assessment of pain should bear in mind the purpose of the assessment - for example, whether it is for making a diagnosis or for treatment evaluation - because the issues addressed will probably be different. This examination of the assessment of chronic pain will be based on the current conceptualization of pain as a multi-dimensional phenomenon consisting of four main components - nociception, sensation, suffering and behaviour (Fordyce, 1978).

As this examination of assessment issues is in the context of a review of chronic pain treatment outcome studies, the emphasis will be on the assessment of chronic pain (as opposed to acute pain) in the treatment setting. This distinction was, perhaps, most aptly made by Fordyce et al, (1985) when they described 'pain' as a symptom and 'chronic pain' as a syndrome. The main point being that in attempting to treat the chronic pain syndrome, cognitive/behavioural treatments are not treating either an underlying disease or lesion or simply a single symptom (e.g. reported pain intensity), but rather a constellation of events (Bradley, Prokop, Gentry, Van der Heide and

Prieto, 1981) which are generally considered to characterize, or be associated with, chronic pain (e.g. Fordyce et al., 1985). As described previously, this 'constellation of events' includes not only reported pain intensity but also affective distress (e.g. anxiety and depression) and so-called 'pain behaviours', such as pain complaints, grimaces, medication consumption, and reduced daily activity levels (e.g. Fordyce, 1978; White, Bradley & Prokop, 1985; Reading, 1984).

Thus, the assessment of chronic pain in the cognitive/behavioural treatment setting needs to include measures which sample both these phenomena and any other phenomena considered relevant to an understanding of chronic pain and attempts to change it, such as the coping strategies employed and the cognitions of the pain patients (e.g. Turk and Kerns, 1983; Keefe, Brown, Scott & Ziesat, 1982). Turk and Rudy (1987) also argued that these 'other phenomena' should also include some measure of the organic or physical factors believed to underlie the chronic pain and they presented a means of achieving this as part of their multi-axial assessment. Some authors have also included, as behavioural components of chronic pain, measures of physiological functioning, such as EMG readings, straight-leg raising and muscle strength (e.g. Naliboff, Cohen, Swanson, Bonebakker & McArthur, 1985; Keefe et al., 1982; White et al., 1985).

This chapter will examine current approaches to the assessment of the phenomena of the chronic pain syndrome.

2.1 Clinical Pain Measurement

The most obvious problem in attempting to measure pain is that, while it may have behavioural referents, pain is a subjective experience and, as such, is not directly measurable (Merskey, 1973; Reading, 1984). Consequently, attempts to measure the subjective experience of pain have come to rely on patients' self-report (Bradley et al., 1981; Reading, 1984). Behavioural methods of clinical pain measurement emphasize the measurement of observable 'pain behaviours', such as verbal complaints, grimaces, bracing, etc. (e.g. Keefe and Block, 1982). However, Fordyce (1982) and others (e.g. White et al., 1985) have pointed out, that while such behaviours may be part of an operationalized definition of pain, they are not pain and they cannot really be identified as 'pain behaviours' without the concomitant report (or complaint) of the patient that he/she is 'in pain'. There are no behaviours that are peculiar to pain alone. Similarly, attempts to record physiological responses, such as muscle tension or heart rate, as measures of pain are not measuring pain, but possibly only concomitants of pain (Keefe et al., 1982). Certainly, no physiological response has been shown to be unique to pain.

Laboratory studies of experimentally induced pain in humans have been able to couple subjective pain report with a measurable noxious stimulus, such as electric shock or the temperature of iced-water (e.g. Chapman et al., 1985). Consequently, although they still rely on subject self-report, the measurement of experimentally-induced pain in the laboratory has had the advantage of being able to relate subject self-report to a known quantity of input, thus allowing for

more experimental manipulation (than possible in the clinical setting) and the application of psychophysical methods, rather like studies of vision and learning (Chapman, 1983). However, as Chapman (1983) pointed out, such an approach implies the tacit assumption that pain may be construed as primarily a sensory modality - a view which is of course, at odds with the prevailing multi-dimensional conceptualization of pain.

In the case of clinical pain, measurement of the noxious input is either impossible with present technology or relatively crude in nature (Rudy, Turk and Brena, in press). In any case, as noted earlier, there is considerable evidence of variability between the extent of known tissue damage and reported pain (Wall & McMahon, 1985).

As a consequence of such considerations, clinicians and clinical researchers, while generally acknowledging the inherent limitations of attempting to measure a complex perceptual experience, have mostly continued to use subjective measures (of pain) as an integral element in the assessment of clinical pain (e.g. Keefe et al., 1982; Reading, 1984). Keefe (1982), for example, argued that subjective measures of pain were not only valid, but "necessary components in the behavioural assessment of chronic pain" (p. 331). Keefe also pointed out that verbal self-reports of pain were often instrumental in gaining medical attention and further interventions.

2.1.1 Pain Intensity Measures

(i) Psychophysical Methods

Although the assessment of pain in the (human) laboratory setting has become increasingly sophisticated, employing such psychophysical methods as magnitude estimation procedures and applications of sensory decision theory (e.g. Chapman, Casey, Foley, Gracely and Reading, 1985), the relevance of many of these approaches to pain assessment in the clinical setting is either limited (e.g. Turk and Kerns, 1983) or remains to be established (e.g. Syrjala and Chapman, 1984). Certainly, while some, such as Gracely (1980) and Tursky, Jamner and Friedman (1982), have attempted to apply cross-modality matching techniques to clinical pain estimation, their use in clinical settings appears relatively rare (e.g. Chapman et al., 1985).

Cross-modality matching, as described by Gracely (1980), basically involves scaling the magnitude of sensation associated with each adjective on a set of pain descriptors describing two dimensions of pain experience - pain intensity and unpleasantness (i.e. the affective quality of pain). This is achieved by asking subjects to match handgrip strength, time estimation and time length with each adjective. The result is a ratio scale, in which the intervals between each adjective are established, which can then be used to assess the magnitude of pain sensation when the subject nominates the descriptor which best describes his/her pain (Chapman, 1976). Such scales can allow reliable comparisons of pain intensity between measurement occasions - for example, whether a given report of pain

is two or more times more intense than previously reported (Keefe et al., 1982).

It is argued by the proponents of this approach that such measures are less subject to biases which may distort the more commonly used category rating scales, in which the intervals between items, whether numbers or words, are only assumed (and not established) to be equal (Gracely, 1980).

However, the practical utility of such psychophysical methods (e.g. in terms of time required and word knowledge) in the clinical setting has been questioned (e.g. Syrjala & Chapman, 1984). Furthermore, as Chapman et al. (1985) pointed out, such methods "necessitate the untestable assumption that the subject can accurately perceive, judge and report this sensory experience, but this assumption can be tenuous when opioids or certain other analgesics (something which is not uncommon in the clinical setting) are given" (p. 12). Turk and Kerns (1983) also argued that psychophysical procedures derived from laboratory settings can tend to reflect a unidimensional, sensory model of pain in which the role of such psychological factors as cognitions and affect may not be considered. They pointed to evidence that differences in cognitions, such as self-statements and appraisals, could contribute to individual differences in perception and tolerance of nociceptive stimuli.

Thus, it appears that while the psychophysical methods of pain intensity estimation can offer some advantages over the typical clinical alternatives, their usefulness in clinical populations and their reliability and validity in such populations remains to be

established (e.g. Syrjala & Chapman, 1984; Reading, 1984; Chapman et al., 1985).

(ii) Category Rating Scales

In contrast to the psychophysical approaches, category rating scales rate the severity or intensity of pain on scales consisting of either a series of numbers (e.g. from 0 to 10, where 0 represents "no pain" and 10 "extremely severe pain"), or words, such as 'none', 'mild', 'moderate', 'severe' (Syrjala & Chapman, 1984).

The patients' responses are converted into integral numbers (in the case of verbal rating scales) and these are usually averaged and analyzed statistically on the assumption that the interval between each number on the scale is equal (Gracely, 1979). However, this assumption has been questioned by a number of authors (e.g. Chapman, 1976; Syrjala & Chapman, 1984). Nevertheless, Chapman (1976) did acknowledge that the use of such measures is almost universal practice in pain assessment.

Gracely (1979) also contended that category rating scales appear to assess pain as if it was a single sensory dimension varying only in intensity when, given the evidence for a multi-dimensional model of pain, the scores obtained on such scales must "represent an unknown integration of multiple dimensions of pain experience" (p. 809).

Determining the reliability of these scales has also proved difficult, particularly, as Reading (1984) pointed out, when the variable being measured (i.e. pain) was likely to vary with time. In fact, Reading (1984) suggested that, given the possible influence

of both memory for previous responses and the fluctuating nature of pain, it could be argued that low test-retest reliability on such scales may be seen as desirable as it could be considered a reflection of a scale's sensitivity to change. It has also been argued (e.g. Ohnhaus & Adler, 1975) that the relatively small number of possible points on the category rating scales may not only result in limited sensitivity to change, but also in artificially augmented scores. For example, it has been reported that numbers 0, 5 and 7 may appear too often in numeric scale scores to satisfy the statistical requirements for probability and homogeneous distribution (Murrin & Rosen, 1981).

(iii) Visual Analogue Scales

As an alternative to the numeric and verbal pain rating scales, visual analogue scales are also widely used as a subjective measure of pain intensity. The visual analogue scale normally consists of a 10 cm. line between two ends of a presumed dimension, represented by words such as 'no pain' at one end and 'unbearable pain' at the other and is scored by the patient making a mark on the line to indicate his/her pain intensity (e.g. Merskey, 1973). As with verbal rating scales, the point at which the patient marks the line is converted into an integral number and may be averaged and dealt with statistically, again on the assumption of equal intervals between numbers. However, in the case of visual analogue scales, there is theoretically an infinite number of points which can be marked, though normally either 0 to 10 or 0 to 100 points are scored (Syrjala & Chapman, 1984).

However, while there is evidence that the visual analogue scale may be more sensitive (with a much greater number of potential points than in the verbal rating scales or most numerical scales) and more reliable than the verbal rating scales or numerical scales (e.g. Joyce, Zutshi, Hrubes & Mason, 1975), correlations between the visual analogue scales and verbal analogue scales are often quite high (e.g. Ohnhaus & Adler, 1975; Reading, 1980, Woodforde & Merskey, 1972). In addition, the visual analogue scales also share many of the shortcomings of the verbal rating scale and numerical scales. For example, the assumption that pain can be adequately described along one dimension, such as intensity (Turk & Rudy, 1987), and the assumption of equal intervals between points (Chapman, 1976). Interestingly, there is evidence that different patient samples may have different types of problems in completing the two types of scale. For example, deficiencies in vocabulary have been related to problems in completing a verbal rating scale (e.g. Syrjala & Chapman, 1984), while limitations in abstract thinking have been related to problems in completing the visual analogue scale, especially in older patients (e.g. Kremer, Atkinson & Ignelzi, 1982).

Thus, both the verbal rating scale and visual analogue scale approaches have their limitations with neither being consistently superior to the other. However, whichever intensity scale is used, it is clear that it should only be used as one component of a multi-dimensional assessment and not in isolation. The investigator also needs to be particularly aware of their statistical limits when drawing conclusions (e.g. Syrjala & Chapman, 1984; Reading, 1984; Chapman et al., 1985). Nevertheless, both methods are currently more

easily employed in the clinical setting than the more time-consuming psychophysical methods (e.g. Syrjala & Chapman, 1984).

2.1.2 The Assessment of Qualities of Pain

In an attempt to address some of the problems of the pain intensity measures, particularly the criticism that they are essentially treating pain experience as a unidimensional phenomenon, Melzack and Torgerson (1971) developed an adjective checklist (as part of their McGill Pain Questionnaire) which was intended to measure different qualities of pain experience. The words (or pain descriptors) were selected by Melzack and Torgerson after a high level of agreement had been reached on their meanings by groups of patients, students and physicians. The second version of the checklist (Melzack, 1975), now in common use, contains adjectives divided into 20 categories that the authors grouped on an a priori basis (based on Melzack & Casey's, 1968, model) into 3 major dimensions of pain - sensory-discriminative qualities (e.g. pressure, temperature), affective-motivational qualities (e.g. tension, fear) and cognitive-evaluative qualities - words that "describe the subjective overall intensity of the total pain experience" (Melzack, 1975, p. 278), such as 'annoying' and 'unbearable'. The words in each of the 20 categories are arranged in rank order in terms of pain intensity. However, the dimensions are not equal in terms of number of categories or words, with the sensory dimension consisting of ten categories, the affective five and the evaluative one. A fourth 'miscellaneous' group consists of four categories and appears to be a mixture of sensory and affective words which Melzack (1975) reported as less commonly used.

The test can be scored in three different ways but the most common is the Pain Rating Index which is obtained by summing the rank values of the words selected by the patient as best describing his/her pain at present. In this administration of the test, the patients are instructed to select no more than one word from each category, but they do not have to select a word in each category if none apply. Separate scores can be derived for the three major dimensions (and the miscellaneous group) in the same manner as for the total PRI.

The MPQ may be administered as either an oral or a written test. However, there is evidence that, unless they are explained, many of the words are not readily understood by patients with limited education (Wolff, 1978), suggesting that a combined visual and oral administration might be preferred (e.g. Walsh & Bowman, 1982).

Evidence supporting the reliability of the MPQ Checklist (PRI) has been reported by Melzack (1975) and Graham, Bond, Gerkonsch and Cook (1980). The validity of the MPQ checklist has been more widely studied, however, with general but not complete support. Evidence of the construct validity of the MPQ checklist was reported by Reading, Everitt and Sledmere (1982) who, using a different methodology and statistical approach to that of Melzack and Togerson (1971), replicated the construction of the questionnaire and reported general support for the groupings of the words as well as the distinction between sensory and affective-evaluative dimensions, despite some differences with the original version. However, their findings did raise some doubts over the way in which the PRI is scored, with results indicating large individual differences amongst subjects over the relationship between intensity and the different words. In

particular, not all word groups could be ordered along a single intensity dimension and, when they were, the words were not necessarily equally spaced in terms of scale values.

Other studies of the MPQ's construct validity have also been generally supportive (e.g. Prieto, Hopson, Bradley, Byrne, Geisinger, Midax & Marchisello, 1980), though some factor analytic studies have reported from two to seven factors (e.g. McCreary, Turner & Dawson, 1981; Leavitt, Garron, Whisler & Sheinkip, 1978). McCreary et al. (1981), for example, concluded that the variation in the findings of such studies, often with different types of pain patients, suggested that the nature of the dimensions of pain may vary according to type of pain. However, they also acknowledged that differences in factor analysis procedures could also have contributed to the variable findings.

Kremer and Atkinson (1981) reported evidence in support of the construct validity of the affective dimension of the PRI when they found positive correlations between the affective dimension scores on the Somatization, Depression and Anxiety Scales of the Brief Symptom Inventory in a group of chronic pain inpatients. McCreary et al. (1981) found similar results with a group of chronic back pain outpatients using the hypochondriasis, depression and hysteria scales of the MMPI (which, interestingly, were independent of pain intensity ratings). In a later study, Kremer, Atkinson and Kremer (1983) found that the affective descriptors on the MPQ were a good predictor of psychological disturbance and were a more reliable predictor of psychological distress than the other dimensions of the MPQ.

However, while there is evidence of the construct validity of the MPQ, Turk, Rudy and Salovey (1985), criticized the factor analytic studies on the basis that they have generally employed exploratory rather than confirmatory factor analyses. Turk et al. (1985) argued that confirmatory factor analysis would seem more appropriate to test the underlying model of the PRI as "a priori expectations of the factor structure exist" (p. 387). Using two diverse samples of pain patients from different hospitals, Turk et al. (1985) found that confirmatory factor analytic procedures supported Melzack's three-dimension structure of the PRI. However, they also found that the three dimensions were highly intercorrelated and that the PRI did not display adequate discriminant validity to assess the three components of pain described by Melzack and Casey (1968) (i.e. sensory, affective, and evaluative). Turk et al. (1985) concluded that rather than separate sensory, affective and evaluative scores, only the total PRI score should be used and only as a measure of general pain severity.

Other evidence in support of the PRI as a pain severity measure has been reported. Reading (1979), for example, reported PRI scores to be correlated with analgesic requests, and Hunter and Philips (1981) reported significant correlations between MPQ scores and ratings of headache intensity and duration, though not frequency.

Thus, while the MPQ is now a widely used instrument in the measurement of clinical pain and there is evidence of its general psychometric adequacy, its scores still need to be interpreted with caution, particularly (in the present instance) when it is being considered as an outcome measure.

In addition to the problems already mentioned, such as vocabulary limitations and poor discriminant validity, some authors have also questioned the scoring format. Syrjala and Chapman (1984), for example, argued that the ranked scores could distort the data as the word groups have different numbers of words and the dimensions have different numbers of word groups. They concluded that "the MPQ scores are best treated qualitatively but certainly do not merit use of psychometric statistics" (p. 82).

2.2 Measurement of Suffering or Affective Distress

As discussed in the previous section, even if measures of pain intensity were accepted as psychometrically adequate, being unidimensional they could not be considered an adequate description of the multi-dimensional conceptualization of chronic pain. The pain intensity measures in the clinical setting have also been criticized on the grounds of contamination by affect. Chapman (1983), for example, argued that "the emotionally neutral intensity dimension of pain is an abstract concept not really relevant to distressed patients marking visual analogue scales, and it is doubtful that such scales can yield pure measures of pain intensity" (p. 245). Chapman considered that such scales are really measuring the aversive quality of pain.

Some studies, such as those reported by McCreary et al. (1981) and Leavitt and Garron (1979), have found that the description of pain experience by chronic pain patients has been related to levels of emotional disturbance. However, there have been few consistently employed measures of emotional distress associated with pain between studies. Although many studies have employed the MPQ's affective

dimension as an indicator of the emotional distress associated with pain, the findings of Turk et al. (1985) reported earlier would suggest that, by itself, this measure is insufficient.

The MMPI (although more commonly used for descriptive, diagnostic or predictive purposes) has also been employed in this capacity (e.g. McCreary et al., 1981; Moore & Chaney, 1985; Love & Peck, 1987). However, some authors have argued that the ways in which this measure is often used may tend to oversimplify the psychological processes involved in clinical pain (e.g. Bradley et al., 1981). Keefe et al. (1982) also criticized its use as an outcome measure on the grounds of its length, its trait - rather than symptom-orientation, and the possibility that it "may irritate patients who interpret the test as suggesting their pain is 'in their head'" (p. 326).

Other, more symptom-oriented measures of psychological functioning, such as the Symptom Checklist-90 (Derogatis, 1977), the Middlesex Health Questionnaire (Crown & Crisp, 1966), and the Illness Behaviour Questionnaire (Pilowsky, Spence, Cobb & Katsikitis, 1984), have also been used to assess affective distress associated with chronic pain. However, their use in outcome studies has been limited. In part, this may be related to the fact that these measures contain a number of dimensions in addition to that of affective distress and including all of the dimensions in an outcome analysis would, of course, affect the statistical power of the analysis. Such measures tend to have been used primarily for predictive, descriptive and diagnostic purposes, often with large samples of patients, rather than in the typical treatment evaluation setting (e.g. Bradley et al., 1981).

Probably the most widely-used measures of affective distress associated with chronic pain in the outcome context have been those normally employed as outcome measures in psychiatric settings, such as the Beck Depression Inventory and the State-Trait Anxiety Inventory (e.g. Turner, 1982; Kerns, Turk, Holzman & Rudy, 1986; Philips, 1987). The advantages of employing these measures include: their established psychometric properties, their brevity, and their widespread use as outcome measures. However, their use with chronic pain patients has been criticized on the grounds that they were not specifically developed for such a population and some, particularly the depression scales (e.g. the BDI), may tend to result in inflated scores when used with chronic pain patients as some of the items may relate more to the disabilities associated with pain than depression (e.g. Kerns, Turk & Rudy, 1985). For example, disturbances in sleep, appetite and sexual activities may be related more to pain (and medication use) than to depression in this population. However, if used for outcome purposes, rather than for descriptive or diagnostic purposes with chronic pain patients, it could be argued that any inflationary influence associated with the pain condition would be reasonably constant.

Some investigators have developed measures of affective distress specifically for pain patients which take heed of this sort of criticism (e.g. Kerns et al., 1985). However, as yet there is no evidence that, apart from face validity, such measures are any more useful in the clinical setting than those measures developed in psychiatric settings. Nevertheless, it is clearly premature to draw conclusions about this issue given the limited data available.

In conclusion, there is currently no general consensus on which particular measures of affective distress should be used with chronic pain patients. However, there is general consensus that measures of affective distress should be employed as part of a multi-dimensional assessment of treatment outcome with chronic pain patients.

2.3 Assessment of Pain-Related Behaviours

Classifying pain behaviours as either respondents or operants, Fordyce (1976) conceptualized them as overt expressions or communications of pain which, unlike the subjective experience of pain, were amenable to observation and thus, recording and measurement. Pain behaviours, in Fordyce's (1976) view, included (i) verbal complaints of pain and suffering, (ii) non-language, paraverbal sounds (e.g. moans), (iii) body posturing and gesturing (e.g. limping and grimacing), (iv) display of functional limitations (e.g. lying-down during the day), and (v) behaviours concerned with pain reduction (e.g. use of analgesic medication and treatment seeking). Sanders (1979) expanded on Fordyce's focus on overt behaviours and included covert (e.g. cognitions) and physiological responses as well in his trimodal model of pain. Since then reference to the construct of pain behaviours has often included these three response systems (i.e. overt behaviours, cognitions and physiological responses) (e.g. Keefe et al., 1982; Follick, Zitter & Ahern, 1983; Turk, 1986). Follick et al. (1983), in fact, argued that failure to consider covert pain behaviours as part of the assessment of pain patients attending behavioural treatment programmes could have accounted for many of the failures of these programmes - on the grounds that the patients concerned were not

fully assessed in the first place and thus the treatment presented may not have been directed at the appropriate targets.

While noting that behavioural assessments of chronic pain patients tend to focus on identifying and measuring target behaviours, Keefe et al. (1982) argued that the selection of specific target behaviours (i.e. of what constitutes a pain behaviour) has tended to be based on a priori theoretical grounds - particularly Fordyce's (1976) model. Some investigators have recently questioned what they considered to be some of the assumptions of this model. For example, Turk and Flor (1987), referring to evidence of differences in identified 'pain behaviours' between different pain problems (e.g. limping has been found more often in low back pain patients while grimacing has been found more often in neck pain and head cancer pain patients), argued that such differences raised questions about the appropriateness of subsuming such a variety of behaviours under one construct. They argued that while some pain behaviours may be a means of communication to gain attention or serve to avoid undesirable activities (i.e. they may be positively or negatively reinforced by such external consequences) others may be (i) strategies to reduce pain (e.g. medication use, reclining after activity), (ii) related to physical impairment (e.g. use of walking stick for support) or (iii) protective - in that a patient may have found that walking in a stiff posture, for example, may lessen any exacerbation of pain. In other words, internal consequences associated with a given patient's physical pathology or pain could be reinforcing some pain behaviours. In support of their argument, Turk and Flor (1987) noted the findings of Keefe, Wilkins and Cook (1984) which indicated that measured pain behaviour could be predicted by

the results of physical examination and/or the number of operations undergone. Turk and Flor (1987) argued that a consideration of medical status variables (i.e. physical pathology) was therefore important in the analysis and understanding of pain behaviours - as opposed to external reinforcement contingencies alone.

There is evidence, however, that the relationship between the results of physical examinations and pain behaviours can vary considerably (e.g. Meenan, Gertman, Mason & Dunaif, 1981; Wall, 1979). Similarly, the relationship between reported pain intensity and pain behaviours has also been shown to vary (e.g. Fordyce, Lansky, Calsyn, Shelton, Stolov, and Rock, 1984). Nevertheless, if Turk and Flor's (1987) point (which has also echoed by others, e.g. Linton, Melin & Gotestam, 1984) is accepted, it would mean that in selecting behaviours as pain behaviours the investigator would need to consider the behaviour in the context of a given physical condition. It would also seem to suggest that the comparisons of behavioural results of treatment studies across different pain populations (e.g. headache versus low back pain patients) would require qualifications. For example, increases in rate or extent of walking may be an appropriate treatment goal with chronic low back pain patients but is unlikely to be relevant to headache or shoulder pain patients. Thus, in some respects, this would be an argument for studying only one pain population or pain-type at a time.

Turk and Flor's (1987) approach also suggests that the construct 'pain behaviour' might be better conceptualised as 'pain-related behaviour' or behaviour identified (by either the pain patient or clinician) as pain behaviour on the basis of its association with

pain - rather than because it communicates or expresses the actual experience of pain.

The actual delineation of pain behaviours, however, appears to vary from study to study - partly because of different measures employed, partly because of different pain conditions studied and partly because of different treatment settings. Some studies, for example, have focussed on what might be called 'molecular' pain behaviours, such as counting the numbers of groans, limps, grimaces or analgesics consumed in a given period (e.g. Keefe & Block, 1982; Richards, Nepomuceno, Riles & Suer, 1982). Typically, such approaches have been employed in in-patient settings. Some studies, on the other hand, particularly those dealing with outpatients, have often focused on what might be called 'molar' pain behaviours (or categories of pain behaviours - as opposed to individual responses), such as general activity avoidance and withdrawal from social activities (e.g. Philips & Jahanshahi, 1986). Fordyce et al. (1985) also referred to reductions in such behaviours as 'excessive functional disabilities' and appeared to discriminate between them and 'molecular' pain behaviours. For example, they referred to the possibility that "pain behaviours may be diminished and activity level increased" (p. 122).

While this issue could be seen as simply a matter of semantics, it could have both treatment and assessment implications, particularly in the context of treatment-outcome comparisons. From the assessment perspective, it is clearly important for comparison and outcome evaluation purposes that investigators define what they mean by 'pain behaviours' (and 'well behaviours' for that matter), preferably by employing similar measures to those used by other

investigators. From the treatment perspective, although Fordyce et al. (1985) described behavioural treatment programmes as essentially concerned with rendering "chronic pain patients functional again and as normal in behaviour as possible" (p. 115), Follick et al. (1983) argued that such a goal is unlikely to be achieved by the reduction of ('molecular') pain behaviours alone. Thus, attending to the measurement of both 'molecular' and 'molar' categories of pain behaviours (or excessive functional disabilities) is likely to have the maximum relevance in the therapeutic context.

This section will examine the assessment of three categories of pain-related behaviour: overt, covert and physiological. It will examine measures of both 'molecular' pain behaviours as well as broader measures of general functional disabilities (or 'molar' pain behaviours).

2.3.1 Self-Report Measures

(i) Overt behaviours

Self-report or self-observation measures of pain behaviours generally fall into two categories - those involving the patients recording of specified behaviours on a daily or hourly basis over a given period and those involving a more generalized assessment by the patient on his/her current activity level. An example of the former is Fordyce's (1976) activity diary which consists of a printed form which the patient is asked to carry with him/her and on which he/she records on an hourly basis the amount of time spent walking or standing, sitting and reclining, as well as medication use and pain intensity level. The amount of time spent daily in each category, as well as daily 'uptime' (total time spent sitting, standing and

walking) can thus be calculated and graphed. Similar direct recording of specified behaviours have also been applied to the practice of physical exercises, such as sit-ups, straight-leg raising, etc. (e.g. Cairns, Thomas, Mooney, & Pace, 1976) and medication intake (e.g. Brena & Unikel, 1976).

An example of the general assessment type of pain behaviour measure is the Sickness Impact Profile (Bergner et al., 1981). This is a behaviourally-based inventory aimed at assessing the effects of health status on 12 categories of common activities. These include: sleep and rest, emotional behaviour, home maintenance, social interaction and work. The patient is asked to rate 136 statements sampling these activities as either true or false according to whether or not they describe him/her on a given day and are related to his/her health status. The term 'health status' can, of course, be defined for chronic pain patients as 'pain'. In other words, the patient is asked to relate the statements in the inventory to his/her pain (e.g. Turner, 1982; Follick et. al., 1983).

In contrast to the diary format, therefore, the SIP provides a more global assessment of the patient's current level of functioning which, from the patient's perspective, is related to pain. Other examples of the questionnaire approach include the Pain Behaviour Checklist (Zarkowska, 1981) - a 49 item list of typical pain-related activities which the patient is asked to indicate whether or not they have done in relation to his/her present pain condition. Philips and Jahanshahi (1986) divided (a priori) the items into 3 categories: avoidance, complaint and help-seeking. More recently, Kerns, Turk and Rudy (1985) developed an inventory (The West Haven-Yale Multidimensional Pain Inventory - WHYMPI) intended to sample the

patient's perception of the impact of pain on his/her life, the response of significant others to the patient's expressions of pain and the extent to which the patient engages in common daily activities.

As both forms of self-report measure generally apply to current activities or functioning they can be employed at pretreatment and posttreatment in treatment outcome evaluation. However, while the reliability and validity of self-report measures in general have been questioned, evidence of adequate reliability and validity has been reported for questionnaires like the SIP and WHYMPI (e.g. Bergner et al., 1981; Follick et al., 1985; Kerns et al., 1985). The possible influences of demand characteristics (e.g. the patient recording or reporting according to his/her perception of what the clinicians concerned would like to see rather than according to what he/she actually did) and poor compliance have often been cited as casting doubt on the reliability and validity of such measures (e.g. Syjala & Chapman, 1984; Keefe et al., 1982; Bradley et al., 1981). For example, the self-monitoring of medication-intake has been found quite unreliable when checked independently (e.g. Taylor, Zlutnick, Conley & Flora, 1980; Ready, Sarkis & Turner, 1982). Also Kremer et al. (1981) reported that three out of the four pain inpatients they studied significantly under-reported their level of well-behaviour when compared to staff observations and Keefe et al. (1982) reported doubts about patient compliance in completing self-monitoring forms especially when the number of such tasks is large and/or complicated. They cited an earlier study (Keefe, Kopel & Gordon, 1978) in which they had reason to believe that some of the patients had completed

their self-monitoring forms at one sitting - thus casting considerable doubt on the validity of the data.

Despite such shortcomings, the use of self-report measures has been supported on the grounds that they are inexpensive (e.g. require little staff time), easy to administer, cross-situational (i.e. useful for assessment of generalization effects beyond the clinic setting) and can be therapeutically useful (e.g. by increasing the patient's awareness of target behaviours and promoting a greater sense of self-control) (e.g. Fordyce, 1976; Keefe et al., 1982; Syrjala & Chapman, 1984; White et al., 1985).

Kerns et al. (1985) also argued that, from a cognitive-behavioural perspective, assessment of patients' appraisals of their experience of pain and its effects on their lives were important for treatment planning and treatment-outcome evaluation. They argued that objective assessment of observed pain behaviour, by itself, was an insufficient measure of pain behaviour because it was unlikely to lead to an understanding of the function of some pain behaviours, especially those reflecting covert contingencies. There is considerable support therefore, consistent with a multidimensional understanding of pain, for the use of self-report or self-observation measures of pain behaviours despite evidence that such data may be at variance with observed behaviours.

(ii) Covert Behaviours

The use of self-report measures of covert behaviours is, of course, unavoidable, and clearly, the criticisms of susceptibility to the influence of demand characteristics and doubtful compliance apply just as much in this context as they do for self-report measures of

overt behaviours. Nevertheless, a number of measures of cognitive pain behaviours have been reported. Some have addressed the use of cognitive (and behavioural) pain coping strategies, such as Rosenstiel and Keefe's (1983) Coping Strategy Questionnaire, while others have examined the patient's beliefs about his/her pain, such as Gottlieb's (1984) Pain Beliefs Questionnaire, and tendency to somatize or focus attention on somatic symptoms, such as Main's (1982) Modified Somatic Perception Questionnaire. Pilowski et al's (1984) Illness Behaviour Questionnaire samples patients' perceptions of a mixture of cognitive and behavioural responses in relation to their illness.

While some evidence of the reliability and validity of these measures has been reported (e.g. Rosentiel and Keefe, 1983, reported alpha coefficients for inter-rater correlations within each subscale of the CSQ in the range 0.71 to 0.95 and Gottlieb, 1984, reported significant correlations between improvement on other measures after treatment and endorsement of positive and negative pain belief statements), some findings have been mixed. For example, Main and Waddell (1987) found that the IBQ, as a whole, correlated poorly with other measures of pain-related functioning. Thus casting doubts on the reliability, validity and utility of the IBQ. However, Keefe et al. (1987) did find a significant correlation between observed pain behaviour scores and the Disease Conviction dimension of the IBQ.

Some investigators have also reported the use of structured interviews, parts of which sample patients' cognitions about their pain. Turk et al. (1983), for example, asked patients to describe their cognitive and affective responses to a recent episode of increased pain intensity. However, while such methods are

undoubtedly useful in target identification in treatment planning for individual pain patients, their usefulness in treatment-outcome contexts is limited as they usually have no reported psychometric properties and may not be scored.

2.3.2 Observation Measures

One of the first systematic attempts to measure pain behaviour objectively by observation was described by Fordyce (1976). Employing as his unit of measurement what he called a 'movement cycle' (i.e. from when the patient starts a given behaviour to when he/she is capable of repeating it) Fordyce counted the occurrence of such behaviours as pain statements, walking, weaving and sit-ups over given period of time. For example, a walking movement cycle could be defined as the completion of a 200 feet walk in 30 minutes. Such operationally defined movement cycles were, therefore, able to be recorded by observers (as well as by the patients themselves) and rates of movement or activity could be used as treatment outcome measures.

More recently, Keefe and Block (1982) described a method for measuring four defined pain behaviours (guarded movement, bracing, rubbing and sighing) in the clinic-setting. This method required a patient to perform four types of activity (standing, sitting, walking and reclining) in one and two minute periods over ten minutes. The behaviours could be video-tape and later rated by independent observers in terms of the four pain behaviours. In a subsequent development of this method, Keefe, Wilkins and Cook (1984) described a modified version (not employing the video-tape and, hence, less expensive) which could be performed in a clinic setting during the

course of a physical examination. High levels of inter-rater reliability were reported for both versions (e.g. Keefe & Block, 1982; Keefe et al., 1984). However, only moderate correlations were obtained between scores of pain behaviour and pain intensity ratings taken over the same period.

A similar, but slightly simpler method of observer rating of pain behaviour was described by Richards, Nepomuceno, Riles and Suer (1982) which they called the UAB Pain Behaviour Scale (PBS). Like the other observation measures already described, the PBS was designed for use in the clinic or hospital setting, usually with inpatients. It measures 10 specified types of pain behaviour, such as vocal complaints which are verbal, vocal complaints which are nonverbal, time spent reclining because of pain between 8am and 8pm, and facial grimaces, which are rated by a trained observer in terms of either how often they occurred during a standardized and structured 5 minute session with the rater or how much over the previous 24 hours (as in the case of medication intake and time spent reclining). Richards et al. (1982) reported inter-rater reliabilities of 0.94 to 0.96 for three trained raters and high test-retest reliability. While correlations with MPQ total pain descriptors score at admission and pain ratings on the VAS were not significant, the correlations between the PBS and pain ratings on the VAS were significant at discharge. Richards et al. (1982) also reported that PBS scores were inversely correlated with measures of designated well behaviours.

Feuerstein, Greenwald, Gamache, Papciak, and Cook (1985) reported a modified version of the PBS for outpatient use. As reclining due to pain (or downtime) and medication intake could not

be independently assessed with outpatients, Feuerstein et al. (1985) removed these items in their outpatient version and were therefore left with eight items which could be observed during a clinic visit. After examining 43 chronic pain outpatients with the Modified PBS (and other measures), Feuerstein et al. reported that the scale had a high degree of internal consistency and that it displayed reasonable degrees of convergent and discriminant validity when compared with measures of decreased activity level, pain intensity, and such psychological phenomena as depression, anxiety and self-control.

An alternative form of observation measure used in some studies is the behaviour rating scale (e.g. Teske, Dant & Cleeland, 1983) in which a trained observer rates (on a scale of severity or intensity, rather than frequency) defined behaviours thought to reflect pain or affective distress. Again, such measures have mainly been used on an inpatient basis where there is opportunity to discretely observe a patient over an extended period. In the measure described by Teske et al. (1983) two nurse observers were trained to rate such behaviours as restlessness, guarding, and groans, etc., on a 7-point scale of intensity (i.e. from 'none' to 'extreme'). The observers were also asked to make global judgements about the patients' pain and suffering ratings, rating them on two 7-point scale of intensity. Analysis of the results obtained by both observers indicated a high level of agreement on the more easily observed behaviours such as rubbing or grunting but low agreement on less easily observed or defined behaviours and less frequent behaviours, such as frowning or grimacing. However, the correlations between the observers' ratings and patients' reports of pain intensity were only modest, though statistically significant. Interestingly, in the context of studying

chronic pain, discrepancies between observers' ratings and patients' ratings of pain were much greater in the chronic pain sample than an acute pain sample.

Discrepancies between what patients say about their pain and what they do is not uncommon (e.g. Fordyce et al., 1984), but does not necessarily invalidate either (e.g. Syrjala & Chapman, 1984; Turk & Flor, 1987). However, while a multidimensional assessment of pain requires sampling of both domains, it is clearly important that when observer-rated measures of pain (and well) behaviours are employed adequate inter-rater reliability is established as it cannot be assumed - as the Teske et al. (1983) study demonstrates. It may also be significant that their study found greater disparity between observers' ratings of pain and patients' ratings of pain with chronic pain patients than with acute pain patients. In this case the observers significantly underrated the pain of the chronic pain sample and only marginally underrated the pain of the acute pain sample.

Provided that adequate inter-rater reliability is established, and preferably re-checked from time to time (White et al., 1985), the use of observation measures of pain behaviours can offer reliable and objective measurements of specified behaviours which are of clinical value. However, they are not without limitations. Probably the main one is that they are generally performed either on a ward (with inpatients) or clinic setting and not in the community where the patient lives. Thus, the generalizability of the results obtained from such observation measures is often a problem unless, of course, other measures of behaviour in the community settings are also obtained. Typically, as mentioned previously, this has involved the

use of self-report or self-observation measures completed by the patients themselves. However, some studies have also examined the use of patients' spouses or significant others in this regard. For example, Turner (1982) reported a modification of the SIP so that a patients' spouse (or significant other) could rate the patients' current behaviour with it.

Unfortunately, no correlational data between the self-report and other-report versions (of the SIP) were reported, although inspection of the results indicates that the spouses tended to underrate the patient's self-reports (i.e. score the patients as less functionally impaired due to pain than the patients reported themselves). Nevertheless, the use of the SIP in this manner does suggest a feasible means of obtaining relatively independent information about a patient's behaviour away from the clinic or hospital setting, particularly as it doesn't depend on specially trained observers, which could be both intrusive and expensive.

Reliance on adequately trained observers and associated additional costs, especially when equipment such as video-recording devices are employed, has frequently been noted as an additional problem for observation methods (e.g. White et al., 1985). As a possible alternative to the use of trained observers, some studies have reported employing mechanical devices to record various physical activities, such as movement (e.g. Sanders, 1980). However, as Turk and Rudy (1987) pointed-out, such devices are limited in what is recorded and as a rather coarse measure should only be used in conjunction with other measures.

Reactivity by the patient to the assessment measure has, often been seen as a problem with self-report measures, however, such criticism can also be applied to observer-rated methods. Block et al's. (1980) study, for example, clearly demonstrated the influence the presence of an observer could have on the pain behaviours emitted. Keefe and Block (1982) claimed their video-taping technique could be one way of reducing this effect as the observers are not present during filming. However, the filming, itself, could be argued to be a possible source of influence. Discrete recordings of behaviour can be made in ward settings but, again, the problem of generalizability remains. Turk and Rudy (1987) also argued that the timing of behavioural observations can be a possible source of influence. Whether, for example, such recordings are made following physical exercises (when pain intensity might be expected to be greater) or before such exercises (when pain might be less) could influence the behavioural scores and, thus, would need to be considered when interpreting the scores. Furthermore, although the behavioural observation measures may be seen as more objective than self-report methods, that does not mean they are necessarily free from cognitive or affective mediation by the patient (Turk & Rudy, 1987).

To conclude, while the use of observational measures of pain behaviour has a number of advantages over the self-report methods, particularly when it is considered that behavioural treatment programmes are attempting to change behaviours rather than pain per se (Fordyce et al., 1985), such measures do have a number of limitations, particularly with regard to generalizability from the usual measurement setting in a clinic to a patient's normal

environment. Consequently, while some form of observational measure of behaviour can be considered important in treatment outcome evaluations, their limitations indicate that they should be used in conjunction with other measures, particularly self-report measures. It was also noted that one solution to the generalizability problem of clinic-based observational measures is the use of an observer in the home environment, such as the patient's spouse (e.g. Turner, 1982). Consequently, in the series of studies to be presented shortly a significant-other version of the SIP will be employed as an observer-rated measure of general, pain-related functional impairment.

2.3.3 Physiological Measures

While a number of physiological responses have been measured in pain patients, such as muscle tension, autonomic responses like heart rate and skin resistance, evoked potentials, and levels of endorphins in cerebro-spinal fluid, by far the most commonly measured physiological response in treatment outcome evaluations has been muscle tension and even that has been very limited in extent (e.g. Keefe et al., 1982; Syrjala & Chapman, 1984; White et al., 1985).

As possible explanations for this infrequent use of such measures, Syrjala and Chapman (1984) noted that not only were the correlations between individual pain reports and physiological measurements often inconsistent, but also some measures, particularly autonomic ones, tend to decline over time irrespective of pain and they are also likely to be influenced by factors other than pain such as stress or anxiety (e.g. Collins, Cohen, Naliboff, & Schandler, 1982). Flor, Turk and Birbaumer (1985), for example, found

elevations of paraspinal electromyogram (EMG) reactivity to discussion of personally relevant stress in chronic back pain patients, but not in non-back pain patients or healthy controls. While such findings indicate that EMG recordings may be useful in measuring the effects of treatment, particularly relaxation and coping-skills training, it should be noted that the findings were specific to one particular pain group and the authors did acknowledge that different types of medication could affect such measures and factors such as spinal surgery and movements during measurement (not uncommon for seated back pain patients) could introduce sources of error.

Heeding the inconsistent findings between EMG readings and reported pain, and Wolf, Nacht and Kelly (1982) studied patterns rather than absolute levels of EMG activity in lumbar muscle sites in chronic back pain patients under varying conditions. They found asymmetry between right and left lumbar spine EMG levels during static and dynamic activities in these patients. They also reported reductions in reported pain (on the MPQ sensory dimension) and increases in activity levels in chronic back-pain patients trained to produce more normal (i.e. symmetrical) EMG patterns. However, as numerous reviews of the use of EMG measures in headache samples (where they are used most often) have reported, consistencies between such measures (and other physiological measures) and treatment outcome have not been common (e.g. Philips, 1980; Andrasik, Blanchard, Arena, Saunders and Barron, 1982). Wolf et al. (1982) also pointed to methodological problems in the use of EMGs, such as varying methods of recording and placement of electrodes.

In sum, the use of physiological measures in treatment outcome evaluations has been limited by methodological problems as well as reports of inconsistent findings and difficulties in interpretation. There seems to be a degree of consensus between investigators that while there have been some promising findings (e.g. Wolf et al., 1982; Flor et al., 1985), the relationship between physiological responses, reported pain and activity levels is clearly very complex and as yet poorly understood (e.g. Keefe et al., 1987; Syrjala & Chapman, 1984; White et al., 1985). As a consequence, the use of such measures, although perhaps desirable as a confirmatory measure when relaxation training is conducted, has tended to be rare in clinical outcome studies.

Comments

The assessment of chronic pain in the treatment setting clearly presents a number of theoretical and methodological problems. The prevailing model of chronic pain predicates that the assessment of chronic pain should include measures which sample a number of dimensions, such as sensation, affective disturbance and behaviour. The purpose of the assessment can also be considered to determine the nature of the measures employed and the form the assessment takes.

This review of the current literature indicates that despite their psychometric attractions, the psychophysical approaches to measuring pain sensation have not yet been established as clinically relevant and their use in treatment evaluation is rare. In contrast, despite criticism of their psychometric deficiencies, category rating scales and visual analogue scales are widely used in treatment evaluation. However, by themselves, they cannot adequately describe

the multiple dimensions of chronic pain, and thus need to be used in conjunction with other measures. Assessment of the qualities of pain has largely depended on the McGill Pain Questionnaire (MPQ), yet, despite its wide use, it remains unclear whether it offers any more than a measure of pain severity. Its use as an outcome measure has also been questioned. Even though some studies have found the affective scale of the MPQ related to affective disturbance, it could be argued that if an assessment of affective disturbance is required it may be better to employ an already established and psychometrically adequate measure of affective disturbance. A number of treatment evaluation studies have evidently taken this course, despite the difficulties such measures as the Beck Depression Inventory may have with some of their items conflicting with pain-related rather than affect-related phenomena. While it would seem desirable to employ measures of affective disturbance developed specifically for pain populations, their use at present is limited.

The assessment of pain-related behaviours has posed particular theoretical and methodological problems. There still appears to be a divergence of views as to what constitutes a pain behaviour and measurement of them seems to be particularly influenced by the treatment setting. Thus, inpatient studies commonly focus on individual behaviours while outpatient studies focus on more general measures of activity dysfunction. Although the relationship between the two types of pain behaviour was not really explored, it would seem that the individual behaviour approach has the advantage of greater reliability and validity, largely due to their amenability to observer-rating rather than self-rating methods. The general activity dysfunction approach, in contrast, has the advantage of

potentially greater generalizability to the normal daily life of a patient, but the disadvantage of relying more on self-rating methods. One innovative approach has, however, devised a way of employing a significant-other person from the patient's home environment to rate the patient's home activities, although the psychometric adequacy of this approach remains to be fully established. The relative merits of observer-rated and self-rated measures have been extensively debated in the literature, but there appears to be general agreement that both types of assessment should be included in treatment evaluation studies. However, the form the observer-rated assessment takes is, to some extent, determined by the treatment setting, and in outpatient treatment settings it can be argued that use of a significant-other person from a patient's home environment offers an acceptable compromise in this regard.

While some investigators have included covert responses, such as self-statements about pain, within their definition of pain behaviours, such responses have more commonly been assessed as concomitants of overt pain behaviours in an attempt to explore factors which might influence overt pain behaviours (e.g. Philips, 1987a; Turner & Clancy, 1986). Changes in physiological functioning, such as EMG recordings of muscle tension changes, have also been considered as a type of covert pain behaviour. However, the findings from much of the research in this area have often been inconsistent and affected by methodological problems. Largely as a consequence, but probably related to matters of practicality as well, few treatment evaluation studies appear to employ such measures.

In conclusion, despite their deficiencies, it can be argued that an adequate armamentarium of measures now exists for a multidimensional assessment of chronic pain in the treatment setting. In the evaluation of treatment studies the degree to which the experimenters employ measures which sample the multiple dimensions of chronic pain should therefore be kept in mind.

CHAPTER 3COGNITIVE, BEHAVIOURAL AND RELAXATIONTREATMENTS FOR CHRONIC PAIN

Largely because of the lack of success in treating chronic pain patients and the concomitant accumulation of evidence of the role of psychological factors in chronic pain complaints, many multidisciplinary pain units began including cognitive, behavioural and relaxation techniques in their treatment programmes during the 1970's. While early results were considered "promising" (Linton, 1982), reviews of the literature covering the 1970's to early 1980's period reported serious methodological deficiencies in the published studies which hindered evaluation of the psychological treatment methods (e.g. Linton, 1982; Keefe, 1982, Turner and Chapman, 1982a, 1982b). Two years later Turner and Romano (1984) concluded that while some progress had been made with regard to the methodological issues, many problems remained, particularly the need for controlled group treatment studies with long-term follow-up evaluations and standardised and commonly used assessment methods. Linton (1986) reviewed the literature published since his earlier paper and concluded that although the general quality of the studies had improved and substantial evidence for the use of behavioural treatments and relaxation techniques had been produced, evidence for the use of cognitive treatments remained limited and it was still not clear which treatment methods were the most effective and economic.

Since Turner and Romano's (1984) and Linton's (1986) reviews were published a number of controlled treatment studies of cognitive, behavioural and relaxation methods have been reported. This section will review the evidence for the use of such methods, with a particular emphasis on the more recent studies. As in the previous sections of this review, the primary focus of this section will be on chronic, intractable, benign pain, particularly low back pain, which accounts for the largest proportion of typical pain clinic patients (Shealy and Shealy, 1976; Sandanam, 1984). Linton (1982) pointed out that it is not known if the findings of research on the treatment of headaches will generalise to other chronic pain conditions, and as Turk et al. (1983) defined it, headache pain tends to be more periodic than chronic low back pain. Furthermore, it was pointed-out earlier that many of the functional limitations, such as restricted walking, which are often associated with low back pain are unlikely to be associated with headaches, making some treatment outcome comparisons problematic. Consequently, other than where they appear in heterogeneous pain complaint samples, the findings of headache research will not be included in this review.

3.1 Multimodal Treatment

Most hospital-based pain unit treatment programmes for chronic pain are multimodal in nature (Chapman, Brennan, and Bradford, 1981; Gottlieb, Koller, and Alpers, 1982). In such programmes treatment may include: medication, various forms of physiotherapy, acupuncture, transcutaneous nerve stimulation (TNS), family therapy, group therapy, education, electromyographic (EMG) biofeedback,

behavioural therapies, relaxation training and stress management procedures. However, the actual mix of interventions varies from one programme to another, making comparisons difficult. This is often compounded by the fact that different programmes often use different outcome measures. Furthermore, evaluations of such programmes are often based on pretreatment to posttreatment assessments, with no control groups used. Consequently, it is difficult to determine not only the efficacy of the programmes, but also the relative efficacy of their components. Although, as most of the patients attending such programmes have previously received other forms of treatments without success, any improvement after the multimodal programmes may, at least, be considered to justify the continued use of such programmes and warrant further investigation of the active components. Before proceeding to look at the evidence relating to the cognitive, behavioural, and relaxation components of these programmes, the evidence on multimodal programmes will be briefly reviewed.

The typical aim of these programmes is to achieve improvements in as many pain dimensions as possible, including reduction in pain severity, affective disturbance, and various pain behaviours, such as medication use, and a corresponding increase in activity level and various well behaviours, especially return to work.

In one of the earliest programmes, Swanson, Swenson, Maruta, and McPhee (1976), for example, reported moderate to marked improvement in 27 (54%) of the first 50 chronic pain patients to attend their inpatient programme of behaviour modification (non-reinforcement of

pain behaviours and reinforcement of increased activity and functioning), physiotherapy (education on anatomy, exercises, TNS), gradual medication reduction, counselling of patient with family, biofeedback and relaxation. Improvement was greatest in verbal pain behaviours, medication use and in independent physical function. Pain intensity levels changed the least. However, a third of the patients left the programme early and follow-up measures were not reported.

In a more recent study, Chapman et. al (1981) reported significant improvements in a group of 100 chronic pain patients who attended their outpatient programme. The programme included detoxification from medication, nerve blocks, physiotherapy, education and reinforcement of well behaviour. At 21 months follow-up, subjects reported significant decreases in pain intensity and increases in daily living activities, with substantial reductions in use of analgesic medication. Significantly, there was no difference in outcome between those subjects with and without pending or current compensation litigation.

Other, similar, programmes have reported similar results with a variety of chronic-pain conditions, particularly on measures of activity level, pain, mood, and medication use (e.g. Gottlieb et al, 1982; Khatami and Rush, 1982). Many studies have also reported reasonable maintenance of treatment effects at follow-up (e.g. Chapman et al, 1981; Khatami and Rush, 1982). However, some studies did report substantial drop-out levels (e.g. Swanson et al, 1976) and some found little or no improvement for the majority of their

subjects at follow-up (e.g. Newman, Seres, Yospe, and Garlington, 1978).

However, as noted earlier, while the results of these large multicomponent treatment programmes often appear impressive, the lack of control groups in such studies precludes confident assessment of their efficacy. In particular, the relative contributions of the various components of these multicomponent programmes cannot be determined from such studies. As a consequence, a number of studies have attempted to evaluate the individual components of these larger programmes in varying degrees of isolation. Thus, the following sections will examine the evidence relating to the use of behavioural, cognitive, and relaxation techniques, both alone and in combination, in the treatment of chronic pain. Although it may often be difficult to separate the available studies according to treatment type, for the present purposes, the literature will be divided into three parts: (1) studies dealing predominantly with behavioural treatments, (2) studies dealing predominantly with cognitive treatments, and (3) studies dealing predominantly with relaxation treatments.

3.2 Behavioural Treatments

The principal behavioural methods used have generally been derived from Fordyce's (1976) approach and focus, firstly, on reducing such pain behaviours as medication use, complaints of pain, lying down during the day, and avoiding activity, and secondly, on increasing such well behaviours as activities of daily living and exercise. Typically, reinforcement is given contingent on desired

changes in the well behaviours and is withheld following pain behaviours. Reinforcement may be in the form of praise or attention by staff or family or performance feedback. Analgesic medication intake is put on a time-basis rather than a pain-basis, in the belief that this may extinguish any pain behaviour reinforcing effects that take-as-needed medication use may have. The medication dose is then gradually reduced, often by means of a medication cocktail.

Unfortunately, most of the behavioural studies have been of the uncontrolled single group design which, despite some long-term follow-ups, has made evaluation of efficacy difficult. More recently, however, some controlled group treatment studies have been reported and they will be reviewed following an examination of the uncontrolled studies. One of the earliest examples of the uncontrolled type was reported by Fordyce, Fowler, Lehmann, De Lateur, Sann, and Trieschmann (1973), in which they treated 36 inpatients, mainly presenting with chronic low back pain, using the methods described above. They reported significant increases in activity level and exercise tolerance and decreases in medication intake and average pain intensity ratings. These improvements were largely maintained at a 22 month follow-up. Other studies have reported similar results with this design (e.g. Sternbach, 1974; Cairns, Thomas, Mooney, and Pace, 1976). Cinciripini and Floreen (1982), in particular, reported some impressive results from their single group study which involved 121 chronic pain patients with a variety of pain complaints in a 4-week inpatient behavioural programme (which, like many others, also included relaxation training and physical therapy). They followed-up the patients after 6 and 12

months and found that the substantial improvements achieved at posttreatment on measures of pain intensity, verbal and nonverbal pain behaviour, and physical activity were largely maintained at the follow-ups. One of their major findings included an increase in the number of patients not taking medication - from 2.4% at admission to 92.2% at discharge and although there was some regression at follow-up the figure was still 55% at 12 months. Despite these findings, however, the absence of any comparison groups limits conclusions about the efficacy of the programme or its components.

Using a type of group comparison design Roberts and Reinhardt (1980) reported an inpatient operant treatment programme with 58 chronic pain patients who presented with various pain complaints. They compared the outcomes on three groups; the 26 who completed treatment, the 20 who were rejected as unsuitable by the clinic team and, the 12 who refused treatment. At follow-ups of 1 to 8 years, 77% of the treated subjects were reported to be leading normal lives without analgesic medication compared to only 1 subject in the other two groups. However, the non-random subject selection method for the groups clearly weakens these findings.

In a better designed study, but with only a small sample of 4 chronic low back pain inpatients, Sanders (1983) used a multiple baseline across subjects design in which each subject received 4 behavioural treatments (relaxation, assertiveness training, functional pain-behavioural analysis, and social reinforcement of increased activity). Treatment consisted of five 50 minute sessions over 5 days. The results showed that relaxation training contributed

most to overall improvement (in terms of pain intensity reduction and reduced medication intake), with social reinforcement of activity next. Behavioural analysis and assertiveness training had little effect. In a small controlled group study, Cairns and Pasino (1977) compared the effects of verbal reinforcement, with and without graphic feedback of performance, on 9 chronic back pain patients. Significant increases in specified activities occurred only during the two conditions receiving contingent verbal reinforcement. However, there was no follow-up to ascertain whether or not there were any maintenance effects. Despite their limitations, these two studies do at least provide some experimental evidence that individual behavioural treatment components can have measurable effects on the pain related behaviours of clinical subjects.

More recently, a small number of controlled group treatment studies have been reported in which behavioural treatments were compared with either waiting list controls or alternative forms of treatment. However, it appears that only two of these studies employed a reasonably 'pure' behavioural treatment (i.e. along the lines described by Fordyce, 1976), as opposed to various combinations of behavioural, cognitive and other methods, and even the 'pure' behavioural treatment studies included relaxation training. Furthermore, none of these controlled studies involved an inpatient programme.

Perhaps the study which has come closest to a controlled inpatient behavioural treatment programme was reported by Linton and Gotestam (1984) who used a number of single subject designs in which

the subjects were assigned to one of three groups, one of which involved spending 6.5 hours a day, 4 days a week for 4 weeks on a hospital day ward (i.e. attending the ward during the day). The study compared a waiting list control condition with 2 treatment conditions - one receiving applied relaxation training and the other, applied relaxation training plus an operant conditioning programme similar to that described by Fordyce (1976). Fifteen chronic pain patients, complaining mainly of back and joint pain, were randomly assigned to one of the three groups. The results indicated that the operant treatment plus relaxation condition improved more on measures of activity and medication use compared to the relaxation and waiting list conditions while the relaxation condition improved more on the measure of pain intensity compared to the other conditions. Follow-up 6-12 months later indicated a reasonable degree of maintenance, with most subjects continuing to practise relaxation and physical exercises. However, in the statistical analysis the experimenters did not allow for the possibility of Type I errors due to the number of dependent measures (5) (see Harris, 1985, for a discussion of the use of univariate analyses with multivariate data). Consequently, although the study does represent a methodological advance on many earlier ones, the results should be treated with caution.

In a follow-up, fully outpatient version of their earlier study, Linton, Melin and Stjernlof (1985) compared an applied relaxation and operant activity programme with a waiting list control condition and an individually-prescribed regular treatment condition (which included treatment and services from a multidisciplinary

rehabilitation clinic). Twenty-eight chronic pain patients with multiple pain sites, but mostly lower back pain, completed the programme, which did not include a follow-up evaluation. The results at posttreatment indicated that the behaviour therapy group improved significantly more than the comparison groups on measures of pain intensity, sleep disturbance, daily activity levels and medication use. Although there was no follow-up, these findings provide further evidence of the efficacy of combined behavioural and relaxation techniques in the treatment of chronic pain, but again, the number of univariate analyses of dependent measures does raise questions concerning the increased risk of Type I errors. Nevertheless, the fact that the behavioural treatment was compared with an alternative treatment condition and that the results were consistent with their earlier findings, and with others in the literature, does add weight to the findings.

The only controlled group treatment study to compare a mixed behavioral treatment with a primarily non-psychological form of treatment was reported by Heinrich, Cohen, Naliboff, Collins, and Bonebakker (1985). They compared a behavioural group treatment, which included information, assertiveness training, cognitive pain coping strategies, relaxation training, goal setting and reinforcement for activity increases with a physical therapy group programme which included information, instruction in back care strategies, relaxation training, exercise tuition and group discussion. Fifty-one chronic low back pain patients were admitted to the outpatient programme but only 33 completed it. The treatment programme involved 10-weekly 2 hour sessions. The results indicated that both groups improved on

measures of psychological and physical functioning as well as pain intensity, with the physical therapy group doing significantly better than the behavioural group on measures of physical abilities (e.g. muscle strength, walking speed) and back care procedures while the behavioural therapy group reported significantly more use of the techniques they had been taught, compared to the physical therapy group, at the 6 month follow-up.

While the use of an alternative, non-psychological treatment as a comparison condition in Heinrich et al's study clearly represents a major methodological advance relative to the previous literature, there is also a need for caution in interpreting the results. As was noted in some previous studies, the present results suffer from an increased risk of Type I errors because of the large number of univariate analyses of dependent measures. Furthermore, because the physical therapy condition also included relaxation training and supportive group interactions were also evident, the actual effect of the behavioural therapy relative to the physical therapy is difficult to determine and thus requires further clarification.

From the studies reviewed so far, that is up to 1985, it would seem that the most significant methodological improvement over the early behavioural studies has been the introduction of controlled group designs, especially ones employing alternative forms of treatment, rather than simply waiting list groups, as the comparison condition. However, a number of methodological problems clearly remain. Two of the more important of which would probably be the variations in dependent measures employed, making comparisons between

studies more difficult (Turner and Romano,1984), and the repeated use of univariate analyses for large numbers of dependent measures, thus unnecessarily increasing the risk of making Type I errors in interpreting the results (see Harris,1985). Interestingly, two of the most recent controlled group treatment outcome studies have gone some way towards addressing these issues.

Kerns, Turk, Holzman and Rudy (1986), for example, employed multiple self-report measures (which included many commonly-used instruments with demonstrated psychometric properties) in their comparison of behavioural and cognitive-behavioural treatments with a waiting list control condition, but instead of analysing each dependent measure in turn they submitted all the measures to a principle components analysis to produce four principle component scores which accounted for 61.4% of the total variance. Using scale-to-component correlations they labeled these components as Affective Distress, Pain Severity, Instrumental Activities and Dependency. Component scores for each of the 28 subjects in the study were then derived from the raw scores on the self-report measures by the use of z-scores which were assessed for normal distribution. The component scores were then subjected to repeated measures multivariate analysis of variance (MANOVA). The experimenters argued that this seemingly rather complicated approach allowed them to directly compare the subjects' relative standing at different assessment occasions for each of the four component scores. Importantly as well, by reducing the effective number of dependent measures from 16 to 4 they could substantially reduce the high risk of Type I errors that would have otherwise been the case. However,

it should also be pointed-out that this approach does have the disadvantage of making comparisons with other treatment studies more difficult, because even if they employed the same dependent measures, the factor structure produced from the principle components analysis with another patient sample could well be different.

After 10 weeks of 1 hour outpatient treatment sessions analysis of the results of the Kerns' (1986) study revealed significant pretreatment to posttreatment improvements for the cognitive-behavioural group over the other groups on the four component measures (i.e. affective distress, pain severity, instrumental activities, and dependency). In contrast, neither the behavioural treatment group nor the waiting list control group improved significantly on these measures. However, both treatment groups did make significant progress towards individually-tailored behavioural goals at posttreatment. Analysis of the 3- and 6-month follow-up results indicated that the cognitive-behavioural group generally maintained their pretreatment to posttreatment improvements at 3-months but not at 6-months. However, no pretreatment to follow-up improvements were revealed for the behavioural group at 3-months and, due to the drop-outs, no analysis was made of the 6-month results, although there was some evidence that patients in both treatment groups reduced their use of the health care system over the follow-up period.

Unlike many previous findings, the results of Kerns et al's study suggest that the outpatient behavioural treatment was essentially no more effective than the waiting list control. In

contrast, the cognitive-behavioural group did substantially better than the behavioural group on a number of measures, though the effects were relatively short-lived. The reasons for the disparity in outcome between the two treatments and between the overall findings of the study and the findings of previous studies are difficult to determine, although the experimenters suggested that it may be related to the possibility that the patient sample was more severely disabled than those in many outpatient studies. However, that would not explain the difference between the two treatments, given that the subjects came from the same sample.

Despite these results, the study does have a number of important strengths relative to many earlier studies. These include a more sophisticated statistical analysis (which could also have accounted for some of the poorer results as it was more conservative than many used previously), the use of a controlled group treatment design with long-term follow-ups, and the comparison of two active forms of treatment whose consistency was assessed. Possible shortcomings of the study include the use of a heterogeneous pain complaint group which was drawn largely from a male veterans population (and, thus may not be typical of the usual pain clinic sample), and the reliance upon patient self-report measures.

Recently Philips (1987a) reported a study which compared a behavioural treatment group with a waiting list control group on 40 chronic pain patients with a variety of pain complaints. The behavioural treatment included relaxation training, reinforcement for gradual increase in exercise and activity level, reduction in

medication, training in cognitive-behavioural pain coping strategies, and preventive strategies, such as activity pacing and anxiety management. A number of widely used dependent measures were employed and the pretreatment-posttreatment results indicated significant improvements on measures of self-efficacy, affective distress, perceived size of pain problem, affective reaction to pain, and avoidant behaviour. There were no significant improvements on measures of pain intensity, effect of pain on daily life, and complaint behaviour. Substantial improvements were also reported in independent therapist assessment, medication use, exercise capacity, expected use of health care services. In contrast, there were no pretreatment-posttreatment improvements on any of the dependent measures for the control group. At two follow-up assessments the effects of treatment appeared to have been generally maintained.

The results of this study, therefore, clearly contrast with those of the Kerns et al. (1985) study. Possible explanations for this discrepancy could include the use of a more comprehensive treatment programme (Philips employed a number cognitive methods in her behavioural programme) and differences in patient sample. However, Philips did employ some widely-used assessment measures and did employ an independent assessor. Although the lack of a comparison group at follow-up and the increased risk of Type 1 errors due to the number of univariate analyses performed are possible weaknesses in her study.

It would seem, therefore, that despite the Kerns et al. (1986) study, the findings of the controlled behavioural treatment studies

have generally supported the efficacy of behavioural treatments of chronic pain, especially chronic low back pain. However, a number of issues remain unresolved. In particular, given the number of components in many of the published behavioural treatment programmes, the relative contributions of the different components have not been firmly established. For example, it is not clear whether some of the behavioural treatment effects are related more to relaxation training than to reinforcement for increases in activity level, or to some additive effect between them. Philips (1987a), for example, taught her behavioural treatment group to use relaxation as a coping technique for dealing with increases in pain when attempting to increase activity level. Similar questions could also apply to the frequent use of frankly cognitive techniques in many of the behavioural treatment studies.

With regard to methodological issues, from the studies published since the most recent reviews it is clear that a number of improvements have been made, particularly in the greater use of controlled group trials, though as Kerns et al. (1986) suggested, there is now probably a need for more studies comparing different active treatments, rather than waiting list control studies. Furthermore, as was noted previously, there are still shortcomings in relation to the use of consistent dependent measures between studies, the statistical problems associated with analysing large numbers of dependent measures, and the need for long-term follow-up evaluations.

3.3 Cognitive Treatments

Most cognitive approaches to the treatment of chronic pain may be characterised as including: (1) instruction in a theoretical model which emphasises the relationships between cognition, affect, and the experience of pain; (2) training in the use of coping skills, such as cognitive restructuring and various distraction techniques; and (3) reinforcement of the practice the coping skills and their implementation in dealing with pain (Kerns et al., 1986). Extensive descriptions of the cognitive and cognitive-behavioural approaches to the treatment of chronic pain have been reported by Tan (1982), Turk et al. (1983), and Holzman and Turk (1986). However, as mentioned above, there have been very few controlled evaluations of cognitive treatments by themselves with clinical samples.

Cautela (1977), for example, reported a single case study using a patient with chronic arthritic pain. The treatment included a combination of thought stopping, covert conditioning of performing activities without pain, instructions to cease pain complaints, and instructions to the family to ignore pain complaints. After 3 weeks the patient was reported to be pain free and this was maintained at an 8 month follow-up. Use of antidepressant medication also ceased. However, while the study does demonstrate the use of some cognitive techniques, the inclusion of some behavioural elements and the limitations of the single-subject design clearly restrict any conclusions regarding the efficacy of cognitive techniques.

The only group comparison study designed to evaluate the efficacy of cognitive techniques by themselves was reported by Rybstein-Blinchik (1979) who compared three cognitive techniques with a control condition on 44 chronic-pain patients (with a variety of pain complaints). One cognitive group was asked to reinterpret the pain stimuli (as something other than pain), another group was asked to divert their attention from the pain, and the third group was asked to concentrate on the pain sensation itself, describing it by words other than 'pain'. The control group simply engaged in conversation about their pain. The patients were randomly assigned to their conditions. Outcome measures showed that the reinterpretation group improved significantly more than the other three groups in terms of pain behaviours and pain descriptors. The distraction group also did significantly better than the control group, in terms of pain descriptors, and the reinterpretation group improved significantly over the sensation-focusing group and the control group on pain intensity ratings.

Although Rybstein-Blinchik did not evaluate the long-term effects of these interventions, this study does raise the issue of the relative efficacy of different cognitive coping techniques. A number of reviews have concluded, on the basis of both laboratory and clinical studies, that there is no consistent evidence that any particular cognitive coping technique is better than another or better than whatever techniques the subjects in these studies were already using (Tan, 1982; Turk et al., 1983). However, as noted previously, there is some evidence that rather than teaching chronic pain patients to employ any particular cognitive coping technique, it

may be more useful to encourage them to avoid the use of catastrophizing as a response to pain (Turner and Clancy, 1986). Unfortunately, apart from Rybstein-Blinchik's (1979) study, no clinical treatment studies have tested this hypothesis.

In a controlled group study, Turner (1982) compared the effects of relaxation training, cognitive-behavioural treatment and a waiting list/attention condition on 36 chronic low back pain patients who were randomly assigned to the three conditions in an outpatient setting. The cognitive-behavioural treatment included relaxation training, learning to use imagery techniques and coping self-statements to deal with pain and stress, and reinforcement for working towards individual behavioural goals. Pretreatment-posttreatment results revealed that both the relaxation and cognitive-behavioural treatment groups improved significantly, relative to the waiting list group, on measures of pain, depression, and physical and psychosocial dysfunction. The cognitive-behavioural treatment group also reported improved pain tolerance and ability to participate in normal activities relative to the relaxation group. At 1 month follow-up the cognitive-behavioural treatment group showed further improvement relative to the relaxation group which, in fact, reported an increase in pain. However, improvements were generally maintained for both groups in a 1.5 to 2 year mail follow-up, with reductions reported in the use of health-care services.

These results are clearly consistent with the findings of the combined cognitive and behavioural treatment studies reviewed in the

previous section (e.g. Kerns et al., 1986; Philips, 1987), but while they indicate the superiority of cognitive-behavioural (and relaxation) treatments over waiting list controls and, to a lesser extent, relaxation training alone, the relative contributions of the cognitive and behavioural components to the results cannot be determined. Furthermore, as in many of the other studies reviewed, some caution is necessary in interpreting the results because of the increased risk of Type I errors due to the number of dependent measures analysed. Nevertheless, the study represents a major methodological advance because it was the first to compare a cognitive-behavioural treatment with another active treatment and a waiting list control in the treatment of chronic low back pain.

Further evidence in support of the efficacy of cognitive-behavioural treatments was provided by Moore and Chaney (1985) who evaluated the effect of spouse involvement in a controlled cognitive-behavioural treatment study with 43 chronic pain patients who had a mixture of pain complaints. Two treatment conditions were employed, one with and the other without spouse involvement, and a waiting list control condition as well. Apart from spouse presence, both treatments were basically the same and included training in problem-solving, relaxation techniques, rational-thinking techniques, attention-diversion techniques, stress management and assertiveness techniques. Advice was also given on operant approaches to chronic pain and ways of rearranging contingencies for pain and well behaviours. The programme was conducted over 8 twice-weekly 2-hour sessions in an outpatient setting and employed some of the dependent measures employed in Turner's (1982) study. A repeated measures

MANOVA was performed on the 8 dependent variables and the results indicated significant pretreatment to posttreatment improvements for both treatment groups relative to the control group on measures of pain severity, spouse-observed pain behaviour, somatization, and spouse-rated community adjustment. There were no major differences between the treatment groups, however, and most treatment gains were maintained at 3-month to 7-month follow-ups. In addition, attendance at medical outpatient clinics declined over the follow-up period, but medication intake did not change.

While no effect was observed for spouse involvement, and the waiting list control condition was not continued in the follow-up period, the results are consistent with many of the earlier findings from cognitive-behavioural studies and, in the present context, are especially interesting because the treatment was predominantly cognitive in orientation. Furthermore, relative to many of the earlier studies, this study has a number of methodological strengths, such as the use of multivariate statistics and spouse observations and rating scales.

Thus, despite their limited numbers, the controlled group studies of cognitive and cognitive-behavioural treatments have generally been of a higher methodological standard than many of the earlier behavioural studies. In addition, they have provided good evidence for the efficacy of cognitive-behavioural treatment programmes. However, due to the experimental designs employed and the number of treatment components, the relative efficacy of the individual

components of these treatment programmes, especially in the long-term, remains unclear.

3.4 Relaxation Treatments

Whilst there is evidence that relaxation training can increase pain threshold and tolerance in acute pain, particularly experimentally-induced pain (Elton and Stanley, 1976), and reduce the frequency of tension headaches (e.g. Turner and Chapman (1982), its role in chronic low back pain treatment is more uncertain. The main reason for this is probably that relaxation training is normally used in conjunction with other techniques. The two main aims of relaxation training with chronic pain patients are to reduce muscle tension and anxiety, in the belief that they can exacerbate pain (Melzack, 1975; Bond, 1979). However, some studies have also referred to relaxation as pain coping strategy (e.g. Linton, 1986).

An example of a large multicomponent inpatient programme which emphasized the use of relaxation procedures was reported by Keefe, Block, Williams and Surwit (1981). This programme included EMG-assisted relaxation training and generalization procedures for transfer of relaxation skills, together with a medication reduction procedure and physiotherapy. Pretreatment-posttreatment changes with 111 chronic low back pain patients indicated significant improvements on measures of subjective tension, EMG activity, and pain. Reductions in medication intake and increases in activity level were also found in many patients. However, while the reduction in both EMG activity and pain is consistent with the muscle tension-pain

hypothesis, the design of the study clearly precludes assessment of the role played by relaxation training.

Where relaxation has been used alone with chronic low back pain it has usually been in the context of EMG biofeedback studies. A number of case studies have reported reduction in EMG and pain intensity levels with such training. For example, Gentry and Bernal (1977) using frontalis EMG biofeedback for 2 chronic-back pain patients, and Belar and Cohen (1979) using back muscle EMG biofeedback on 1 subject with chronic back pain, reported improvements which were maintained at 6 weeks and 6 months follow-ups, respectively. In a group study of 26 chronic back-pain patients, Nouwen and Solinger (1979) compared a paraspinal EMG biofeedback group with a waiting-list control and found significant EMG and pain reduction only in the treatment group. At a 3-month follow-up, the EMG readings returned to pre-treatment levels for the treatment group, although pain reductions did not change. A similar study, though employing just a pre/post design, was reported by Nouwen (1983) in which a spinal erector EMG biofeedback group was compared with a waiting list control group. While a significant decrease in EMG was reported for the treatment group, relative to the control group, there was no reduction in pain.

One flaw which characterises many of these EMG studies, however, is a limited range of outcome measures (often just EMG readings and a pain severity scale), which makes it difficult to both compare their findings with other forms of treatment and to fully assess their results. Also, follow-up periods are generally short. Consequently,

the findings of the EMG studies in relation to evaluating the efficacy of relaxation training for the treatment of chronic low back pain appear somewhat equivocal.

More substantial evidence regarding relaxation training has come from Turner's (1982) controlled group study which indicated that those patients receiving relaxation training improved significantly over the waiting list control group on measures of pain, depression, physical and psychosocial dysfunction. However, a 1-month follow-up showed no further improvement in the relaxation group, compared to the cognitive-behavioural group (who were also practising relaxation) and an increase in pain levels in the relaxation group but not in the cognitive-behavioural group. Sanders (1983) also showed that relaxation contributed significantly to overall improvement in his subjects, although he did not present any follow-up data. It should be noted, however, that neither Turner nor Sanders included any measure of muscle tension, such as EMG readings. Thus, the role of reduced muscle tension was not assessed.

Another treatment comparison study was reported by McCauley, Thelen, Frank, Willard, and Callen (1983) who compared relaxation training with hypnosis in 17 chronic back pain patients in an outpatient setting over 8-weekly 50 minute sessions. Although both groups improved significantly on measures of pain, depression, quality of life, and medication use, there were few differences between them. Most of the treatment gains were maintained at the 3-month follow-up. While this study had a number of methodological shortcomings, the reported changes in pain intensity ratings are at

least consistent with some of the findings in other relaxation studies. The findings of Linton and Gotestam (1984) and Linton et al.(1985) which were reviewed earlier, also provide evidence of the effects of relaxation on pain intensity in chronic low back pain patients.

To conclude, there is evidence that shows relaxation training and measured muscle tension reduction can result in reduced pain intensity and affective distress in chronic low back pain patients. However, whether these results are due to reductions in muscle tension, anxiety or some other process, such as enhanced sense of control over pain, is unclear. However, the inconsistent findings of many of the EMG studies suggest that muscle tension changes are unlikely to be a major factor in the results obtained. The role of relaxation training in cognitive and behavioural treatments is also unclear, especially given the different results obtained in some studies in which both comparison groups have received relaxation training.

Comment

The literature reviews published in 1982 generally concluded that due to the lack of controlled group treatment studies the evidence for the use of cognitive, behavioural and relaxation techniques in the treatment of chronic pain was, at best, 'promising' (Linton, 1982). The multicomponent inpatient treatment programmes and the behavioural inpatient treatment programmes were generally of the single group pre/post design and although they often included long-term follow-up evaluations and reported improvements in

previously intractable chronic pain syndromes, no firm conclusions about their efficacy were possible. The studies examined in detail in this review, however, have mainly been published since 1980 and, in comparison to most of the earlier studies, they generally display considerable improvements in methodology. As a result of these recent studies it is now possible to say that a substantial body of evidence exists which supports the utility of cognitive, behavioural and relaxation methods in the treatment of chronic pain, especially chronic low back pain. However, a number of methodological and theoretical issues clearly remain unresolved.

In particular, as Turner and Romano (1984), Linton (1986) and Kerns et al. (1986) have pointed-out, there have been relatively few treatment comparison studies reported. Thus, the relative efficacy of the different treatment methods is largely unknown. In comparison to the waiting list controlled studies the results from the few treatment comparison studies have been less clear cut, with some finding few differences between different treatments (e.g. Heinrich et al., 1985; Turner, 1982), while others have found unexpectedly large differences (e.g. Kerns et al., 1986). Some marked differences in the maintenance of treatment effects have also been found between treatment studies. Kerns et al. (1986), for example, reported poor maintenance effects at the 6-month follow-up in comparison to other studies employing apparently similar treatment methods (e.g. Moore and Chaney, 1985; Turner, 1982).

CHAPTER 4

STUDY ONE

4.1 Introduction

In the previous chapter evidence was presented in support of the continued use of various psychological techniques in the management of chronic, benign pain. It was pointed out, however, that relatively few well-controlled experimental studies had been reported in which different components of the multi-component pain-management programmes had been evaluated. Consequently, the relative contributions of cognitive, behavioural and relaxation techniques to the outcomes of these programmes remain uncertain. One of the few controlled studies (Turner, 1982) reported that a group of chronic low-back patients receiving a combination of cognitive, behavioural and relaxation techniques improved more on a range of measures than a waiting-list control group. A group receiving relaxation training only also improved more than the waiting-list control group at posttreatment, but not as much as the cognitive-behavioural group at 1-month follow-up. Sanders' (1983) single subject design study indicated that progressive relaxation training contributed most to overall improvement while social reinforcement for activity also played a role. Linton and Melin's (1983) study and Linton and Gotestam's (1984) study also provided support for the use of relaxation training as well as an operant activity programme. The authors in the second study concluded that their results suggested that the operant programme was primarily effective in changing activity levels and medication use while relaxation training was more successful in reducing the subjective experience of pain.

As mentioned in the previous chapter, no studies evaluating the use of cognitive techniques (by themselves) in comparison with behavioural and relaxation techniques, have been reported, although many of the behavioural techniques have included cognitive components (e.g. Turner, 1982). Rybstein-Blinchik's (1979) study compared various cognitive techniques with each other and with an attention-control condition and the results indicated that the distraction and reinterpretation groups improved more on measures of pain behaviour and pain descriptors than the control group. However, the patients included in this study suffered from a variety of chronic pain complaints and no data was reported by the author on any differential effects between type of pain complaints. Thus, the relevance of these findings to the management of chronic low-back pain is unclear.

While there is a considerable amount of evidence for the maintenance of treatment effects with behavioural techniques, Rybstein-Blinchik (1979) did not examine this issue. However, Kerns et al. (1985) found their cognitive-behavioural treatment group improved significantly more at posttreatment than both a behavioural treatment group and a waiting list control group. However, while there was good maintenance of these improvements at the 3-month follow-up, by 6 months this effect had largely abated. Thus, there is no clear evidence in support of the maintenance of treatment effects with cognitive techniques.

While an increasing number of controlled studies on the use of cognitive-behavioural and relaxation techniques have been reported in

recent years (e.g. Linton, 1986), it is also noticeable that the controls employed have tended to be of the waiting-list type, with a lesser number being other forms of psychological intervention, such as relaxation training (e.g. Turner, 1982) or attention (e.g. Rybstein-Blinchik, 1979). Relatively few controlled studies, however, have employed non-psychological forms of intervention, such as physiotherapy, as the comparison condition. This may be considered somewhat surprising given that most multi-disciplinary pain-management programmes include such forms of intervention as well as the psychological techniques (e.g. Roberts & Reinhardt, 1980; Keefe et al., 1981). One of the few studies which did employ an alternative, non-psychological, group treatment as the comparison condition (Heinrich et al., 1985) in fact, found few differences on psychological outcome measures between a group which received behaviour therapy and one which received a form of physiotherapy, although there were general improvements obtained for both groups.

Further comparisons involving psychological and other forms of treatment would therefore seem germane, particularly given the understandable concern over cost-effectiveness of treatment reported by a number of authors (e.g. Linton, 1986; Turner and Romano, 1984). Associated with the concern over costs has been the question of whether out-patient programmes can demonstrate similar results to those reported by the in-patient programmes originally reported by Fordyce et al. (1973) and others (e.g. Gottlieb et al., 1977; Swanson et al., 1976). Although there have been no reported direct comparisons of in-patient versus out-patient pain management programmes (i.e. formal experiments comparing one with the other), there is

considerable evidence that out-patient programmes can be effective, at least with the less severely disabled chronic pain patients (e.g. Linton, 1986). Interestingly, much of the experimental or controlled research appears to have been conducted in out-patient settings. Although there is no clear explanation for this it may well be related to the relative expense of conducting research in in-patient, as opposed to out-patient, settings (Fordyce et al., 1985).

Some authors have also pointed to the need to avoid the "myth of homogeneity" of chronic-pain patients when evaluating different treatment approaches (e.g. Fordyce, 1976; Keefe et al., 1986). Linton (1986) and Keefe (1986) also pointed out that not only should this concern apply to different pain sites and medical diagnoses, but also to other factors, such as the length of time pain has persisted and the severity of disability or dysfunction. Aronoff, Evans, and Enders (1983) and Holzman, Turk, Rudy, Sanders, Gerber, Zimmerman, and Kerns (1985), for example, have found considerable differences between patient samples attending different hospitals or pain clinics. Turner (1982), in fact, noted that her sample of 36 chronic low-back pain patients would probably have been considered only "mildly disabled," whereas Kerns et al. (1985) suggested that their sample of 35 patients with various pain aetiologies and sites were somewhat more disabled with longer pain histories, higher rates of pain-related surgery and higher usages of analgesic medication than those reported in Turner's (1982) study. Clearly, adequate description of subject characteristics is essential when the generalizability of treatment results is being considered. It may be, for example, as Linton (1986) suggested, that in-patient

programmes are likely to be more effective with the more severely disabled or less active patients while the less severely disabled patients will do just as well, and at less cost, in an out-patient programme. However, although the Kerns et al. (1985) study did suggest reduced maintenance effects from out-patient treatment with their more severely disabled group than those normally reported for such programmes, there is little other data to support this contention as yet.

In summary, while there is a considerable amount of evidence supporting the utility of interventions including various combinations of cognitive, behavioural, and relaxation techniques in the management of chronic low-back pain, more information is required concerning:

(i) The relative contributions of the components of multicomponent treatment programmes to treatment outcome at posttreatment and long-term follow-up, and

(ii) The utility of these components in comparison with another form of treatment, as opposed to a non-treatment control condition.

The following experiment will attempt to address these issues by comparing cognitive and behavioural treatments, both with and without relaxation training, with an attention-control condition and a no-attention control condition. All conditions, including the two controls, will also receive the same physiotherapy back-education and exercise programme - thus allowing a comparison of the cognitive and

behavioural interventions with another form of commonly-employed intervention.

The programme will be conducted in an out-patient setting and all subjects will have chronic low-back pain as their main complaint. As the treatment programme will be based on the procedures reported by Turner (1982) and Turk et al. (1983), similar assessment measures to the ones employed by those investigators will be employed. Treatment outcome will be assessed at posttreatment, with 6-month and 12-month follow-ups.

4.2 Method

4.2.1 Subjects

Sixty-two subjects, thirty-three females and twenty-nine males, were selected from a sample of eighty-two referred by general medical practitioners, specialist medical practitioners, and the Westmead Hospital Pain Clinic. (See Appendix A for a copy of the referral criteria sent to the referring doctors).

(A) Selection Criteria

The subjects were accepted into the programme provided that they met the following criteria:

- A history of chronic (i.e. more than 6 months), benign (i.e. non-malignant) low-back pain.
- Are not considered suitable for further invasive treatments.
- Are aged between 20 and 60 years.
- Have no (insurance) compensation claim due for settlement within 12-months (to the best of his/her knowledge).
- Are able to read and speak English.
- Are willing to participate in a research-oriented management programme, which will mean -
 - (a) attending pre-treatment assessment sessions (with physiotherapist and clinical psychologist) as well as completing

post-treatment and two follow-up assessments (at 6 and 12 months following the programme).

(b) attending two treatment sessions each week for five weeks. Each session lasting 1.5 to 2 hours.

(c) agreeing not to seek alternative forms of treatment for the pain during the treatment phase of the programme (5 weeks) unless medically advised.

(d) agreeing to carry-out requested home-work activities between treatment sessions.

(e) agreeing to allow the results of the programme to be used for research purposes and possible publication.

(B) Selection Procedure

Each subject was interviewed by the Experimenter on two occasions before entering the programme and once by one of the physiotherapists involved in the programme. At the initial interview with the Experimenter, prospective subjects were asked for a brief personal history and a history of their back complaint, treatments received, current treatment, insurance or pension status and when any settlement was likely, as well as work history and present work status.

The broad nature of the programme was explained to each prospective subject, but not specific details of the different experimental conditions. The prospective subjects were informed they would be seen by a clinical psychologist and two physiotherapists in

small group sessions held on two afternoons a week for five weeks. They were informed that the aim of the programme was not to cure them but to teach them ways of living-with or coping-with their back-pain. They were also informed that the programme was part of a research project, that it was being evaluated and that follow-up interview/assessments would be required on the occasions - one week, six months, and twelve months after the end of the programme. It was emphasized that any information gathered about them would be treated as strictly confidential and in any ensuing publications their identity would not be revealed. Following the interview and after dealing with any questions the subjects had, they were asked to sign an informed consent form (see Appendix B).

Those subjects who did not meet the experimental criteria (for example, their English was insufficient) were rejected but, where possible, alternative arrangements were made for them to be treated on an individual basis.

At the second interview, usually 1 to 2 weeks before the start of the programme, with the Experimenter all subjects suitable for and willing to participate in the programme were asked to complete a number of questionnaires. At the conclusion of this session the subjects were asked to take home and complete over the subsequent week a daily pain-rating form and to give their spouse (or significant other) the Sickness Impact Profile (S.I.P) to complete. The subjects were asked not to contribute to the completion of the spouse-rating version of the S.I.P. as it was the spouse's views that were being sought.

At the pretreatment assessment interview and examination by the physiotherapist, each subject was asked for a brief history of his/her back complaint, any other medical or health problems they may have or have had, details of any medication they may be taking and a standard physiotherapy physical examination. This assessment normally took about 30 minutes.

Ten subjects were admitted to the programme at one time and they were assigned randomly to one of two experimental conditions. The random assignment was conducted after the final pretreatment assessment and before the programme started. Thus, neither the experimenter nor the physiotherapist knew to which condition a subject would be assigned at the time the pretreatment assessments were conducted.

4.2.2 Experimental Design

The experiment consisted of six (conditions) x four (trials) design. Each of the six conditions underwent repeated measurement on four occasions - pretreatment, posttreatment, 6 months and 12-months after the end of treatment (see Table 1).

Four conditions were designated as treatment conditions and two as control conditions. The four treatment groups consisted of: Cognitive treatment without relaxation training; Cognitive treatment with relaxation training; Behavioural treatment without relaxation training; and Behavioural treatment with relaxation training. The two control conditions consisted of: Attention and No-Attention conditions.

Table 1. Description of Experiment

Initial Interview	Pre TMT Assessment	Condition	Experimental Period (5 weeks) - All conditions given same Physiotherapy (PT) - At end Session 1, Expectation Rating	Post Tmt Assessment (Blind)	6-Month Assessment (Blind)	12-Month Assessment (Blind)
History,	STAI-S,	1	Cognitive Treatment (CT)	STAI-S,	STAI-S,	STAI-S,
Treatments,	BDI,	2	Cognitive Treatment plus Relaxation (CT + RT)	BDI,	BDI,	BDI,
Compensation	PBQ,			PBQ,	PBQ,	PBQ,
Work,	SIP-0,	3	Behavioural Treatment (BT)	CSQ,	CSQ,	CSQ,
Education,	Hourly Pain ratings			SIP-S,	SIP-S,	SIP-S,
Marital Status	Medication Intake	4	Behavioural Treatment plus Relaxation (BT + RT)	SIP-0,	SIP-0,	SIP-0,
General Explanation of Programme,	*	5	Attention-Control (AC)	Hourly pain ratings,	Hourly pain ratings,	Hourly pain ratings,
Consent Form		6	No-Attention Control (NAC)	Medication Intake,	Medication Intake,	Medication Intake,
				PT Evaluation	Other treatments	Other treatments
					Practise of skills	Practise of skills
				*	*	*

* MPQ, MSPQ also administered but used for correlations not as Dependent Variables - see chapter 7

Ten subjects were assigned to each condition and each condition was divided into two cells of five subjects. Two cells (one from each of two different conditions) were treated at a time. When their treatment was completed another two cells (from another two conditions) were treated, and when their treatment was completed the final two cells (from the two remaining conditions) were treated. Once one cell from each of the six conditions had been treated, the second cell in each condition was then treated in a similar paired fashion. The order in which the cells were treated was randomly selected.

4.2.3 Procedure

The treatment programme covered five weeks and involved two sessions each week, with one group from each of two conditions attending simultaneously. For the first hour of the first session each week (held on a Monday afternoon) one group was seen by the two physiotherapists while the other group was seen separately by the clinical psychologist (apart from the subjects in the No-Attention control condition who were seen by the physiotherapists only). After one hour the physiotherapists and clinical psychologist changed places and the physiotherapists then saw the group which had been seen first by the clinical psychologist while the clinical psychologist saw the group which had been seen first by the physiotherapists. The second part of this session also lasted for about one hour.

At the second session each week (Thursday afternoon) the two groups combined and were seen by the two physiotherapists for 1.5 hours.

4.2.4 Physiotherapy

All subjects received the same physiotherapy input (see Appendix C for a description of the information, exercises and materials given to each subject). The physiotherapy sessions were primarily educational in nature and were intended to teach the subjects some basic back anatomy, back-care procedures (e.g. how to lift objects, etc.), information on medical terms associated with back conditions and the different types of medication commonly prescribed for people with back-pain. Training in exercises thought to strengthen back-support muscles was also given and some advice on desirable eating habits and food (to avoid putting on weight) was provided by a dietitian in one half-hour session during one Thursday physiotherapy session.

The physiotherapy programme also included four sessions of exercise practice in a hydrotherapy pool. This consisted of the opportunity to practice the physiotherapy mobilization exercises in a heated, indoor hydrotherapy pool under the supervision of the two physiotherapists who were in the pool with the subjects. These sessions were held during the first physiotherapy session each week, beginning in week two. The second physiotherapy session each week was largely devoted to presentation of information and demonstration of the back-strengthening exercises.

All the subjects were encouraged by the physiotherapists to practise the exercises at home, but no check was made on that by the physiotherapists and no specific reinforcement for doing the exercises was provided by the physiotherapists. All subjects were given the printed exercise record charts (see Appendix D) by the clinical psychologist to record which and how often the different exercises were practised.

4.2.5 Cognitive Treatment

The cognitive treatment was based largely on the published work of Turk et al. (1983), Turner (1982), and Rybstein-Blinchik (1979).

Subjects were given information on the distinction between chronic and acute pain and a model of chronic pain and its consequences was described and discussed (see Fig. 1). This model focussed on:

(a) the consequences of inactivity (particularly the decline in the strength of muscles for spinal support) which would be addressed by the physiotherapy section of the programme;

(b) the consequences of persistent pain and repeated treatment failures which often took the form of increasingly negative and non-coping cognitions (e.g. "why me?", "nothing helps," "I can't go on", "no one really cares") which, in turn were frequently associated with feelings of depressed mood, helplessness and anger. It was suggested that such non-coping cognitions and depressive feelings were likely to make their pain and their general predicament seem even worse than they may need to be and make it even harder to cope.

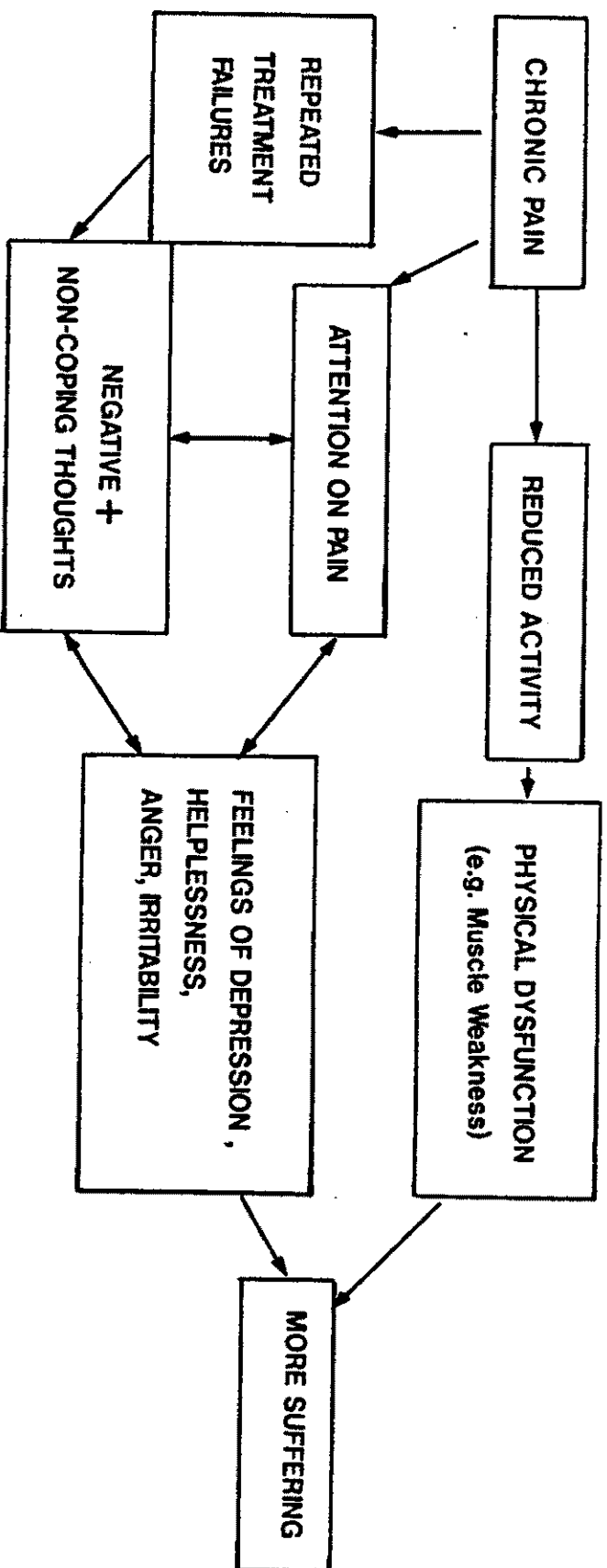


Figure 1. Model of Chronic Pain for Cognitive Condition.

As a result, it was suggested that their suffering was probably increased, which, in turn, acted in a feedback manner on their whole predicament rather like a vicious cycle.

It was further suggested to the subjects that if they could not be cured of their conditions and associated pain then perhaps they could try to change the ways in which they reacted to the pain and associated problems and thus reduce their level of depression, helplessness, anger and general suffering. The subjects were informed that the sessions with the clinical psychologist would therefore focus on assisting them to identify negative or non-coping ways in which they may be reacting to their pain and then to develop some more effective coping strategies.

(c) It was also suggested in the model presented to the subjects that a further consequence of persistent pain was thought to be an increasing tendency to focus attention on the pain so that it tended to dominate their daily lives to the exclusion of other experiences. It was suggested that this tendency could result in the magnification of pain sensations. In this context a simplified version of the Gate-Control model of pain was described stressing the role of descending influences (i.e. from the brain) in the modulation of pain. The role of attention was particularly emphasized, with common examples given (e.g. 'football players reporting they had not noticed any pain from a fractured nose until after the game, and the frequent observation by the subjects themselves 'that their pain often seems worse when they are lying in bed at night waiting to go to sleep'). Consequently, it was suggested that if the subjects

could try to keep their attention away from their pain they may notice it less or it may bother them less. To deal with this aspect the subjects were informed they would be introduced to a number of cognitive distraction techniques and would be encouraged to practise them.

After the model had been described and discussed the subjects in this condition were asked as their first homework task to identify their cognitive and affective responses to increases in pain in the period before the next session using a self-monitoring diary (see Appendix E).

At the next session each subject's responses were read out and written-up on a board for the group to consider. The subjects were encouraged to see the links between their cognitive and affective responses to pain and these were then discussed in a didactic manner. Then ways of dealing with unrealistic, non-coping cognitions were introduced and discussed, along the lines described by Turk et al., 1983 (see Appendix F: copies of this outline were given to the patients). This approach stressed the importance of identifying non-coping cognitions (e.g. "I can't cope"), challenging them (e.g. "that's not really true, I've had pain like this before and I guess I can cope with it"), and replacing them with more appropriate, coping self-statements (e.g. "it's not realistic to expect the pain to disappear completely, but let's look at what I can do now"). The subjects were encouraged to start using such coping strategies and verbally reinforced by the clinical psychologist for reported attempts.

Imagery and distraction techniques were also taught (see Appendix G for the hand-out used). These were based on the techniques described by Turk et al. (1983) and Rybstein-Blinchik (1979). The subjects were encouraged and verbally reinforced by the clinical psychologist for developing their own versions of the imagery and distraction techniques.

The subjects were encouraged and verbally reinforced for using the imagery and distraction techniques in conjunction with the cognitive coping strategies outlined above. Thus, when asking himself/herself what he/she could do to cope with their pain at a particular moments, one of the methods the subjects were encouraged to list were the imagery/distraction techniques. It was explained that by learning a number of imagery/distraction techniques the subjects would have a number of alternatives to use when they were trying to cope with their pain and that they should try each one in turn until they found the most effective for that occasion. However, even if none of them proved useful on a particular occasion at least time would have elapsed while they were being tried and in that time either the pain might have eased slightly anyway or they may have avoided sinking into a vicious cycle of non-coping, helplessness inducing cognitions.

The subjects were asked to practice each technique several times a day between sessions. It was stressed that these techniques were unlikely to eliminate the pain entirely but could help them to cope with it better and to feel more in control as they would have

something to do rather than be left feeling helpless victims of their pain.

At each session the subjects were reminded that their success in learning to cope with their pain largely dependent on what they did (e.g. their use/non-use of coping strategies, etc.), rather than on what the clinical psychologist or their doctor did. In other words, throughout the programme the subjects in the cognitive condition were reminded that in learning to cope with or live with their pain they had to take the primary responsibility, the health professionals involved could only provide information, advice, and support. It was also stressed to the subjects that they would need to persist with the techniques they learnt during the programme if they were to maintain any improvements they had made during the programme.

Throughout the programme the subjects were also encouraged to ask questions and engage in discussion (both with the clinical psychologist and other subjects) in an attempt to improve their understanding of the methods being taught.

At each session with the clinical psychologist the subjects were given a physiotherapy exercise self-monitoring record sheet which was returned at the following session. In the Cognitive Condition the subjects were not verbally reinforced by the clinical psychologist for doing the exercises.

If the subjects in this condition had any questions about the exercises they were advised to discuss them with the physiotherapists.

4.2.6 Behavioural Treatment

As mentioned previously, the Behavioural treatment was based largely on the published work of Turk et al. (1983) and Turner (1982), with some elements derived from Fordyce (1976), and Sanders (1983).

The subjects in this condition were also given information on the distinction between acute and chronic pain and a model of chronic pain and its consequences was also described (see Fig. 2). However, unlike the model presented to the subjects in the Cognitive condition, the model presented to the subjects in the Behavioural condition emphasized -

(a) the reduced activity level that often accompanied chronic pain had two main consequences: firstly, it led to a deterioration in muscle strength and fitness - which could be remedied by practicing the exercises taught by the physiotherapists and secondly, it led to feelings of depression, along the lines described by Lewinsohn (1975), and this aspect could be remedied by the subjects seeking-out and engaging in activities which they could still do, especially ones that they had previously enjoyed doing or thought they would enjoy doing. To assist them in this regard, a list of activities (see Appendix H) was given to each subject and they were encouraged to select any activities from this list which they thought they could do. They could also select activities not on the list. The list itself was derived from Lewinsohn's Pleasant Events Schedule (1973).

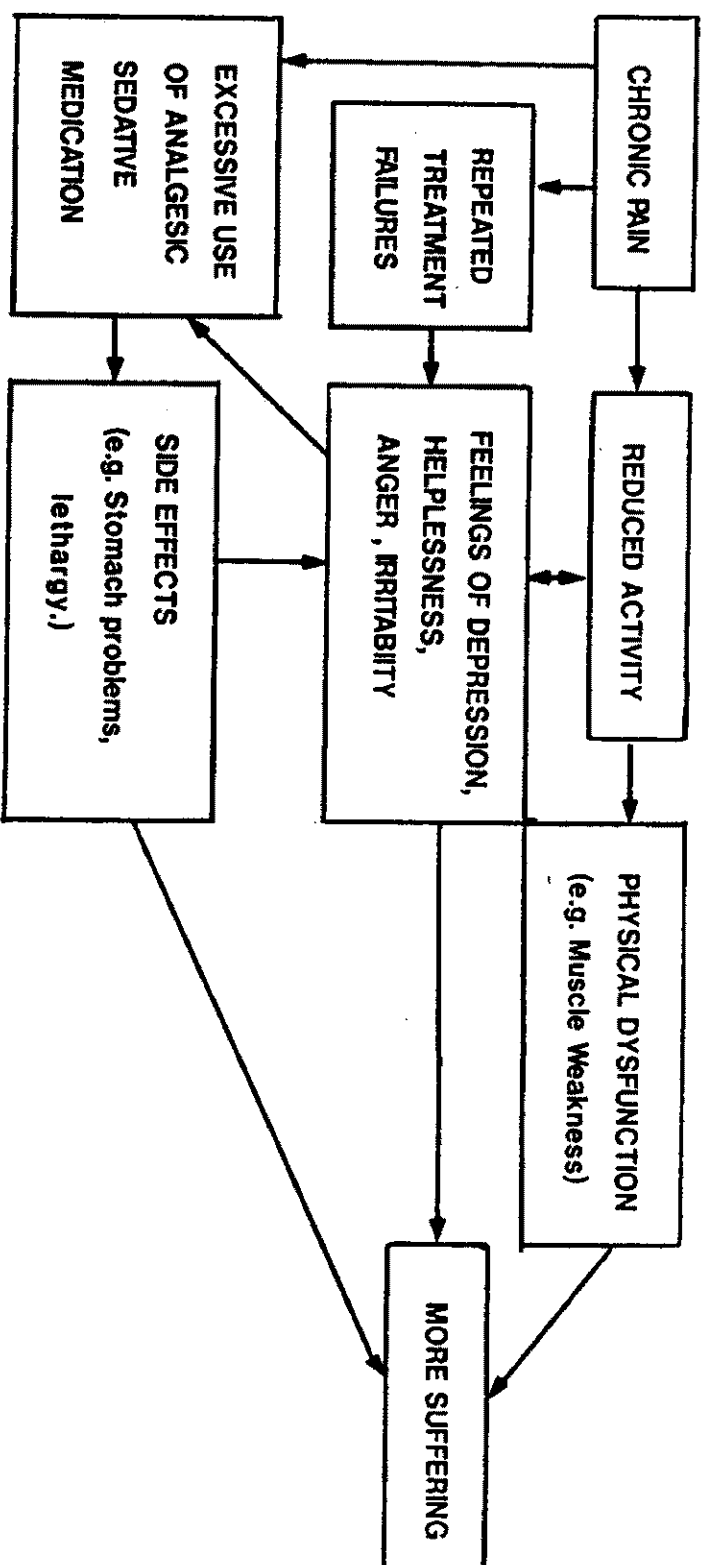


Figure 2. Model of Chronic Pain for Behavioural Condition.

(b) In addition to reduced activity being a cause of depressed mood, it was also suggested that numerous treatment failures had probably contributed to the feelings of depression. It was suggested that such feelings were especially likely if the subjects viewed themselves as entirely dependent upon health-care providers, such as surgeons or physiotherapists, for any improvements in their conditions. It was suggested that if they began to take over responsibility for their improvement or, at least successful coping with their back pain, themselves and began to look to whatever they could do to help themselves then they could start to feel less dependent on others and more in control of their lives and well-being. In this way they could begin to overcome their feelings of failure and depression.

(c) It was also pointed out that many people with chronic pain tended to take too many analgesics and sedatives in an attempt to cope with their pain. The problems associated with this were pointed-out and discussed. In particular, the issues of increasing habituation and side-effects were explored. It was suggested that while such medication might be useful in the short-term or for occasional use, its continual use was not recommended for chronic pain conditions like chronic low back pain. It was, therefore, recommended that the subjects should start to gradually reduce their medication and to take it on a time-basis rather than a pain-basis. The subjects were encouraged to discuss the issue with their doctors and to particularly discuss desirable medication-reduction rates with them.

The strategies to increase activity level were presented as follows:-

(i) In the first session all subjects were given the Suggested Activities List mentioned above and another sheet of paper titled Setting Behavioural Goals (see Appendix I) which was divided into six categories of activities - Medication Use, Family Activities, Recreational Activities, Social Activities, Home Duties, and Work. Examples of each were also provided (see Appendix Ia). All subjects were asked to decide over the next week what goals they wanted to achieve in each category in the long-term, whether that might be 6 weeks or 12 months. It was explained that the aim of this programme was to shift their attention from simply "getting rid of pain" to developing as active as possible a lifestyle despite their pain. Consequently, it was explained to the subjects, they needed to develop some long-term activity or behavioural goals for themselves - especially goals which could be clearly identified, such as 'taking no analgesics', 'having friends over for dinner twice a month', 'going to Europe for a holiday', etc. It was especially emphasized that these long-term goals needed to be feasible, both financially and physically, but did not need to be achievable immediately.

(ii) At the second session, after discussing the long term goals to ensure all subjects had understood and completed the task, each subject was asked to develop short-term goals for the same six categories which they thought they could achieve in the next week. It was stressed that they should aim to gradually increase their activity level beginning from a low baseline, well-within their

present capabilities, and build it up week by week. It was pointed-out that people with chronic back pain tended to have 'good-days' and 'bad-days'. 'Good-days' being when their pain was less and 'bad-days' being when their pain was worse. On the good days people with chronic backpain tended to overdo activities and then 'suffer the consequences' the following two or three 'bad days' when their activity level would be very low. It was suggested that this 'peaks and valleys' approach probably tended both to make them repeatedly frustrated with their limitations and to confirm their sick-role status.

As a possible strategy to deal with this problem, it was suggested that each subject should set behavioural goals or a behavioural agenda for himself/herself each week and, as mentioned above, they should set these goals in the first week well-within their present capabilities. Then they should gradually raise the goals in terms of number, frequency or extent of activities each week. Thus, in week one they might set themselves the task of walking 50 metres in the street once a day. In week two, they could increase that to 60 or 70 metres, and so on. It was stressed that it was important that once they set these goals they tried to keep to them. Thus, even if they felt they could do more on a given day they should not and vice-versa on days when they felt like doing less they should try to keep to their goals, not letting pain stop them.

At each subsequent session subjects reported on their progress (or lack of progress) with their activity programme and when they had clearly made an attempt, even if not completely successful, the

experimenter verbally praised the subjects. If a subject had done more than he/she had planned and had subsequently experienced an increase in pain the experimenter took a problem-solving approach, asking the subject to examine what he/she had done, where he/she might have erred and how this problem could be avoided in future. In this way the subjects were encouraged to look more closely at how they were going about things and to explore better ways of doing things.

In this context, the concept of 'pacing' was described. It was pointed-out to each subject that their pre-treatment pain diaries had generally indicated a fluctuation in pain intensity throughout the day. It was explained that this was normally the case for people with chronic-pain, but that it was likely that the increases in pain were aggravated by a tendency to overdo some activities, perhaps in a desire to get them finished or 'over and done with', and that this could result in muscle strain (particularly for someone whose muscles were weaker than they might have been before their back pain developed) and thus lead to more pain. It was suggested that if they paced such activities (i.e. did not try to do them too quickly and in one session, but rather spread them out, doing a little at a time, took short breaks and even did something else for a while, and then returned to the original task) they would avoid muscle strain and excessive pain. Such an approach might result in activities taking longer, but at least they would get them done without too much aggravation of their pain, leaving them free to do other things rather than having to spend several hours lying-down to recover from one activity which had been attempted too quickly. In this way the

subjects were encouraged to break-down activities or tasks into small units and to attempt them in turn.

(iii) Not only did the clinical psychologist verbally praise each subject for signs of progress towards their behavioural goals, but other group members were also encouraged to reinforce each other for signs of progress or, at least, attempts in the direction of increased activity.

(iv) As in the Cognitive condition, the subjects in the Behavioural condition were given self-monitoring physiotherapy exercise recording sheets at end of each session with the clinical psychologist and they returned their sheet from the previous week. In the Behavioural condition the subjects were encouraged to apply the same principles to the exercises as they had been instructed to follow with their overall activity level. Namely, to practise the exercises at an initial frequency well within their current capabilities for a week, then to set a slightly higher frequency goal for the next week and so on each subsequent week, until they reached a level of exercising which they felt they could maintain after the programme ended. Suggested ideal goals were in the range of practising each exercise in lots of five, three to five times a day. If they found an exercise difficult or causing more pain they were advised to consult the physiotherapists to check on how they were doing it or to review the appropriateness of the particular exercise for them.

They were, however, instructed not to set their initial exercise goals too high and so run the risk of muscle strain. They were

informed, nevertheless, that they should expect some increase in pain to begin with as they would be doing exercises with muscles they had probably not been using very much for some time. However, this additional pain should gradually ease-off as their muscles became stronger and more used to exercise again. To aid understanding of this point an analogy was given, comparing their doing the physiotherapy exercises with an athlete trying to get fit again after a long period of inactivity. It was pointed out that such an athlete, even though he was not injured, would also experience some pain or soreness in his muscles and joints to begin with, especially if he/she tried to achieve too high a rate of exercise before he/she was adequately conditioned.

At each session with the clinical psychologist the subjects were questioned on their exercise practice over the previous week. They were verbally praised by the clinical psychologist for any practice performed. If they reported an increase in pain following the exercises the subjects were asked why they thought it had occurred and what could be done about it. In this context the subjects were encouraged to take responsibility for a problem-solving approach to their exercise difficulties. A similar approach was taken if a subject had not done any exercises in the previous week.

4.2.7 Relaxation Training

It was explained to the subjects receiving relaxation training that one of the consequences of chronic pain was increased irritability and muscle tension, which could not only aggravate the pain but also make it difficult for them to cope with the pain and

any conflicts or stressors in the home or workplace. This information, like the models of chronic pain described earlier in the Cognitive and Behavioural treatment sections, was presented in a didactic way so that the subjects had the opportunity to discuss it and relate it to their own experiences. It was also suggested that learning to use a relaxation technique could help them to counter these effects of pain and stressors by helping them to reduce muscle tension and general irritability. It was also suggested that the use of a relaxation technique could help them to cope with their pain.

The subjects receiving relaxation training were taught the progressive muscular relaxation training technique described by Bernstein and Borkovec (1983) and used in Turner's (1982) study. Three thirty minute audio-tapes were used: the first focussing on muscle groups above the waist, the second focussing on the whole body, and the third the whole body but with individual muscle groups combined into four inclusive groups (both arms, legs, torso and head/neck). The subjects were given tape(1) at the first session with the clinical psychologist, tape(2) at session three and tape(3) in session four. In return for a blank tape, they were allowed to keep tape(3) and were encouraged to continue using it after the programme ended.

The subjects were instructed to practice relaxation at least twice a day with the tape and, as they got better at it, to practice more often without the tape, even for short periods and in different places. They were especially encouraged to use their relaxation

technique whenever they started to feel more tense, more irritable or if their pain was increasing in intensity.

At each session each subject was asked about his/her progress with the relaxation technique and any difficulties, such as problems with concentration, were discussed in a problem-solving manner. No actual practice of the relaxation technique took place during the group sessions.

4.2.8 Cognitive Treatment and Relaxation Training

The subjects in this condition received the Cognitive treatment as previously described as well as the Relaxation training described above.

4.2.9 Behavioural Treatment and Relaxation Training

The subjects in this condition received the Behavioural treatment as previously described as well as the Relaxation training described above.

4.2.10 Attention-Control Condition

In addition to the Physiotherapy treatment, which all subjects received, the subjects in this condition attended five sessions with the clinical psychologist. The approach employed in this condition was derived from the attention control condition used in Rybstein-Blinchik's (1979) study. The subjects were informed at the first session (and reminded of it at subsequent sessions) that these sessions were aimed at providing them with an opportunity to discuss the problems of living with chronic back-pain with others who also

had chronic back-pain. It was pointed-out that many people with such conditions often reported that they felt alone or unusual and that other people, especially their doctors and friends (most of whom did not have a chronic pain condition) never seemed to really understand them or what they were going through. It was therefore suggested that these sessions could provide an opportunity for them to discuss a number of issues concerning their back-pain with others who might be in a better position than most to understand them. The subjects were encouraged to share information on how they lived with their back-pain and to try-out anything they learned from other subjects which they thought might be useful.

In order to get discussion started at each session the clinical psychologist introduced a new topic at each session and encouraged each subject to say something about that topic based on their experience. However, conversation or discussion was not limited to that topic and subjects were not discouraged from discussing other topics. The topics introduced by the clinical psychologist were, in order:

- Session 1: the history of their back complaint
- Session 2: the treatments they had received
- Session 3: the effects of their back complaints on their families
- Session 4: the effects of their back complaints on their lifestyles and work
- Session 5: the ways in which they tried to cope with their back pain.

Throughout each session the clinical psychologist attempted to present a friendly, empathic manner but was reflective rather than directive in approach. Thus, direct questions to the clinical psychologist were deflected onto other subjects to answer (or to people, such as the subject's doctor) on the basis of their experience. The clinical psychologist acknowledged how difficult it could be to live with chronic back-pain, but apart from trying to be understanding he offered no solutions. No coping methods were taught. No information on the nature of chronic pain or treatments available was provided. When subjects asked questions on aspects of the Physiotherapy section of the programme they were instructed to direct the question to the physiotherapists.

The subjects were also asked to return their physiotherapy exercise record sheets from the previous week at each session with the clinical psychologist and new ones were distributed. However, the subjects were not encouraged to do, nor reinforced for doing, the exercises by the clinical psychologist.

4.2.11 No-Attention-Control Condition

Subjects in this condition attended the Physiotherapy section of the programme only. They saw the clinical psychologist only briefly at the end of the first Physiotherapy session each week in order to return their physiotherapy exercise record sheets and to receive new ones for the following week.

No information on the exercises was given by the clinical psychologist and any questions were referred back to the

physiotherapists. In addition, no information about chronic pain, methods of coping with chronic pain or treatments available was given to these subjects, other than that included in the Physiotherapy section of the programme.

No encouragement to do, nor reinforcement for doing, the exercises was provided by the clinical psychologist.

4.2.12 Evaluation of Content of the Conditions

In order to provide a measure of integrity of content of the conditions (i.e. that the subjects in each condition actually received the in-put described) all sessions with the clinical psychologist were audio-taped. At the completion of the programme two raters, blind to the identity of the subjects and the conditions they were in, were asked to listen to sections of the audio-tapes randomly selected from the Psychological Treatment and Control conditions and to evaluate their content.

Two tapes from each of the Cognitive, Behavioural and Attention-Control conditions were randomly selected and the conditions from which the tapes came were not identified.

The raters were provided with copies of the descriptions of the different conditions as presented in the Methods section. The raters were asked to listen (not at the same time) to each tape for 10 minutes and then to identify from which condition the tape came. Each tape was previously wound so that it was at least 10 minutes into a session (in order to reduce the possibility of the rater hearing the Experimenter describing the session which could have made

the tape easier to identify). However, the raters were informed they could listen to any section of the tape.

The raters were two experienced clinical psychologists working at the same hospital as the experimenter. Both raters were familiar with Cognitive and Behavioural approaches to pain management, but had not been involved in the present study and did not know any of the patients involved nor in which condition they had been.

4.2.13 Dependent Measures

Eight outcome measures were employed at the four assessment occasions. These included: The Pain Rating Chart, the State-Trait Anxiety Inventory, the Beck Depression Inventory, the Pain Beliefs Questionnaire, the Coping Strategy Questionnaire, Self-rated Sickness Impact Profile and the Other-rated Sickness Impact Profile, and Medications used. Other measures were employed at the four assessment occasions as well but were included mainly for correlational purposes. These were the McGill Pain Questionnaire and the Modified Somatic Perception Questionnaire. A self-report evaluation measure, rating the physiotherapists, was also completed by the subjects at the post-treatment assessment occasion. Follow-up data on other treatments received and continued practice of the techniques taught in the programme were also collected at the 6-month and 12-month follow-up assessment occasions.

The Experimenter conducted all the pretreatment assessments, but an independent psychologist (who was blind as to which treatments the subjects had received) conducted 39 of the post-treatment assessments.

30 of the 6 month follow-up assessment and 29 of the 12 month follow-up assessments. The Experimenter conducted the remaining posttreatment and follow-up assessments for those subjects unable to attend when the independent assessor was available.

(A) Outcome Measures

(i) Pain Rating Chart (PRC)

The PRC consists of seven graphs, one for each day of the week, printed on one side of a sheet of paper (see Appendix J). The PRC was based on the self-report chart developed by Budzynski, Stoyva, Adler, and Mullaney (1973) and modified by Elton et al. (1983). Each graph covers a 24-hour period and uses a pain intensity rating scale of 0-5 where 0=no pain; 1= pain one is aware of if attention is directed to it; 2= pain which can be ignored at times; 3= constant pain (still able to continue working); 4= very severe pain (concentration is difficult but undemanding tasks can be coped with); 5= intense incapacitating pain.

The subjects were asked to rate their pain intensity on this scale each hour they were awake for one week at a time. This occurred on the four assessment occasions (one week pre-programme, one week post-programme, 6-months later and finally at the 12-month follow-up). The subjects were also asked to record their medication intake below their daily pain-rating graph by noting what they took, how much and when (end day).

For scoring purposes, the hourly pain intensity scores for each day were summed and the total divided by the hours rated for that day to yield a mean score for each day. The means were then added together and

divided by the number of days rated (usually seven) to yield a mean pain intensity score for a week for each subject.

Although evidence of adequate reliability and validity of such numerical pain intensity scales is limited (e.g. Syrjala & Chapman, 1984, Reading, 1984), there is general agreement on the need to include a pain intensity measure as a dependent variable in pain treatment studies, but only as one of a number of dependent variables (e.g. Turk & Kerns, 1983; Keefe, 1982).

(ii) State-Trait Anxiety Inventory (STAI) - State version

The STAI (A-State) was employed to assess level of present anxiety (Spielberger et al., 1970). The STAI (A-State) is a self-report scale consisting of 20 statements that ask a subject to describe how he/she is feeling at present (as opposed to how he/she is feeling at present (as opposed to how he/she generally feels). Each statement is rated on a 4-point scale according to how much the subject is experiencing that feeling at present, where 1= not at all, 2= somewhat, 3= moderately so, 4= very much so. The scores are then summed to produce a total score for each subject, with a maximum possible of 80. The STAI (A-State) was completed at pre-treatment, post-treatment, 6-month and 12-months follow-up occasions. This inventory is a widely used measure of current anxiety and evidence of its reliability and validity has been well documented (e.g. Spielberger et al., 1970).

The STAI-A-State scale is intended to measure anxiety at the time of testing and is expected to vary according to situational factors. Consequently, test-retest reliability tend to be low (ranging from 0.16

to 0.54, with a median of 0.32 for six groups of subjects used in its development). However, a measure of internal consistency, the alpha coefficient ranged from 0.83 to 0.92 when the scale was administered to the normative samples (Spielberger et al., 1970).

Evidence of construct validity of the STAI A-State scale was derived during the development of the scale from experimental studies with college students in which the A-State scale was given under different experimental conditions of stress and relaxation. The mean scores for the A-State scale as well as the scores for individual A-State items were highest after the stressful conditions and lowest in the relaxation and low stress conditions (Spielberger et al., 1970). Subsequent research has found increases in A-State scores associated with threats of physical danger (Hodges, 1967). High correlations between scores on the A-State scale and scores on the D, Pt, and Sc. scales on the Minnesota Multiphasic Personality Inventory when used with a sample of hospitalized neuropsychiatric patients were reported by Spielberger, et al., 1970. Elevations on the D, Pt, and Sc scales are considered to reflect high levels of acute anxiety (Spielberger et al., 1970).

(iii) Beck Depression Inventory (BDI)

The BDI is a 21 category self-report scale designed to measure severity of depression (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). Each category consists of 5 or 6 statements reflecting increasing severity and the subjects were asked to select the statement in each category which best described how they had been feeling over the past week. The statements were scored according to a 0, 1, 2, or 3 scale

described by Beck et al. (1961), with the greater the score the more severe the depression. The maximum possible score is 62.

The BDI has been widely used as a measure of affective distress in chronic pain patients (e.g. Turner, 1982; Kerns, 1985; Philips, 1981). Evidence of its psychometric properties was originally presented by Beck et al. (1961), who reported internal consistency findings of significant correlations between all 21 categories and the total score (20 of which were at $p > 0.001$ level) and a split-half reliability coefficient of 0.86. Beck et al. (1961) also reported significant correlations between scores on the inventory and clinical ratings of depth of depression in a clinical population. More recently, Moran and Lambert (1983) reported a content analysis which indicated that the BDI covered 6 of the 9 DSM-III depressive variables completely and 2 partially.

This BDI was included, along with the STAI, as a means of assessing current affective distress.

(iv) Pain Beliefs Questionnaire (PBQ)

The PBQ is a 43-item self-report questionnaire designed to measure the extent to which "chronic pain patients subscribe to beliefs which could promote disability and engender psychological distress" (Gottlieb, 1984, 1).

Each statement is rated according to how much the subject agrees or disagrees with it on a 4-point scale where 0= do not agree at all, 1= agree somewhat, 2= agree, 3= agree strongly.

For scoring purposes, the items judged by the experimenter to reflect coping or adaptive beliefs were scored negatively (e.g. "agree strongly" was scored= 0, while "do not agree at all" was scored= 3). Seven statements were included in this category:-

- I can live a normal lifestyle even though I have pain.
- I can improve my lifestyle despite pain.
- For the most part, I live a normal life.
- I feel I can accomplish most of my goals.
- I can get much done even though I have pain.
- I can get things done around the house even when I have pain.
- I can gradually resume some of my activities.

The remaining 36 statements were scored positively (e.g. "do not agree at all"= 0, while "agree strongly= 3). The resulting scores were summed to give a total 'negative beliefs score', with a maximum possible of 129. Thus, the higher the score the more negative, or non-adaptive the beliefs.

The PBQ was completed at pre-treatment, post-treatment, 6-month and 12-month follow-up assessment occasions. Results of reliability and validity assessments of the PBQ were reported by Gottlieb (1984) and were considered satisfactory, with Chronbach's alpha yielding a correlation of 0.92, $p < 0.001$ and individual item alpha values all in excess of 0.80. A discriminative analysis to assess the predictive validity of the PBQ found that pre-treatment PBQ scores correctly classified treatment outcome in 78% of cases studied. In addition, individuals who improved after treatment endorsed significantly fewer negative items and significantly more positive items.

(v) Coping Strategy Questionnaire (CSQ)

The CSQ is a 42-item self-report scale developed by Rosenstiel and Keefe (1983) to assess the use of cognitive and behavioural pain coping strategies. Each item is rated according to how often the subject has been using that strategy lately when he/she feels pain. Each item is rated on a seven-point scale, where 0= never do it and 6= always do it.

Two additional items at the end of the scale ask the subject to rate how much control he/she feels he/she has over the pain on a 0 - 6 scale (where 0= no control and 6= complete control), and how much the subject feels he/she can decrease the pain (based on all the things he/she does to cope, or deal with, the pain), again on a 0-6 scale, where 0= can't decrease it and 6= can decrease it completely.

Rosenstiel and Keefe (1983) divided the strategies into seven subscales: six cognitive and one behavioural. The six cognitive scales include: diverting attention, reinterpreting pain sensations, coping self-statements, ignoring pain sensations, praying or hoping, and catastrophizing. The behavioural strategy referred to increasing activity level only.

Each of the seven subscales consisted of six statements randomly placed throughout the 42-item questionnaire. Thus the maximum possible score for each subscale was 36.

A total CSQ score was calculated in the present study according to a formula developed a priori by the experimenter. To produce the total score, designated adaptive (or 'active') coping strategy subscale scores were summed together and designated non-adaptive (or 'passive') coping

strategy subscale scores were first summed and then subtracted from the total adaptive score.

The designated adaptive (or 'active') coping strategy subscales were: diverting attention, reinterpreting pain sensations, coping self-statements, ignoring pain-sensations and increasing activity level. They were designated 'active' on the basis that they involved an attempt to deal with the pain by the patient using his/her own resources (e.g. Brown & Nicassio, 1987).

The designated non-adaptive (or 'passive') coping strategy subscales were: praying or hoping and catastrophizing. They were designated 'passive' on the basis that they reflected reactions to pain characterised by helplessness and/or a reliance on others (e.g. Brown & Nicassio, 1987).

The maximum possible CSQ score, then, was 108, where the higher the score the more often adaptive or active coping strategies were being used in comparison to the non-adaptive or passive coping strategies.

Reliability and validity properties of the CSQ were reported by Rosenstiel and Keefe (1983) and were based on a sample of chronic low-back pain patients. Alpha coefficients were calculated for inter-rater correlations within each subscale and reported to be in the range 0.71 to 0.95 which the authors considered a reasonably high level of overall reliability. Three factors derived from a factor analysis of questionnaire responses were found to be predictive of behavioural and emotional adjustment above what could be predicted from an analysis of patient history variables and somatization tendencies. In addition, the

three factors were found to account for a large proportion of the variance of measures of adjustment to chronic pain. In sum, there is some, albeit limited, evidence of a reasonable degree of reliability and validity for this measure.

(vi) Sickness Impact Profile - Self (SIP-S)

The SIP (Bergner et al., 1981) is a self-report behaviourally based measure of the effects of health status on 12 categories of common activities. The categories include: Sleep and Rest; Emotional Behaviour; Home Maintenance; Social Interaction; and Work. The questionnaire contains 136 statements which the respondent rates as either true or false according to whether or not they describe him/her on a given day and are related to his/her health status.

While the instructions for the SIP refer to "health status" in the present study these were altered to "back-pain". Thus, the respondent was asked to vote each statement on the basis of whether or not it was related to his/her back-pain.

The SIP-S was administered by an interviewer, who, after reading-out the instructions to the subject, proceeded to read-out each of the 136 statements to the subject who was asked to answer 'true' or 'false' to each statement. If the subject questioned any item the interviewer would repeat it or explain it as necessary.

When an item referred to the past, as in the following case: "I am doing less of the regular daily work around the house than I would usually do" the subject was requested to relate 'usually' to the period before his/her pain problem developed (where feasible).

The SIP-S was administered on 4 occasions (pre-treatment, post-treatment, 6-month and 12-month follow-up assessments).

Although the SIP can be scored in terms of sub-scales (e.g. Psycho-social, Physical and Others) which combine several categories within each, in the present study only the total SIP score was used. In this case the score was converted to a percentage in order to allow for the lower scores which subjects who had never worked would have automatically received (compared to those who were not working at present because of their back pain). Thus, each subject's score was divided by the maximum possible for that subject and then converted to a percentage to produce the final score.

Extensive reliability and validity data have been reported by Bergner et al., with a final revision published in 1981. The measure has been used to evaluate functioning in patient samples with Rheumatoid Arthritis, Hyperthyroidism and hip replacements. More recently, its use has been reported on patients with chronic low-back pain (Turner, 1982; Follick et al., 1985).

Test-retest reliability ($r = 0.92$) and internal consistency ($r = 0.94$) were found to be high (Bergner et al., 1981), and convergent, discriminant and clinical validity were also reported to be moderate to high. In addition, Follick et al. (1985), in a study of 107 patients with chronic low-back pain found that the validity of the SIP as a measure of functional status was supported and reported that "the SIP appears to be a measure with sufficient sensitivity to detect pre-/post-treatment changes." (p. 67).

(vii) The Sickness Impact Profile - Other (SIP-0)

The SIP was also answered by each subject's spouse or significant other in his/her life at present. In this case the spouse/significant other was requested to give his/her view of how the subject's life was affected at present by the back-pain. Thus, the spouse/significant other was requested to check only those statements he/she felt were true of the subject at present and were related to his/her back pain. It was also suggested to the spouses/significant others, where possible, they should read all the instructions on the front of the SIP to ensure that they understood the requirements of the task.

The subjects were requested not to discuss the questionnaire with their spouses/significant others until it had been completed. In most cases the SIP-0 was completed at home and returned to the experimenter either by the subjects or by post.

As for the SIP-S, the SIP-0 was administered four times - at pre-treatment, post-treatment, 6-month follow-up and 12-month follow-up.

Although this method of using the questionnaire was not suggested by Bergner et al. (1981), it was used by Turner (1982) in a similar manner on a similar group of chronic low-back pain patients.

(viii) Medications Used:

A record of current medication (name and daily dose) was taken at each assessment occasion. The subjects were also requested to record medication intake (name and dose) each time they took some on their Pain Rating Chart over a week at each of the four assessment occasions. A

number of investigators reported difficulty in obtaining an accurate record of medication intake (e.g. Moore & Chaney, 1985; Turner, Calysyn, Fordyce & Ready, 1982). Inspection of the records made by the subjects in this study also revealed numerous irregularities. Determining the reliability of the subjects' reports at interview was also problematic. Consequently, it was decided to employ just a Yes/No categorical solution for each type of medication reported rather than attempt to assess dosage (e.g. Turner et al., 1982).

A medication use score was produced by adding the number of types of medication subjects reported taking at each assessment occasion. Medication types recorded included: narcotic analgesics, non-narcotic analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), anti-depressants, sedatives/hypnotics. Total possible score= 5.

(B) Additional Measures:

(i) Follow-up Assessment - Receipt of other treatments

This measure asked which, if any, treatments the subject had received for his/her back-pain since the last assessment occasion (see Appendix K). The list included: surgery, physiotherapy, chiropractic, TNS, psychotherapy, medication, acupuncture and nerve blocks. Because of the uncertain reliability of asking subjects to recall number of visits to health care facility only Yes/No answers were recorded.

This measure was administered at the six-month and twelve-month follow-up assessment occasions.

(ii) Follow-up Assessment - Maintenance of techniques

This measure asked how often the techniques (e.g. physiotherapy exercises, relaxation, increased activity level and mental-coping strategies) that had been taught during the programme were still being practised at the six-month and twelve-month follow-up assessment occasions (see Appendix L).

Each technique was rated by ticking one of five frequency statements - from 'daily' to 'not since the programme ended'. The statements were scored from 0 - 4, with 0 being 'not since the programme ended' and 4 being 'daily'. One score was derived for each technique.

As not all techniques had been taught to every group five versions of this measure were proposed - one with only physiotherapy exercises (for the two control conditions); one with physiotherapy exercises and

increased activities (for the Behavioural condition); one with physiotherapy exercises, increased activities, and relaxation exercises (for the Behavioural/Relaxation condition); one with physiotherapy exercises and Mental Coping techniques (for the Cognitive condition) and one with physiotherapy exercises, Mental Coping techniques and Relaxation (for the Cognitive/Relaxation condition).

(iii) Expectation Rating Scale (See Appendix M)

This self-report scale was intended to assess the outcome expectations of all subjects at the beginning of the programme in order to provide a measure of perceived credibility for the different experimental conditions.

The scale was administered at the conclusion of the first session of the programme, that is, once the general outline and rationale of the programme had been explained to each group.

The scale consisted of four questions, three of which were answered by the subject making a mark on a 10 cm. visual analogue line, each of which had opposite statements at each end (e.g. "no reduction in pain" - "complete reduction in pain"). The fourth question, asking whether or not the subject would recommend the programme to a close friend or relative with a similar problem, was answered by checking either 'yes' or 'no'. The answers to this question were not included in the total score for the questionnaire, but the question was included as a possible check for people who did not return after the first session. The total score was derived by summing the scores for the three visual analogue lines

(each individual score being the distance from the left side of the line to the mark on the line) and dividing by 3 to find the mean score.

(iv) Evaluation Rating Scale - Physiotherapists

This measure was intended to provide a means of assessing the level of satisfaction with the physiotherapists who conducted the physiotherapy section of the programme. This was necessary because the physiotherapists involved changed through the course of experiment. Each physiotherapist was involved in two cycles of the programme (i.e. two consecutive five-week courses). The physiotherapists worked in pairs, with one physiotherapist acting as the "senior" partner and the other the "junior" or assistant. When the first five-week course was completed, the "senior" physiotherapist would withdraw from the project and the "junior" would then conduct the next five-week course as the "senior" in the company of a new "junior" assistant physiotherapist rotated through the programme. In order to provide evidence that different physiotherapists were not different in manner or helpfulness, even though they were presenting the same material, the physiotherapists' Evaluation Rating Scale was presented to each subject at the post-treatment assessment occasion.

The scale consists of three questions asking the respondent how helpful, how understanding and how friendly he/she had found the physiotherapists. Each question was answered by marking a 10 cm. visual analogue line with opposite statements at each end (e.g. "not at all helpful" - "extremely helpful"). (see Appendix N).

The distance from the left side of the 10 cm line to the check-mark made by the respondent was measured to determine the score for each question and the mean score was then calculated for the three questions.

4.2.14 Experimental Predictions

- i) That there would be a significant pretreatment to posttreatment improvement for the treatment groups relative to the control groups on all the dependent variables.
- ii) That there would be a significant pretreatment to 6-month follow-up improvement for the treatment groups relative to the control groups on all the dependent variables.
- iii) That there would be a significant pretreatment to 12-month follow-up improvement for the treatment groups relative to the control groups on all the dependent variables.
- iv) That there would be no significant differences in improvement between the control groups at posttreatment, 6-months follow-up, or 12-months follow-up.
- v) That the cognitive treatment groups would improve significantly more than the behavioural treatment groups on the Pain Beliefs Questionnaire and the Coping Strategies Questionnaire.
- vi) That the behavioural treatment groups would improve significantly more than the cognitive treatment groups on both versions of the Sickness Impact Profile and Pain-related medication use.

It should be noted that the use of planned contrasts in this analysis maximises the power available (Tabachnick and Fidell, 1983). In addition, the use of the Bonferroni Correction provides control over the Type I error rate at very close to the nominal level (0.05). Furthermore, the Bonferroni Correction not only reduces the possibility of Type I errors, but also provides less conservative critical values than the alternative MANOVA approach (and thus less possibility of Type II errors) (Harris, 1985). Although the MANOVA approach could have provided interesting information about combinations of the dependent variables, the univariate approach used here is consistent with previous studies in this area and therefore its use facilitates comparisons with these studies.

Tabachnick, B.G. and Fidell, L.S. (1983). Using Multivariate Statistics, Harper and Row, New York.

- vii) That the treatment groups receiving relaxation training would improve more than the non-relaxation treatment groups on average pain intensity ratings.

4.2.15 Statistical Analysis

(i) Outcome Data

As the analyses of the multivariate data in this study were planned each variable was analysed separately (Bird, 1975). In order to control for possible inflation of the Type 1 error rate due to the large number of dependent variables being analysed separately, a family error rate was set using the Bonferroni Inequality (Hummel and Sligo, 1971; Harris, 1985; Miller, 1966). The family error rate was set at 0.05 and as eight variates were employed, each contrast was tested with a Type 1 error rate of $0.05/8 = 0.006$. It should be noted, however, that while this procedure may reduce the possibility of Type 1 errors, it does increase the possibility of Type II errors. However, as most of the previous controlled treatment studies in this area have employed the univariate decision-wise error rate, attention will be drawn to any effects that are significant using this rate. This will be commented upon at the end of each section of the Results.

Eight outcome measures (APR, STAI, BDI, PBQ, CSQ, SIP-S, SIP-O, Med. use) were subjected to repeated measures analyses of variance (ANOVAs), with each variable being analysed separately.

The analyses were planned and the following between group contrasts were performed:

Contrast 1: to test the predictions comparing the effects of cognitive versus behavioural treatments.

Contrast 2: to test the prediction comparing the effects of relaxation training on cognitive and behavioural treatments.

Contrast 3: to test the predictions comparing the effects of the treatment conditions versus the control conditions.

Contrast 4: to test the prediction comparing the effects of the attention-control condition versus the no-attention control condition.

Contrast 5: to test if relaxation is differentially effective with cognitive or behavioural treatment.

Contrast Summary

	CT	CT.RT	AC	NAC	BT	BT.RT
1.	1	1	0	0	- 1	- 1
2.	- 1	1	0	0	- 1	1
3.	1	1	- 2	- 2	1	1
4.	0	0	1	- 1	0	0
5.	- 1	1	0	0	1	- 1

Key: CT= Cognitive Treatment; CT.RT= Cognitive Treatment with Relaxation Training; AC= Attention-Control; NAC= No-Attention Control; BT= Behavioural Treatment; BT.RT= Behavioural Treatment with Relaxation Training.

The following within groups contrasts were also performed:

Pretreatment	Posttreatment	6-Month F/U	12 Month F/U
1	- 1	0	0
1	0	- 1	0
1	0	0	- 1

As an alternative analysis, those readers interested in the results of subjecting the data to repeated measures analysis of covariance (ANCOVA) may refer to Appendix O for a summary of the F-values.

(ii) Pretreatment Data

Differences between groups at pretreatment on the dependent variables as well as the Expectancy scores were analysed using a one-way ANOVA for each variable.

(iii) Posttreatment and Follow-up Data

Posttreatment evaluation scores for the physiotherapists and other treatments sought in the follow-up period were also analysed separately using one-way ANOVAs.

Missed sessions

1

Subjects who missed two or less treatment sessions, but not more than two, were included in the analyses. In fact, all subjects who missed more than two sessions never returned. It should be noted that when a subject missed a session he/she was brought up to date when that session was reviewed at the subsequent session. This meant that they received most, if not all, the information that those who attended all sessions received. Consequently, there seemed no good reason to exclude them from the analyses. In all, fifteen subjects missed one session and four missed two sessions. They were distributed across all conditions with no apparent biases.

4.3 RESULTS

4.3.1 Subject losses

Table (2) describes the subject numbers at different stages through the experiment within the different conditions.

Table (2)

Condition programme	Accepted into programme	Started programme	Completed Folow-up	6-Month Follow-up	12-Month Follow-up
Cognitive	11	10	8	7	6
Cog & Rel.	10	8	7	5	6
Attention	10	10	9	8	9
No-Attent.	12	11	7	6	5
Behavioural	10	10	8	6	6
Behav. & Rel.	9	9	9	7	7
Total N:	62	58	48	39	39

Although sixty-two subjects were accepted into the programme, only fifty-eight actually started the programme. By posttreatment forty-eight subjects remained, with ten subjects dropping-out during the programme. While an attempt was made to contact subjects if they missed a session to encourage them not to miss the next session, on some occasions this was unsuccessful¹. Where possible, an attempt was made to determine the reasons for dropping out. Reasons given included the treatment was not what they wanted, the pain was getting worse and they thought that they should rest, time of sessions was inconvenient and seeing a new doctor now - not the one they referred them to the program - and he/she has prescribed a new treatment.

At 6-months follow-up thirty-nine returned for re-assessment, with five not able to be located. At 12-months follow-up thirty-nine subjects returned for re-assessment, with a further one not able to

be located, one having died and two additional subjects being relocated.

At posttreatment two subjects failed to return their weekly Pain-Rating Chart and SIP-0 by mail. Consequently posttreatment data for these two measures were analysed separately from the other dependent measures to allow for the reduced N (i.e. with N = 46, rather than 48). However, the data for all other pretreatment-posttreatment measures were analyzed with N= 48.

At 6-month follow-up, thirty-nine subjects completed the STAI, BDI, PBQ, CSQ and SIP-S. Accordingly, these data were analyzed with N= 39. However, five subjects failed to return their Pain-Rating charts and, thus, the data for this measure were analyzed with N= 34. Nine subjects failed to return their SIP-0 and, thus, the data for this measure were analyzed with N= 30.

At 12-month follow-up, thirty-nine subjects completed the STAI, BDI, PBQ, CSQ and SIP-S and, thus, the data for these measures were analyzed with N= 39. However, as five subjects failed to return their SIP-0 and Pain-Rating charts the data for these measures were analyzed with N= 34.

4.3.2 Subjects' Characteristics

Data describing the characteristics of the total sample are presented in Table 3. A breakdown of these characteristics for each condition is presented in Appendix P.

Table 3. Characteristics of total sample of subjects

N: 58

Mean Age: 41.2 years (Range 21-63; SD 10.3)

Gender: Males (28); Females (30)

Mean time with

Low-Back pain: 7.0 years (Range 0.6-32.0; SD 6.5)

% covered by

compensation insurance: 38 (65.5%)

Currently working: 8.6% (15.5% were housewives)

Marital status: Married or living with significant other: 47 (81%)

Single or living alone: 11 (19%)

Occupation (when working):

Unskilled manual/Home duties: 35 (60.3%)

Skilled manual: 10 (17.2%)

Clerical/Office: 8 (13.8%)

Professional: 5 (8.8%)

English as first language: 46 (79.3%)

Education:

Primary school only: 1 (1.7%)

3 years or less secondary school: 52 (89.7%)

More than 3 years secondary school: 5 (8.6%)

"Positive" medical findings: 52 (89.7%) (i.e. some abnormality in lower back region reported by referring doctor following physical/radiological investigations).

Previous Treatments

(i) Surgery (one or more operations): 22 (37.9%) (of total sample)

(ii) Nerve blocks : 19 (32.8%)

(iii) Physiotherapy : 56 (96.6%)

(iv) TENS : 23 (39.7%)

(v) Chiropractic : 13 (22.4%)

(vi) Medication : 58 (100%)

(vii) Psychotherapy/Counselling : 8 (13.8%)

Medication at Pretreatment

(i) Narcotic analgesics : 7 (12.1%)

(ii) Non-narcotic analgesics : 41 (70.7%)

(iii) Non-steroidal anti-inflammatory drugs (NSAIDs) : 18 (31.0%)

(iv) Anti-depressants : 18 (31.0%)

(v) Sedatives : 21 (36.2%)

4.3.3 Analyses of Pre-Treatment Dependent Variables

One-way Analyses of Variance were performed on each Dependent Variable according to the planned contrasts described earlier. In determining levels of significance, the error rate was set at 0.05 for each comparison. Although this could increase the risk of Type II errors it was considered to err on the side of caution.

No significant differences were found on any contrast for: Average pain Ratings, STAI, BDI, PBQ, CSQ, SIP-O, and Medication use. However, there was a significant difference in Expectancy rating scores between the four treatment conditions and the two control conditions, with the control conditions indicating a significantly lower expectation of improvement than the treatment conditions at the end of the first session of the programme, $F(1,42) = 14.02, p < 0.001$. In addition, significant differences were also revealed on the SIP-S; between the cognitive and behavioural treatments, with the cognitive treatments being less functionally impaired, $F(1, 42) = 5.90, p < 0.05$; and between the relaxation and no-relaxation conditions with the relaxation conditions being less functionally impaired, $F(1,42) = 4.84, p < 0.05$.

4.3.4 Integrity of treatment and attention-control conditions

The two blind raters independently and correctly identified six audiotapes randomly selected from the cognitive, behavioural and attention-control conditions (two from each) - thus providing some evidence that the content of each condition was consistent with the content descriptions in the Methods section.

Table 4

Group Means and Standard Deviations for Dependent Variables, Pretreatment, Posttreatment, 6-month and 12-month Follow-ups

<u>MEASURE</u>	<u>CONDITION</u>					
	CT	CT.RT	AC	NAC	BT	BT.RT
1) <u>Average Pain Rating</u>						
Pre Mean	3.8	2.27	2.84	2.77	2.78	2.96
SD	0.79	0.54	0.80	0.90	0.41	0.58
n	(10)	(8)	(10)	(11)	(10)	(9)
Post Mean	3.04	1.81	3.03	3.16	2.23	2.73
SD	0.77	0.80	0.75	0.66	0.66	0.60
n	(8)	(7)	(9)	(7)	(8)	(9)
6 Month Mean	3.20	2.22	2.64	3.18	2.18	1.87
SD	0.93	0.48	0.90	0.72	0.55	0.73
n	(5)	(5)	(8)	(6)	(4)	(6)
12 Month Mean	3.30	1.88	2.70	3.22	2.56	2.66
SD	0.83	0.65	0.84	0.69	0.97	1.06
n	(4)	(6)	(8)	(5)	(5)	(6)
2) <u>STAI</u>						
Pre Mean	53.50	40.29	52.89	52.29	52.75	50.78
SD	14.98	10.26	10.74	13.10	14.01	9.14
n	(10)	(8)	(10)	(11)	(10)	(9)
Post Mean	51.13	37.57	48.89	46.57	50.38	40.67
SD	14.23	10.08	8.83	9.75	13.63	9.66
n	(8)	(7)	(9)	(7)	(8)	(9)
6 Month Mean	55.71	36.40	41.13	54.00	57.17	37.57
SD	10.47	6.28	11.70	12.03	10.30	12.92
n	(7)	(5)	(8)	(6)	(6)	(7)
12 Month Mean	47.17	40.67	46.56	53.40	42.83	37.43
SD	17.01	11.81	11.51	18.78	9.42	12.26
n	(6)	(6)	(9)	(5)	(6)	(7)
3) <u>BDI</u>						
Pre Mean	25.13	16.86	15.67	19.29	24.63	19.00
SD	10.37	7.92	4.37	7.63	7.25	8.69
n	(10)	(8)	(10)	(11)	(10)	(9)
Post Mean	18.38	10.14	12.11	15.57	17.13	11.56
SD	6.38	4.76	3.73	5.00	10.29	5.50
n	(8)	(7)	(9)	(7)	(8)	(9)
6 Month Mean	16.14	9.00	9.88	19.17	18.67	8.14
SD	3.80	6.07	5.46	8.78	9.01	5.77
n	(7)	(5)	(8)	(6)	(6)	(7)
12 Month Mean	12.83	13.17	10.56	17.60	18.67	8.00
SD	6.69	8.51	5.21	6.09	10.04	5.93
n	(6)	(6)	(9)	(5)	(6)	(7)

MEASURECONDITION

		CT	CT.RT	AC	NAC	BT	BT.RT
4)	<u>PBO</u>						
	Pre Mean	75.88	66.29	57.44	63.43	71.50	62.89
	SD	12.44	23.09	15.46	15.91	17.67	19.87
	n	(10)	(8)	(10)	(11)	(10)	(9)
	Post Mean	57.13	51.57	57.89	58.43	56.88	36.56
	SD	18.79	24.01	15.95	19.14	22.14	22.19
	n	(8)	(7)	(9)	(7)	(8)	(9)
	6 Month Mean	61.14	46.00	51.00	63.50	59.50	32.29
	SD	14.41	19.75	12.12	17.29	19.04	21.23
	n	(7)	(5)	(8)	(6)	(6)	(7)
	12 Month Mean	50.00	49.67	49.11	56.80	59.17	32.86
	SD	12.32	20.49	21.08	19.11	26.52	17.22
	n	(6)	(6)	(9)	(5)	(6)	(7)
5)	<u>CSQ</u>						
	Pre Mean	29.63	50.57	37.67	35.00	29.38	32.67
	SD	27.44	28.64	27.92	35.55	22.92	19.21
	n	(10)	(8)	(10)	(11)	(10)	(9)
	Post Mean	61.75	68.00	45.56	32.29	33.88	49.22
	SD	28.26	32.17	21.64	38.97	28.00	21.87
	n	(8)	(7)	(9)	(7)	(8)	(9)
	6 Month Mean	64.43	58.80	46.88	37.17	24.17	59.43
	SD	27.86	37.43	21.42	30.69	29.21	27.67
	n	(7)	(5)	(8)	(6)	(6)	(7)
	12 Month mean	63.33	64.00	53.00	43.00	38.50	57.00
	SD	27.08	35.57	32.34	21.36	25.75	30.97
	n	(6)	(6)	(9)	(5)	(6)	(7)
6)	<u>SIP-S</u>						
	Pre Mean	33.41	20.53	27.12	28.06	37.13	34.24
	SD	8.27	9.69	7.05	7.51	10.75	12.05
	n	(10)	(8)	(10)	(11)	(10)	(9)
	Post Mean	24.28	15.53	25.34	21.96	18.14	19.26
	SD	9.75	8.65	10.09	4.59	11.46	9.79
	n	(8)	(7)	(9)	(7)	(8)	(9)
	6 Month Mean	25.69	14.86	19.40	29.78	24.42	15.44
	SD	8.50	9.08	6.89	8.76	11.78	14.12
	n	(7)	(5)	(8)	(6)	(6)	(7)
	12 Month Mean	20.77	12.87	18.94	25.18	23.85	12.80
	SD	8.29	6.68	12.79	8.08	12.50	8.62
	n	(6)	(6)	(9)	(5)	(6)	(7)

MEASURE	CONDITION					
	CT	CT.RT	AC	NAC	BT	BT.RT
7) <u>SIP-0</u>						
Pre Mean	27.91	19.19	21.74	22.05	28.98	22.68
SD	12.44	9.04	9.08	6.97	7.96	11.29
n	(10)	(8)	(10)	(11)	(10)	(9)
Post Mean	22.05	14.87	16.09	20.95	22.08	17.08
SD	12.81	10.07	4.06	9.43	10.90	8.62
n	(8)	(7)	(8)	(6)	(8)	(9)
6 Month Mean	24.36	20.26	15.32	18.56	32.25	12.16
SD	15.09	14.03	5.36	8.53	8.91	6.54
n	(5)	(5)	(6)	(5)	(4)	(5)
12 Month Mean	16.10	15.37	15.39	20.26	20.14	12.58
SD	9.88	13.53	13.19	7.64	9.87	6.69
n	(4)	(6)	(8)	(5)	(5)	(6)
8) <u>Med. Used</u>						
Pre Mean	1.38	1.43	1.78	2.00	2.38	1.56
SD	0.99	0.50	1.40	1.07	1.32	1.34
n	(10)	(8)	(10)	(11)	(10)	(9)
Post Mean	1.25	1.29	1.23	1.71	1.25	0.89
SD	0.83	0.70	1.22	1.03	1.09	1.20
n	(8)	(7)	(9)	(7)	(8)	(9)
6 Month Mean	1.86	1.60	1.50	1.83	1.50	0.57
SD	0.64	1.02	0.71	1.07	1.26	0.73
n	(7)	(5)	(8)	(6)	(6)	(7)
12 Month Mean	1.67	1.33	1.44	1.60	1.17	0.71
SD	1.37	0.75	0.96	1.49	1.37	0.88
n	(6)	(6)	(9)	(5)	(6)	(7)

Key:

CT= Cognitive treatment
 CT.RT= Cognitive treatment with Relaxation training
 BT= Behavioural treatment
 BT.RT= Behavioural treatment with Relaxation training
 AC= Attention-Control
 NAC= No-Attention Control

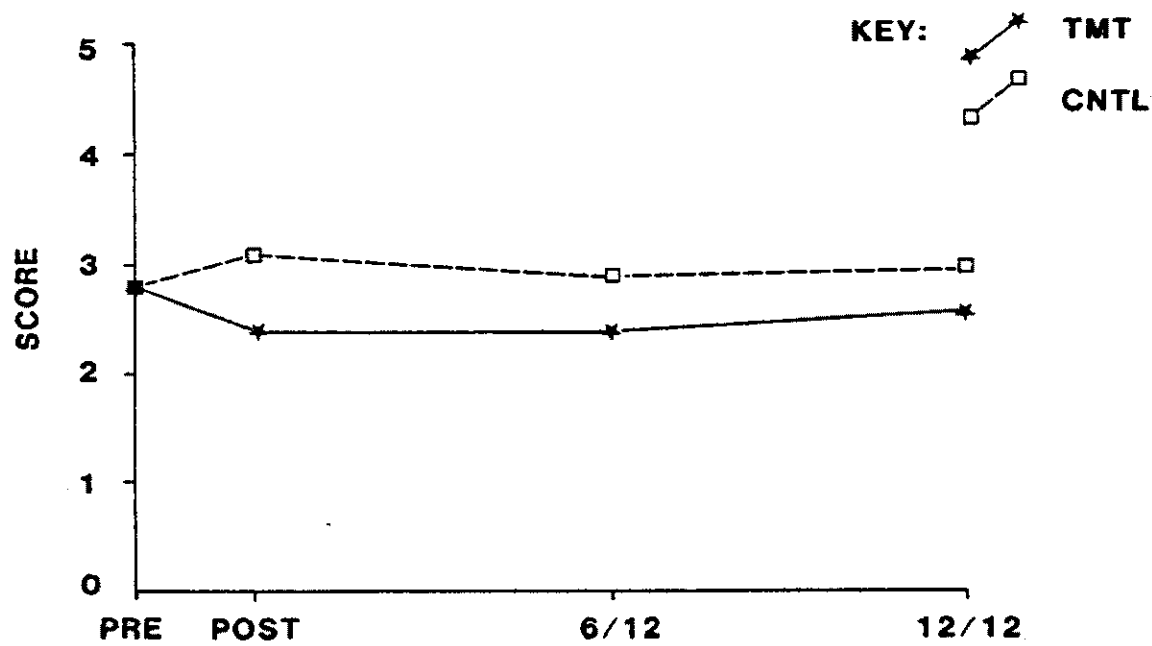
Skewness and Outliers

The dependent variable scores for all contrasts were examined for skewness and outliers prior to analysis. However, distribution analysis, in which the value of skewness for each variable was compared against the standard error for skewness (Tabachnick & Fidell, 1983), revealed that none of the dependent variables were significantly skewed.

In addition, inspection of the dependent variable scores revealed no clear outliers. However, it should be noted, that even if outliers were detected, and were not thought to be due to mistaken readings, it is uncertain what would be the most satisfactory method of dealing with them. For example, a good case can be made for retaining them, lest the generalizability of the findings be altered (Anscombe, 1968; Tabachnick & Fidell, 1983).

Reference: Anscombe, F.J. (1968). Outliers. In 'Statistical analysis, special problems of', International Encyclopaedia of the Social Sciences, 15, 178-182.

FIGURE 3. MEAN WEEKLY PAIN SCORES



4.3.5 Pretreatment to Posttreatment changes

The Means and Standard Deviations for the Dependent Variables at Pretreatment, Posttreatment, 6-month follow-up and 12-month follow-up are presented in Table 4.

(i) Average Pain Intensity

Pretreatment-Posttreatment planned contrasts revealed a significant improvement for the four treatment conditions compared to the two control conditions $F(1,42) = 11.35, P < 0.05$. However, no significant differences in improvement revealed between the treatment conditions or between the control conditions. Table 5 presents a summary of the repeated measures Analysis of Variance (ANOVA) results¹. A graphical account of the average pain intensity scores from pretreatment to 12-month follow-up is presented in Fig. 3.

TABLE 5. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment Pain Intensity Scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (CT+CT.RT vs. BT+BT.RT)	.151	1	.151	.163
A2 (CT.RT+BT.RT vs. BT+CT)	2.051	1	2.051	2.204
A3 (Tmt vs Control)	2.268	1	2.268	2.436
A4 (AC vs. NAC)	0.005	1	0.005	0.005
A5 (CT+BT.RT vs. BT+CT.RT)	7.866	1	7.866	8.449
ERROR	39.098	42	0.931	
WITHIN				
B1 (Trials)	.414	1	.414	2.257
A1B1 (Contrast x Occs.)	.031	1	.031	.171
A2B1	.000	1	.000	.000
A3B1	2.083	1	2.083	11.353 *
A4B1	.076	1	.076	.416
A5B1	.416	1	.416	2.267
ERROR	7.704	42	.183	

* $P < 0.05$ (Bonferroni)

Key: CT=Cognitive treatment; CT.RT=Cognitive treatment with Relaxation training; AC=Attention-control; NAC=No-attention control; BT=Behavioural treatment; BT.RT=Behavioural treatment with Relaxation training.

- ¹ The Between Group and Within Group effects are shown in this and all following ANOVA summary tables. It should be noted that the Between Group contrasts are the result of collapsing the data across Trials and thus are not open to meaningful interpretation in this type of design. However, as it is customary to include both Between and Within contrasts in summary tables of repeated measures ANOVAs the full table is presented.

(ii) Affective Distress

Repeated measures ANOVAS revealed a significant overall pretreatment-posttreatment improvement (main effect for time) for both anxiety, $F(1,42)=10.39$, $p < 0.01$, and depression, $F(1,42)=31.56$, $p < 0.01$, measures (STAI-S and BDI). However, there were no significant differences in improvement revealed between treatment and control conditions or between treatment conditions. Table 6 and 7 present summaries of the repeated measures ANOVA results for both measures.

TABLE 6. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment STAI-S Scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (CT+CT.RT vs. BT+BT.RT)	144.952	1	144.952	.547
A2 (CT.RT+BT.RT vs. BT+CT)	1466.640	1	1466.640	5.532
A3 (Tmt vs Control)	192.956	1	192.956	.728
A4 (AC vs. NAC)	16.794	1	16.794	.063
A5 (CT+BT.RT vs. BT+CT.RT)	225.834	1	225.834	
ERROR	11134.121	42	265.098	
WITHIN				
B1 (Trials)	491.286	1	491.286	10.391*
A1B1 (Group x Trials)	54.282	1	54.282	1.148
A2B1	64.282	1	64.699	1.368
A3B1	1.130	1	1.130	.024
A4B1	5.786	1	5.786	.122
A5B1	54.282	1	54.282	1.148
ERROR	1985.748	42	47.280	1.148

* $P < 0.05$ (Bonferroni)

FIGURE 4. MEAN SICKNESS IMPACT PROFILE SCORES (SELF)

(Treatments versus Controls)

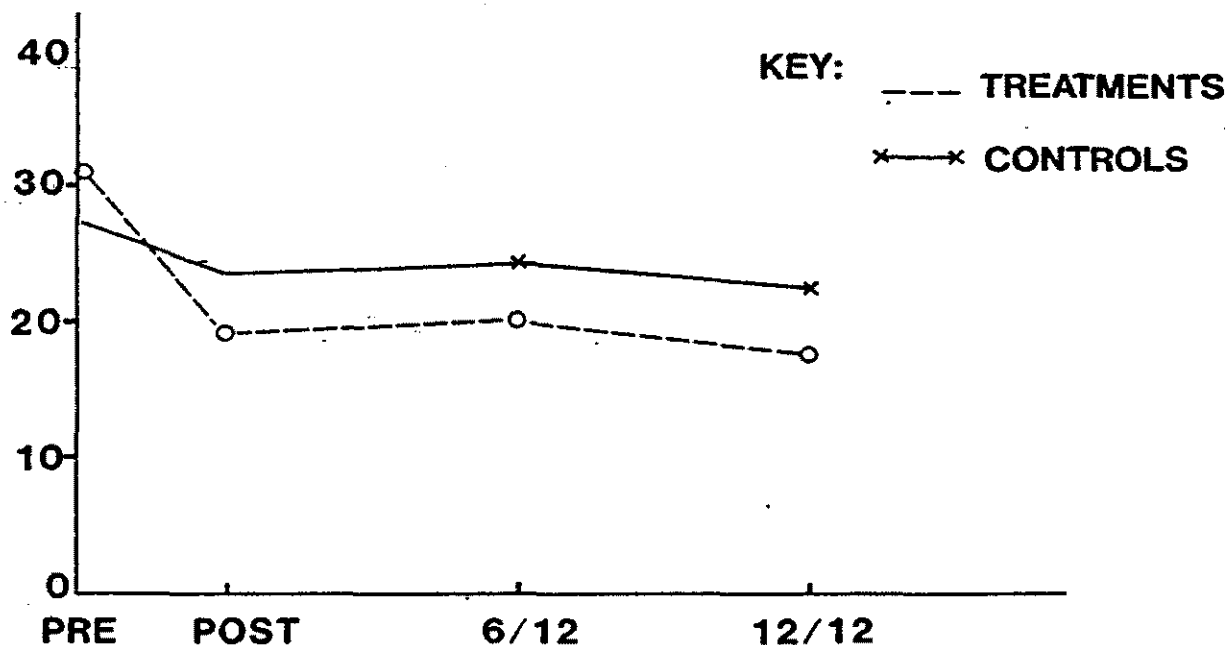


FIGURE 5. MEAN SICKNESS IMPACT PROFILE SCORES (SELF)

(Cognitive versus Behavioural Conditions)

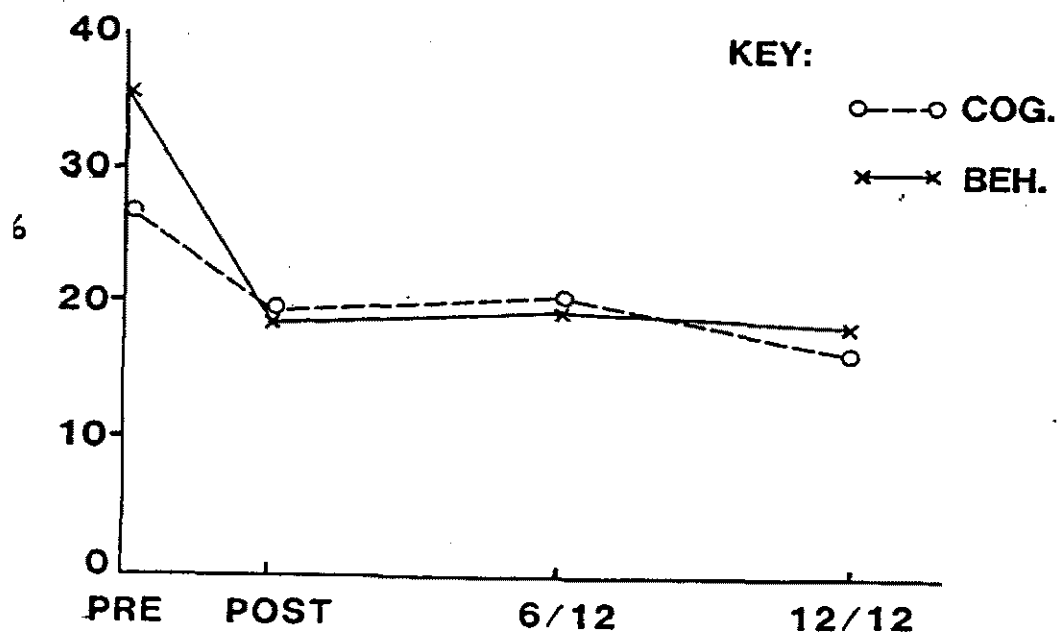


TABLE 7. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment BDI Scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (CT+CT.RT vs BT+BT.RT)	3.234	1	3.232	.035
A2 (CT.RT+BT.RT vs BT+CT)	760.943	1	760.943	8.318
A3 (Tmt vs Control)	101.162	1	101.162	1.106
A4 (AC vs. NAC)	98.669	1	98.669	1.079
A5 (CT+BT.RT vs. BT+CT.RT)	27.927	1	27.927	.305
ERROR	3842.067	42	91.478	
WITHIN				
B1 (Trials)	839.754	1	839.754	31.564**
A1B1 (Group x Trials)	2.174	1	2.174	.082
A2B1	.008	1	.008	.000
A3B1	63.280	1	63.280	2.379
A4B1	.050	1	.050	.002
A5B1	.000	1	.000	.000
ERROR	1117.401	42	26.605	

** $P < 0.01$ (Bonferroni)

(iii) Sickness Impact Profiles (SIP-S and SIP-0)

Repeated measures ANOVAs revealed a significant overall pretreatment-posttreatment improvement in SIP-S scores, $F(1,42)=60.01$, $p < 0.01$ and SIP-0 scores, $F(1,42)=27.51$, $p < 0.01$.

In addition, Group x Trials ANOVAs of the SIP-S scores also revealed a significant improvement for the four treatment conditions compared to the two control conditions, $F(1,42)=9.99$, $p < 0.05$, and a significant improvement for the Behavioural Treatment conditions relative to the Cognitive Treatment conditions, $F(1,42)=11.33$, $p < 0.01$. There was no significant difference revealed between the two control conditions or between the Relaxation and Non-Relaxation treatment conditions.

However, Group x Trials ANOVAs of the SIP-O scores revealed no significant pretreatment-posttreatment differences between treatments and controls, between treatments or between control conditions.

Tables 8 and 9 present summaries of the repeated measures ANOVAs for the SIP-S and SIP-O scores. Figure 4 presents a graphical account of the mean SIP-S scores from pretreatment to 12-month follow-up for the treatment vs. control conditions. Figure 5 presents a graphical account of the mean SIP-S scores from pretreatment to 12-month follow-up for the cognitive vs. behavioural treatment conditions.

TABLE 8. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment SIP-S Scores

SOURCE	SS	PF	MS	F
<u>BETWEEN</u>				
A1 (CT+CT.RT vs. BT+BT.RT)	223.760	1	223.760	1.326
A2 (CT.RT+BT.RT vs. BT+CT)	542.917	1	542.917	3.216
A3 (Tmt vs Control)	1.982	1	1.982	.012
A4 (AC vs. NAC)	11.840	1	11.840	.070
A5 (CT+BT.RT vs. BT+CT.RT)	391.624	1	391.624	2.320
ERROR	7089.687	42	168.802	2.320
<u>WITHIN</u>				
B1 (Trials)	2068.159	1	2068.159	60.014**
A1B1 (Group x Trials)	390.482	1	390.482	11.331**
A2B1	65.675	1	65.675	1.906
A3B1	344.464	1	344.464	9.996*
A4B1	36.779	1	36.779	1.067
A5B1	.019	1	.019	.001
ERROR	1447.376	42	34.461	

* $P < 0.05$ (Bonferroni)

** $P < 0.01$ (Bonferroni)

TABLE 9. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment SIP-0 Scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (CT+CT.RT vs. BT+BT.RT)	162.192	1	162.192	.856
A2 (CT.RT+BT.RT vs. BT+CT)	445.893	1	445.893	2.354
A3 (Tmt vs Control)	110.044	1	110.044	.581
A4 (AC vs. NAC)	45.910	1	45.910	.242
A5 (CT+BT.RT vs. BT+CT.RT)	111.705	1	111.705	.590
ERROR	7575.977	40	189.399	
WITHIN				
B1 (Trials)	788.714	1	788.714	27.512**
A1B1 (Group x Trials)	68.730	1	68.730	2.397
A2B1	9.856	1	9.856	.344
A3B1	68.936	1	68.936	2.405
A4B1	35.490	1	35.490	1.238
A5B1	38.733	1	38.733	1.351
ERROR	1146.734	40	28.668	

** $P < 0.01$ (Bonferroni)

(iv) Medication Use

Table 10 presents a summary of the repeated measures ANOVA results for the mean medications used scores. Figure 6 presents a graphical account of the mean medications used scores from pretreatment to 12-month follow-up.

Repeated measures ANOVA revealed a significant overall pretreatment-posttreatment reduction in number of types of medication used, $F(1,42)=14.46$, $p < 0.01$. However, no significant pretreatment-posttreatment differences were revealed by any of the Group x Trials interactions.

FIGURE 6. MEDICATIONS USED

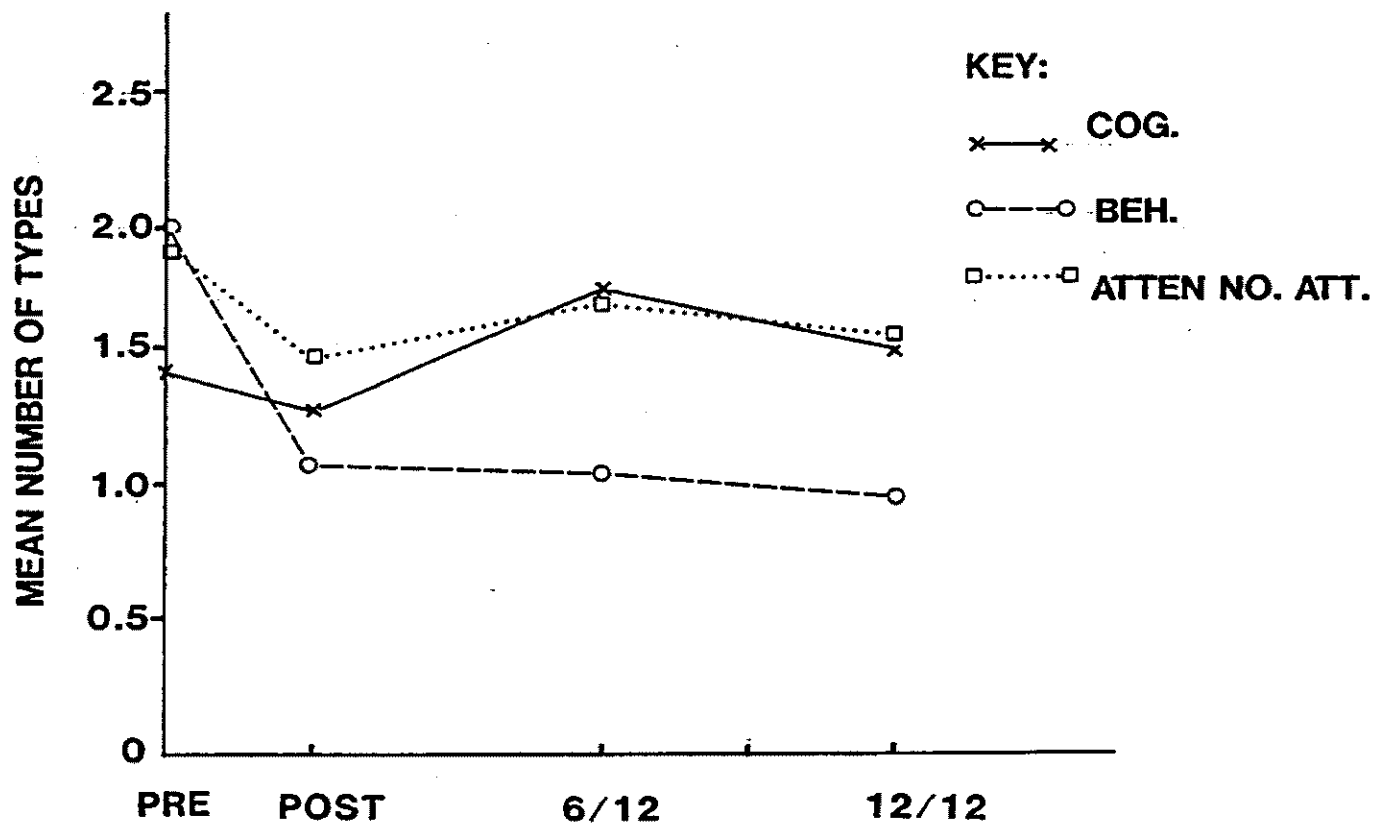


TABLE 10. Summary of Repeated Measures ANOVA on Mean
Pretreatment-Posttreatment Medication Use Scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (CT+CT.RT vs. BT+BT.RT)	.529	1	.529	.219
A2 (CT.RT+BT.RT vs. BT+CT)	1.181	1	1.181	.489
A3 (Tmt vs Control)	1.342	1	1.342	.556
A4 (AC vs. NAC)	1.004	1	1.004	.416
A5 (CT+BT.RT vs. BT+CT.RT)	1.600	1	1.600	.663
ERROR	101.415	42	2.415	
<u>WITHIN</u>				
B1 (Trials)	5.551	1	5.551	14.455**
A1B1 (Group x Trials)	2.304	1	2.304	5.999*
A2B1	.192	1	.192	.501
A3B1	.047	1	.047	.122
A4B1	.143	1	.143	.373
A5B1	.225	1	.225	.586
ERROR	16.129	42	.384	

** P<0.01 (Bonferroni)

* P<0.05 (Univariate)

FIGURE 7. PAIN BELIEFS QUESTIONNAIRE (PBQ)
(Treatments versus Controls)

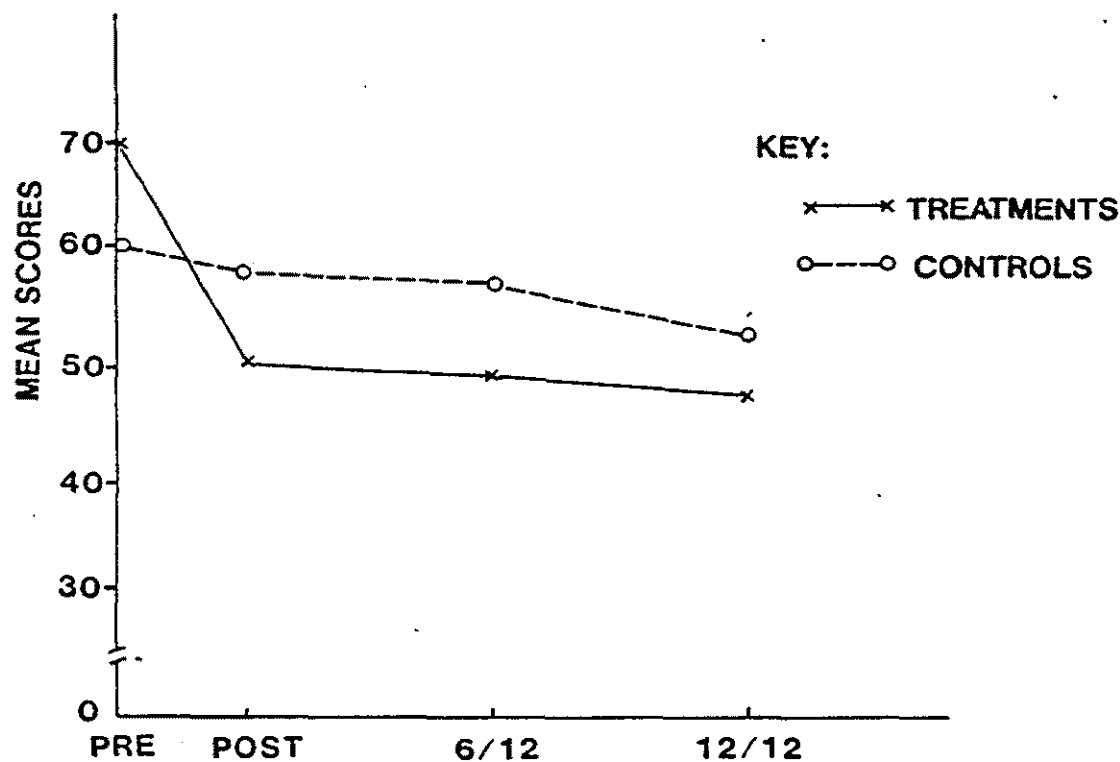
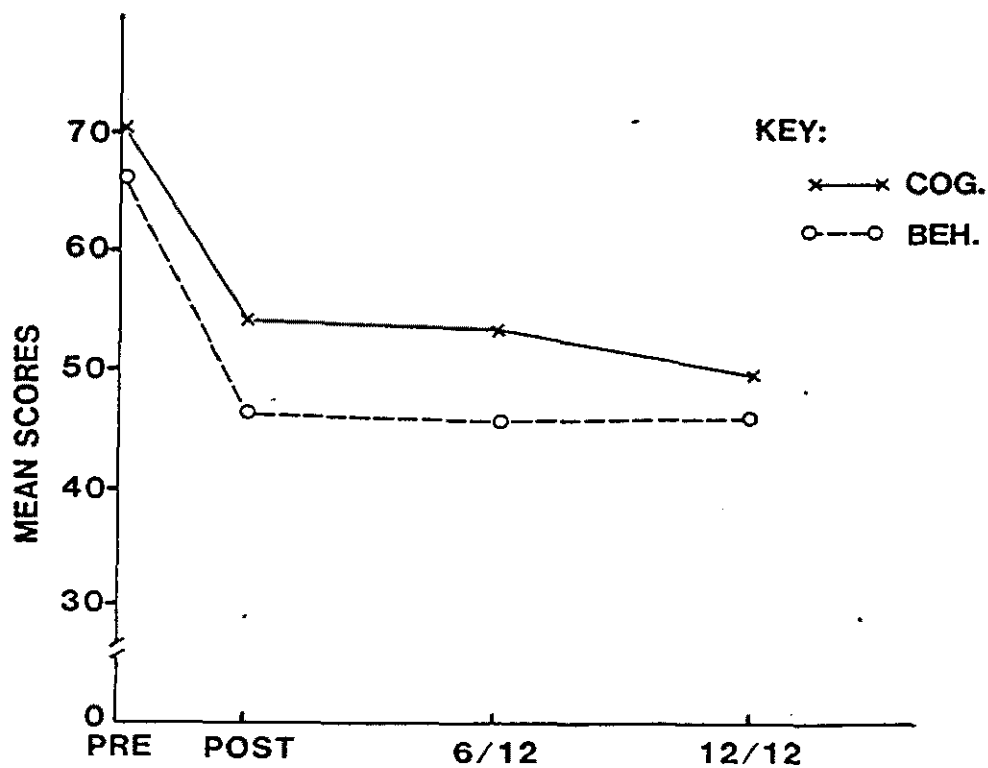


FIGURE 8. PAIN BELIEFS QUESTIONNAIRE (PBQ)
(Behavioural versus Cognitive Conditions)



(v) Dysfunctional Cognitions

A repeated measures ANOVA revealed a significant overall pretreatment-posttreatment decrease in dysfunctional cognitions score on the Pain Beliefs Questionnaire, $F(1,42) = 46.23$. In addition, Group x Trials ANOVAs revealed a significant reduction in dysfunctional cognitions for the four treatment conditions compared to the two control conditions, $F(1,42) = 15.77$, $p < 0.01$. No significant differences were revealed between treatment conditions or between control conditions.

A summary of the repeated measures ANOVA results is presented in Table 11. Figure 7 presents a graphical comparison of mean PBQ scores from pretreatment to 12-month follow-up for treatment and control conditions. Figure 8 presents a graphical comparison of mean PBQ scores for the cognitive and behavioural treatment conditions.

FIGURE 9. COPING STRATEGY QUESTIONNAIRE
(Treatments versus Controls)

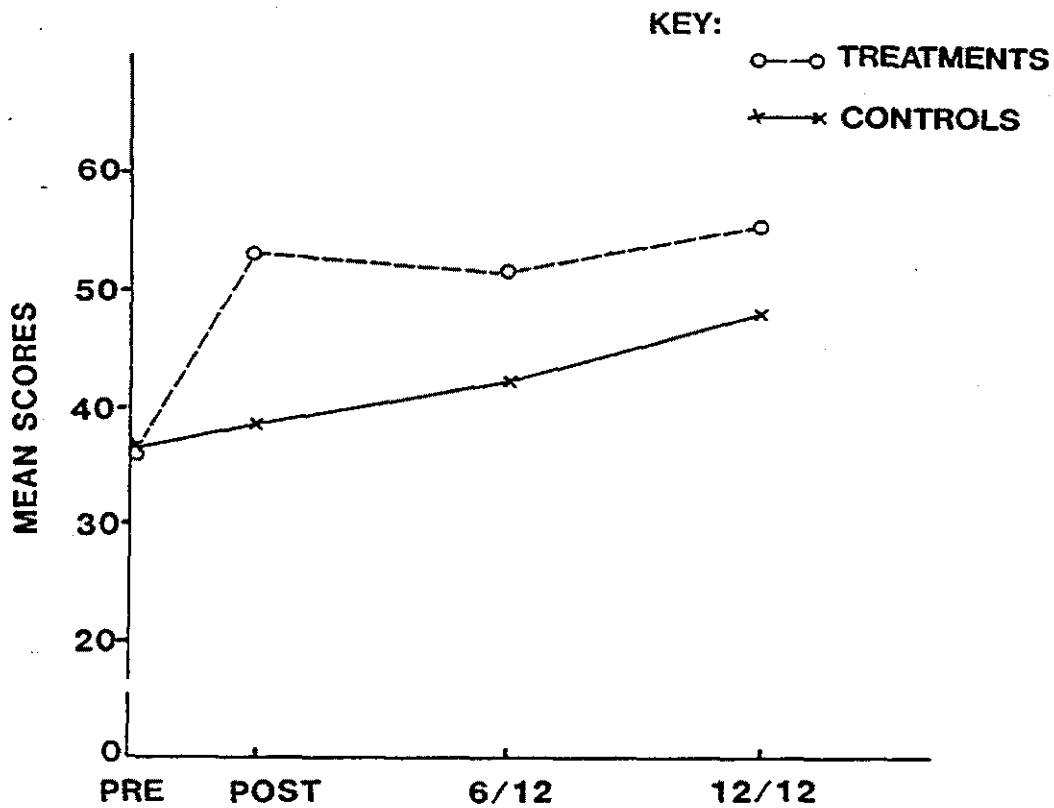


FIGURE 10. COPING STRATEGY QUESTIONNAIRE
(Cognitive versus Behavioural Conditions)

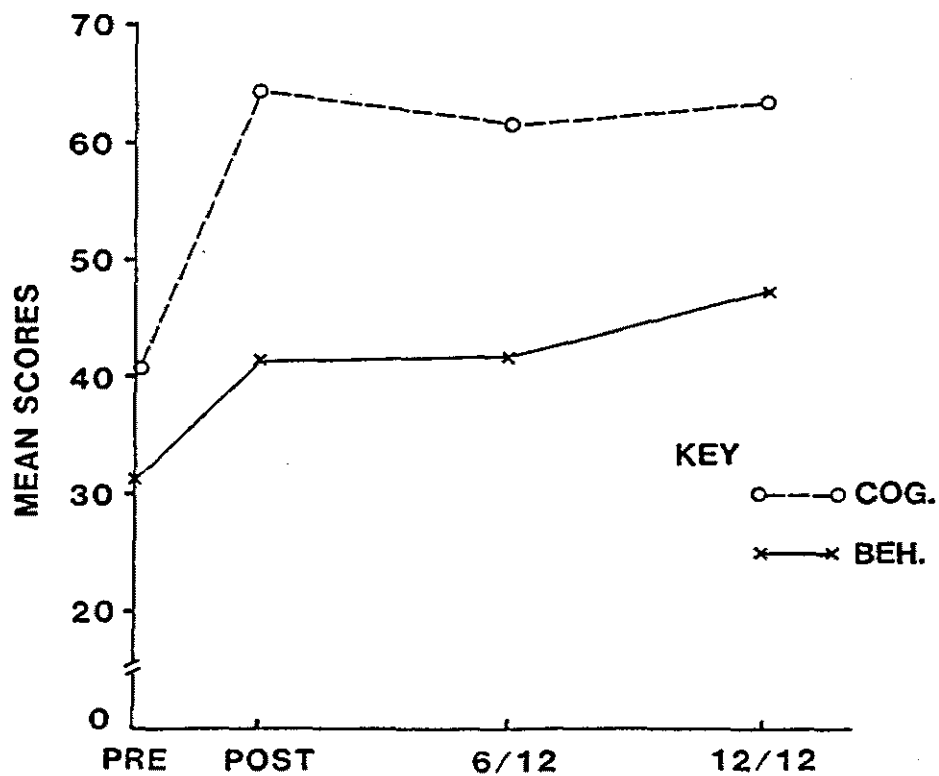


TABLE 11. Summary of Repeated Measures ANOVA on Mean Pretreatment-Posttreatment Pain Belief Questionnaire scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (CT+CT.RT vs BT+RT.RT)	526.557	1	526.557	.756
A2 (CT.RT+BT.RT vs. BT+CT)	1927.171	1	1927.171	2.768
A3 (Tmt vs. Control)	6.071	1	6.071	.009
A4 (AC vs. NAC)	83.790	1	83.790	.120
zA5 (CT+BT.RT vs. BT+CT.RT)	188.604	1	188.604	.271
ERROR	29236.906	42	696.117	
<u>WITHIN</u>				
B1 (Trials)	4114.825	1	4114.825	46.228**
A1B1 (Group x Trials)	55.719	1	55.719	.626
A2B1	58.406	1	58.406	.656
A3B1	1403.302	1	1403.302	15.765**
A4B1	58.358	1	58.358	.656
A5B1	245.923	1	245.923	2.763
ERROR	3738.513	42	89.012	

** $P < 0.01$ (Bonferroni)

(vi) Coping Strategies

A repeated measures ANOVA revealed a significant overall pretreatment-posttreatment increase in use of active coping strategies, $F(1,42)=16.80$, $p < 0.01$. No significant pretreatment-posttreatment differences were revealed by any of the planned Group x Trials interactions.

A summary of the repeated measures ANOVA is presented in Table 12. Figure 10 presents a graphical comparison of mean CSQ scores for treatment and control conditions. Figure 10 presents a graphical comparison of mean CSQ scores for cognitive and behavioural treatment conditions.

TABLE 12. Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment CSQ scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (CT+CT.RT vs. BT+BT.RT)	4166.946	1	4166.946	2.704
A2 (CT.RT+BT.RT vs. BT+CT)	2084.334	1	2084.334	1.352
A3 (Tmt vs. Control)	961.780	1	961.780	.624
A4 (AC vs. NAC)	500.008	1	500.008	.324
A5 (CT+BT.RT vs. BT+CT.RT)	72.655	1	72.655	.047
ERROR	64734.481	42	1541.297	
<u>WITHIN</u>				
B1 (Trials)	3788.691	1	3788.691	16.799**
A1B1 (Group x Trials)	805.742	1	805.742	3.573
A2B1	6.919	1	6.919	.031
A3B1	1194.618	1	1194.618	5.297*
A4B1	221.341	1	221.341	.981
A5B1	710.033	1	710.033	3.148
ERROR	9472.564	42	225.537	

** $P < 0.01$ (Bonferroni)

* $P < 0.05$ (Univariate)

(vii) Univariate Decision-wise Error Rate

Inspection of the summary tables of the repeated measures ANOVA results for the pretreatment to posttreatment changes indicates that with a univariate decision-wise error rate significant differences were obtained on the following comparisons:

a) Medication Use

A significant pretreatment-posttreatment reduction in medications used was revealed for the behavioural treatment relative to the cognitive treatment, $F(1,42) = 5.99$, $p < 0.05$.

b) Coping Strategies

A significant pretreatment-posttreatment increase in the use of active coping strategies was revealed for the treatment conditions relative to the control conditions, $F(1,42) = 5.30$, $p < 0.05$.

4.3.6 Pretreatment to 6-Month Follow-up Changes

(i) Average Pain Intensity

Repeated measures ANOVA revealed no significant pretreatment to 6-month follow-up differences either within subjects or on any of the planned Group x Trials contrasts. Thus, the difference in average pain intensity ratings between treatment and control conditions in the pretreatment-posttreatment analysis had abated by the 6-month follow-up assessment. Inspection of Fig. 4 indicates that the mean control condition scores declined between posttreatment and the 6-month follow-up while the mean treatment condition scores barely changed.

(ii) Affective Distress

A summary of the repeated measures ANOVAs on the mean Beck Depression Inventory scores is presented in Table 13 and 14.

Repeated measures ANOVAs revealed no significant pretreatment to 6-month follow-up differences in level of anxiety either within subjects or on any of the planned Group x Trials contrasts.

However, significant pretreatment to 6-month follow-up improvements were revealed in levels of depression within subjects, $F(1,33) = 21.17$, $p < 0.01$, but not on any of the planned Group x Trials contrasts. These results were similar to those found at posttreatment.

TABLE 13. Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment STAI-S scores.

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (CT+CT.RT vs. BT+BT.RT)	4166.946	1	4166.946	2.704
A2 (CT.RT+BT.RT vs. BT+CT)	2662.754	1	2662.754	13.075
A3 (Tmt vs Control)	19.704	1	19.704	.097
A4 (AC vs. NAC)	183.048	1	183.048	.899
A5 (CT+BT.RT vs. BT+CT.RT)	25.782	1	25.782	.127
ERROR	6720.781	33	203.660	
<u>WITHIN</u>				
B1 (Trials)	432.571	1	432.571	3.964
A1B1 (Group x Trials)	137.815	1	137.815	1.263
A2B1	273.085	1	273.085	2.503
A3B1	.768	1	.768	.007
A4B1	407.440	1	407.440	3.734
A5B1	31.020	1	31.020	.284
ERROR	3600.826	33	109.116	

TABLE 14. Summary of Repeated Measures ANOVA for mean Pretreatment-Posttreatment Beck Depression Inventory scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (CT+CT.RT vs BT+BT.RT)	15.031	1	15.031	.188
A2 (CT.RT+BT.RT vs. BT+CT)	670.214	1	670.214	8.381
A3 (Tmt vs Control)	39.896	1	39.896	.499
A4 (AC vs. NAC)	260.762	1	260.762	3.261
A5 (CT+BT.RT vs. BT+CT.RT)	1.267	1	1.267	.016
ERROR	2638.952	33	79.968	
<u>WITHIN</u>				
B1 (Trials)	982.007	1	982.007	21.173**
A1B1 (Group x Trials)	.919	1	.919	.020
A2B1	25.445	1	25.445	.549
A3B1	162.435	1	162.435	3.502
A4B1	66.964	1	66.964	1.444
A5B1	22.984	1	22.984	.496
ERROR	1530.560	33	46.381	

* $P < 0.01$ (Bonferroni)

(iii) Sickness Impact Profiles (SIP-S and SIP-0)

Tables 14 and 15 present summaries of the repeated measures ANOVAs for the mean SIP-S and SIP-0 scores.

Repeated measures ANOVAs conducted on SIP-S scores revealed a significant pretreatment to 6-month follow-up improvement within subjects, $F(1,33)=21.51$, $p<0.01$. Similarly, repeated measures ANOVAs on the SIP-0 scores also revealed a significant pretreatment to 6-month follow up improvement within subjects, $F(1,24)=14.04$, $p<0.01$.

However, the repeated measures ANOVAs of the SIP-S scores did not reveal any significant pretreatment to 6-month follow-up differences on any of the Group x Trials contrasts. Inspection of the mean SIP-scores in Fig. 4 indicates that the control conditions declined slightly between posttreatment and the 6-month follow-up, while the treatment condition maintained their posttreatment level. Inspection of the mean SIP-S scores in Fig. 5 indicates that both the cognitive and behavioural conditions maintained their posttreatment levels.

TABLE 15. Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment SIP-S scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (CT+CT.RT vs BT+BT.RT)	125.720	1	125.720	.752
A2 (CT.RT+BT.RT vs. BT+CT)	1152.559	1	1152.559	6.898
A3 (Tmt vs Control)	11.666	1	11.666	.070
A4 (Att vs NAC)	130.003	1	130.003	.778
A5 (CT+BT.RT vs. BT+CT.RT)	104.114	1	104.114	.623
ERROR	5514.093	33	167.094	
WITHIN				
B1 (Trials)	1189.113	1	1189.113	21.508**
A1B1 (Group x Trials)	154.107	1	154.107	2.787
A2B1	.515	1	.515	.009
A3B1	237.717	1	237.717	4.300*
A4B1	249.263	1	249.263	4.509*
A5B1	48.457	1	48.457	.876
ERROR	1824.457	33	55.287	

** P<0.01 (Bonferroni)

* P<0.05 (Univariate)

TABLE 16. Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment SIP-0 scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (CT+CT.RT VS BT+BT.RT)	113.244	1	113.244	.510
A2 (CT.RT+BT.RT vs. BT+CT)	1047.305	1	1047.305	4.713
A3 (Tmt vs Control)	437.471	1	437.471	1.969
A4 (AC vs. NAC)tt)	1.571	1	1.571	.007
A5 (CT+BT.RT vs. BT+CT.RT)	58.765	1	58.765	.264
ERROR	5333.372	24	222.224	
WITHIN				
B1 (Trials)	487.114	1	487.114	14.444**
A1B1 (Group x Trials)	120.204	1	120.204	3.564
A2B1	22.502	1	22.502	.667
A3B1	1.315	1	1.315	.039
A4B1	39.960	1	39.960	1.185
A5B1	284.318	1	284.318	8.430*
ERROR	809.408	24	33.725	

** P<0.01 (Bonferroni)

* P<0.01 (Univariate)

(iv) Medication Use

A summary of the repeated measures ANOVA results for the mean medications used scores are presented in Table 17.

Repeated measures ANOVA revealed no significant pretreatment to 6-month follow-up reductions in the use of different types of medication either within subjects or on any of the planned Group x Trials contrasts. Thus the overall improvement, seen at at posttreatment had decipated by the 6-month follow-up. Inspection of Fig. 6 indicates that while the behavioural treatment conditions maintained their posttreatment levels, the cognitive and control conditions returned to pretreatment levels or slightly above.

TABLE 17. Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment Medications Used Scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (CT+CT.RT vs BT+BT.RT)	.141	1	.141	.078
A2 (CT.RT+BT.RT vs. BT+CT)	4.520	1	4.520	2.506
A3 (Tmt vs Control)	.997	1	.997	.553
A4 (AC vs. NAC)	.048	1	.048	.026
A5 (CT+BT.RT vs. BT+CT.RT)	1.893	1	1.893	1.049
ERROR	59.524	33	1.804	
WITHIN				
B1 (Trials)	1.855	1	1.855	2.222
A1B1 (Group x Trials)	4.207	1	4.207	5.040*
A2B1	.003	1	.003	.003
A3B1	.038	1	.038	.045
A4B1	.429	1	.429	.513
A5B1	.40	1	.040	.048
ERROR	27.543	33	.835	

* $P < 0.05$ (Univariate)

(v) Dysfunctional Cognitions

A repeated measures ANOVA revealed a significant pretreatment to 6-month follow-up within-subjects reduction in dysfunctional cognitions, $F(1,33)=34.61$, $p < 0.01$. In addition, Group x Trials ANOVA revealed a significant reduction in dysfunctional cognitions for the treatment conditions relative to the control conditions, $F(1,33)=9.23$, $p < 0.05$. These results indicate that the treatment effects found at posttreatment have been maintained at the 6-month follow-up. Inspection of the mean PBQ scores in Figure 7 confirms this impression.

No significant pretreatment to 6-month follow-up differences were found on any of the other Group x Trials. Inspection of Figure 8 indicates that after the

pretreatment-posttreatment reductions in dysfunctional cognitions for both cognitive and behavioural treatment conditions no further changes occurred for either conditions.

A summary of the repeated measures ANOVA results are presented in Table 18.

TABLE 18. Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment PBQ scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (CT+CT.RT vs. BT+BT.RT)	325.239	1	325.239	.527
A2 (CT.RT+BT.RT vs. BT+CT)	3481.677	1	3481.677	5.645
A3 (Tmt vs Control)	.968	1	.968	.002
A4 (AC vs. NAC)	420.762	1	420.762	.682
A5 (CT+BT.RT vs. BT+CT.RT)	72.751	1	72.751	.118
ERROR	20354.731	33	616.810	
<u>WITHIN</u>				
B1 (Trials)	3497.849	1	3497.849	34.613**
A1B1 (Group x Trials)	78.404	1	78.404	.776
A2B1	229.762	1	229.762	2.274
A3B1	933.182	1	933.182	9.234*
A4B1	149.333	1	149.333	1.478
A5B1	158.926	1	158.926	1.573
ERROR	3334.874	33	101.057	

** $p < 0.01$ (Bonferroni)

* $p < 0.05$ (Bonferroni)

(vi) Coping Strategies

Table 19 presents a summary of the repeated measures ANOVA results of the mean pretreatment to 6-month follow-up CSQ scores.

Results similar to those found at posttreatment were also indicated at the 6-month follow-up. Repeated measures ANOVA

revealed a significant pretreatment to 6-month follow-up within subjects increase in the use of active coping strategies, $F(1,33) = 12.11$, $p < 0.05$. However, no significant pretreatment to 6-month follow-up differences were revealed by repeated measures ANOVA for any of the planned Group x Trials contrasts. Inspection of the mean CSQ scores in Fig. 9 indicates that this was probably due to the improvement of the control condition in the posttreatment to 6-month follow-up period. Both the cognitive and behavioural treatment conditions maintained, but did not improve over that period, as can be seen in Fig. 10.

TABLE 19. Summary of Repeated Measures ANOVA Results of Mean Pretreatment - 6-Month Follow-up CSQ scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (CT+CT.RT vs. BT+BT.RT)	3417.040	1	3417.040	2.294
A2 (CT.RT+BT.RT vs. BT+CT)	2042.909	1	2042.909	1.371
A3 (Tmt vs Control)	15.305	1	15.305	.010
A4 (AC vs. NAC)	407.440	1	407.440	.274
A5 (CT+BT.RT vs. BT+CT.RT)	951.171	1	951.171	.638
ERROR	49160.424	33	1489.710	
WITHIN				
B1 (Trials)	3828.323	1	3828.323	12.111**
A1B1 (Group x Trials)	119.662	1	119.662	.379
A2B1	44.714	1	44.714	.141
A3B1	1347.592	1	1347.592	4.263*
A4B1	27.429	1	27.429	.087
A5B1	1660.935	1	1660.935	5.254*
ERROR	10431.302	33	316.100	

** $P < 0.01$ (Bonferroni)

* $P < 0.05$ (Univariate)

(vi) Univariate Decision-wise Error Rate

Inspection of the summary tables for the repeated measures ANOVA results indicates that with a univariate decision-wise error rate the following pretreatment to 6-month follow-up changes were significant:

a) Sickness Impact Profiles:

The Treatment conditions improved relative to the Control conditions on the SIP-S, $F(1,33) = 4.30$, $p < 0.05$. The Attention-Control condition also improved on the SIP-S relative to the No-attention - Control condition, $F(1,33) = 4.51$, $p < 0.05$. The combination of Cognitive Treatment and Behavioural Treatment with Relaxation Training improved on the SIP-) relative to the combination of Behavioural Treatment and Cognitive Treatment with Relaxation Training, $F(1,24) = 8.43$, $p < 0.01$.

b) Medication Use

An overall (i.e. within subjects) reduction in types of medications used, $F(1,33) = 5.04$, $p < 0.05$.

c) Coping Strategies

The Treatment conditions increased their use of active coping strategies relative to the control conditions, $F(1,33) = 4.26$, $p < 0.05$. The combination of Cognitive Treatment and Behavioural Treatment with Relaxation Training increased their used of active coping strategies relative to the combination of Behavioural Treatment and Cognitive Treatment with Relaxation Training, $F(1,33) = 5.25$, $p < 0.05$.

4.3.7 Pretreatment to 12-Month Follow-up Changes

(i) Average Pain Intensity

Table 20 presents a summary of the repeated measures ANOVA results of the mean pretreatment to 12-month follow-up APR scores.

As was found at the 6 months follow-up, repeated measures ANOVA revealed no significant pretreatment - 12-months follow-up reductions in pain intensity within subjects. Similarly, repeated measures ANOVA revealed no significant pretreatment to 12-month follow-up differences on any of the planned Group x Trials contrasts.

TABLE 20. Summary of Repeated Measures ANOVA of Pretreatment 12-month Follow-up Mean Pain Intensity Scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (CT+CT.RT vs BT+BT.RT)	.004	1	.004	.004
A2 (CT.RT+BT.RT vs. BT+CT)	4.178	1	4.178	4.227
A3 (Tmt vs Control)	.003	1	.103	.003
A4 (AC vs. NAC)	.100	1	.100	.101
A5 (CT+BT.RT vs. BT+CT.RT)	6.233	1	6.233	6.307
ERROR	27.674	28	.988	
<u>WITHIN</u>				
B1 (Trials)	.147	1	.147	.385
A1B1 (Group x Trials)	.000	1	.000	.001
A2B1	.006	1	.006	.015
A3B1	1.848	1	1.848	4.859*
A4B1	.948	1	.948	2.493
A5B1	.008	1	.008	.021
ERROR	10.850	28	.380	

* $P < 0.05$ (Univariate)

(ii) Affective Distress

As was found at both posttreatment and 6-month follow-up, no significant pretreatment to 12-month follow-up differences were revealed by repeated measures ANOVA either within subjects or on any of the planned Group x Trials contrasts.

However, as at posttreatment and 6-month follow-up, repeated measures ANOVA did reveal a significant pretreatment to 12-month follow-up within-subjects improvement in level of depression, $F(1,33) = 22.45$, $p < 0.01$, but none were revealed on any of the Group x Trials contrasts.

A summary of the repeated measures ANOVA results on the BDI are presented in Table 21.

TABLE 21. Summary of Repeated Measures ANOVA of Mean Pretreatment - 12-month Follow-up BDI Scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (CT+CT.RT vs BT+BT.RT)	24.350	1	24.350	.256
A2 (CT.RT+BT.RT vs BT+CT)	226.671	1	226.671	2.385
A3 (Tmt vs Control)	49.127	1	49.127	.517
A4 (AC vs. NAC)	112.801	1	112.801	1.187
A5 (CT+BT.RT vs BT+CT.RT)	78.893	1	78.893	.830
ERROR	3136.318	33	95.040	
<u>WITHIN</u>				
B1 (Trials)	621.662	1	621.662	22.445**
A1B1 (Group x Trials)	14.127	1	14.127	.510
A2B1	10.053	1	10.053	.363
A3B1	115.794	1	115.794	4.181*
A4B1	52.420	1	52.420	1.893
A5B1	110.671	1	110.671	3.996
ERROR	913.985	33	27.697	

** $P < 0.01$ (Bonferroni)

* $P < 0.05$ (Univariate)

(iii) Sickness Impact Profiles (SIP-S and SIP-O)

Summaries of the repeated measures ANOVAs for the mean SIP-S and SIP-O scores are presented in Tables 22 and 23.

Repeated measures ANOVAs revealed similar results to those found at posttreatment and the 6-month follow-up with a significant pretreatment to 12-month follow-up within subjects improvement in SIP-S scores, $F(1,33)=38.45$, $p<0.01$, and SIP-O scores, $F(1,28)=8.91$, $p<0.05$.

Also consistent with the results of repeated measures ANOVAs at the 6-month follow-up, no significant pretreatment to 12 month follow-up differences were revealed on any of the planned Group x Trials contrasts.

TABLE 22. Summary of Repeated Measures ANOVAs Means for the SIP-S

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (CT+CT.RT vs. BT+BT.RT)	212.974	1	212.974	1.329
A2 (CT.RT+BT.RT vs. BT+CT)	898.356	1	898.356	5.608
A3 (Tmt vs Control)	1.299	1	1.299	.008
A4 (AC vs. NAC)	14.788	1	14.788	.092
A5 (CT+BT.RT vs. BT+CT.RT)	8.716	1	8.716	.054
ERROR	5288.234	33	160.250	
<u>WITHIN</u>				
B1 (Trials)	1818.226	1	1818.226	38.446**
A1B1 (Group x Trials)	85.983	1	85.983	1.818
A2B1	11.917	1	11.917	.252
A3B1	385.490	1	385.490	8.151*
A4B1	143.151	1	143.151	3.027
A5B1	72.393	1	72.393	1.531
ERROR	1560.671	33	47.293	

** $P<0.01$ (Bonferroni)

* $P<0.01$ (Univariate)

TABLE 23. Summary of Repeated Measures ANOVA Means for the SIP-0

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (CT+CT.RT vs. BT+BT.RT)	121.264	1	121.264	.725
A2 (CT.RT+BT.RT vs. BT+CT)	285.525	1	285.525	1.707
A3 (Tmt vs Control)	55.049	1	55.049	.329
A4 (AC vs. NAC)	26.848	1	26.848	.161
A5 (CT+BT.RT vs. BT+CT.RT)	13.021	1	13.021	.078
ERROR	4683.114	28	167.254	
<u>WITHIN</u>				
B1 (Trials)	1200.108	1	1200.108	8.907**
A1B1 (Group x Trials)	81.072	1	81.072	1.277
A2B1	13.331	1	13.331	.210
A3B1	206.812	1	206.812	3.258
A4B1	47.688	1	47.688	.751
A5B1	53.207	1	53.207	.838
ERROR	1777.307	28	63.475	

** $P < 0.05$ (Bonferroni)(iv) Medication Use

Table 24 presents a summary of the repeated measures ANOVA of pretreatment to 12-month follow-up medications used scores.

Similar to the findings at posttreatment and the 6-month follow-up, repeated measures ANOVA revealed no significant pretreatment to 12-month follow-up within-subjects reductions in use of different types of medication. In addition, no significant pretreatment to 12-month follow-up differences were revealed on any of the planned Group x Trials contrasts.

TABLE 24. Summary of Repeated Measures ANOVA of Mean Pretreatment - 12-month Follow-up Medication Use

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (CT+CT.RT vs. BT+BT.RT)	.276	1	.276	.151
A2 (CT.RT+BT.RT vs. BT+CT)	.671	1	.671	.368
A3 (Tmt vs Control)	.324	1	.324	.178
A4 (AC vs. NAC)	.001	1	.001	.000
A5 (CT+BT.RT vs. BT+CT.RT)	.004	1	.004	.002
ERROR	60.118	33	1.822	
<u>WITHIN</u>				
B1 (Trials)	2.796	1	2.796	5.268*
A1B1 (Group x Trials)	2.099	1	2.099	3.956
A2B1	.321	1	.321	.606
A3B1	.454	1	.454	.856
A4B1	.179	1	.179	.337
A5B1	.075	1	.075	.140
ERROR	17.512	33	.531	

p>0.05 (Univariate)

(v) Dysfunctional Cognitions

Table 25 presents a summary of the repeated measures ANOVA of pretreatment to 12-month follow-up PBQ scores.

Consistent with the findings at both posttreatment and the 6-month follow-up, a repeated measures ANOVA revealed a significant pretreatment to 12-month follow-up within-subjects reduction in dysfunctional cognitions, $F(1,33)=26.44$, $p<0.01$. However, unlike the findings at posttreatment and at the 6-month follow-up, no significant pretreatment to 12-month follow-up differences were revealed between the treatment and control conditions.

TABLE 25. Summary of the Repeated Measures ANOVA of Mean Pretreatment to 12-month Follow-up PBQ Scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (CT+CT.RT vs BT+BT.RT)	203.281	1	203.281	.291
A2 (CT.RT+BT.RT vs BT+CT)	1779.577	1	1779.577	2.543
A3 (Tmt vs Control)	121.201	1	121.201	.173
A4 (AC vs. NAC)	114.603	1	114.603	.164
A5 (CT+BT.RT vs BT+CT.RT)	821.528	1	821.528	1.174
ERROR	23091.194	33	699.733	
WITHIN				
B1 (Trials)	4326.221	1	4326.221	26.444**
A1B1 (Group x Trials)	.604	1	.604	.004
A2B1	23.122	1	23.122	.141
A3B1	1006.998	1	1006.998	6.155*
A4B1	77.257	1	77.257	.472
A5B1	294.307	1	294.307	1.799
ERROR	5398.731	33	163.598	

** P<0.01 (Bonferroni)

* P<0.05 (Univariate)

(vi) Coping Strategies

Table 26 presents a summary of the repeated measures ANOVA of pretreatment to 12-month follow-up CSQ scores.

Consistent with the findings at posttreatment and the 6-month follow-up, repeated measures ANOVA revealed a significant pretreatment to 12-month follow-up within-subjects increase in use of active coping strategies, $F(1,33)=10.89$, $p<0.05$.

However, unlike the previous findings, repeated measures ANOVA revealed no significant differences in any of the Group x Trials contrasts. Inspection of the mean CSQ scores in Figure 10 indicates that both treatment and control conditions improved slightly in the 6-month to 12-month follow-up period.

TABLE 26. Summary of Repeated Measures ANOVA of Mean Pretreatment - 12-month Follow-Up CSQ Scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (CT+CT.RT vs. BT+BT.RT)	2426.683	1	2426.683	1.550
A2 (CT.RT+BT.RT vs. BT+CT)	889.065	1	889.065	.568
A3 (Tmt vs Control)	66.217	1	66.217	.042
A4 (AC vs. NAC)	51.607	1	51.607	.033
A5 (CT+BT.RT vs. BT+CT.RT)	102.436	1	102.436	.065
ERROR	51667.262	33	1565.675	
<u>WITHIN</u>				
B1 (Trials)	4716.026	1	4716.026	10.889*
A1B1 (Group x Trials)	47.436	1	47.436	.110
A2B1	15.917	1	15.917	.037
A3B1	557.112	1	557.112	1.286
A4B1	330.179	1	330.179	.762
A5B1	455.139	1	455.139	1.051
ERROR	14292.595	33	433.109	

* $P < 0.05$ (Bonferroni)

(vii) Univariate Decision-wise Error Rate

Inspection of the summary tables of the repeated measures ANOVAs indicates that with a univariate decision-wise error rate the following pretreatment to 12-month follow-up changes are significant.

a) Average Pain Intensity

The treatment conditions reported a reduction in pain relative to the control conditions, $F(1,28)= 4.86$, $p<0.05$.

b) Beck Depression Inventory

The treatment conditions reported a reduction in BDI scores relative to the control conditions, $F(1,33)= 4.18$, $p<0.05$.

c) Sickness Impact Profiles

The treatment conditions improved on the SIP-S relative to the control conditions, $F(1,33)=8.15$, $p<0.01$.

d) Medications Used.

There was an overall (i.e. within subjects) reduction in number of medication-types used, $F(1,33)= 5.27$, $p<0.05$.

e) Dysfunctional Cognitions

The treatment conditions reported a reduction in PBQ scores relative to the control conditions, $F(1,33)= 6.16$, $p<0.05$.

4.3.8 Maintenance of Exercises and Techniques at 6- and 12-months

Table 27 describes the mean rates at which the exercises and techniques taught during the treatment programme were still being practised at the 6- and 12-month follow-ups, according to patient self-report. Inspection of the reported rates indicates that most of the exercises are continuing to be practised between one and two days a week, with some, particularly relaxation and increased activity level, being maintained slightly more often in some groups. No statistical analyses were performed on these data.

Table 27. Mean Rates Continued Practice of Exercises and Techniques at 6- and 12-months Follow-ups

		CONDITION						
		CT	CT+RT	AC	NAC	BT	BT+RT	MEAN
Physiotherapy exercises	6 mth. n	2.1	2.2	2.4	2.3	2.0	2.5	2.3
	12 mth. n	2.0	1.7	1.8	2.8	2.2	2.2	2.2
Increased activity level	6 mth. n					2.5	3.5	3.0
	12 mth. n					3.5	3.7	3.6
Relaxation	6 mth. n		3.0				2.0	2.5
	12 mth. n		3.0				2.2	2.6
Coping skills	6 mth. n	2.6	3.0					2.8
	12 mth. n	2.3	2.8					2.6

4.3.9 Other Treatments Received Following Treatment

Table 28 describes the mean number of other treatments received for low back pain in the 12 months following the end of the treatment programme, according to patient self-report. The mean numbers were generally very small, but did increase slightly between 6- and 12-month follow-ups. One-way ANOVAS revealed no significant differences at either the 6-month or 12-month follow-ups between conditions or between treatments and control conditions.

Table 28. Mean Number of Other Treatments Received
in Follow-up Period

		CONDITION					
		CT	CT+RT	AC	NAC	BT	BT+RT
<u>At 6-Months</u>							
Mean No. Treatments:		0.71	0.20	0.88	1.00	0.33	0.43
SD:		(0.95)	(0.45)	(1.73)	(0.89)	(0.52)	(0.53)
<u>At 12-Months</u>							
Mean No. Treatments:		0.67	0.67	1.33	1.60	1.17	1.29
SD:		(0.82)	(0.82)	(1.50)	(1.14)	(0.75)	(1.38)

4.4 Discussion

This study attempted to address the following issues:

- (i) the relative efficacy of cognitive versus behavioural treatments for chronic low back pain;
- (ii) the effect of relaxation training on the cognitive and behavioural treatments for chronic low back pain; and
- (iii) the relative efficacy of cognitive, behavioural and relaxation treatments versus physiotherapy back-education and exercise training for chronic low back pain. In each case, changes at posttreatment and long-term follow-ups were examined.

The Bonferroni-adjusted results indicated there were significant overall (i.e. within subjects) pretreatment to posttreatment improvements on measures of affective distress, functional impairment, medication use, pain-related dysfunctional cognitions and use of coping strategies which were generally maintained at 6-month and 12-month follow-ups. However, the Bonferroni-adjusted results indicated there were few pretreatment to posttreatment differences in improvement between the cognitive and behavioural treatments and little effect associated with relaxation training. At the two follow-ups, the Bonferroni-adjusted results showed that the differential effects found at posttreatment between the cognitive and the behavioural treatments had dissipated, although the treatment gains were generally maintained for both conditions.

Analysis of the pretreatment to posttreatment changes indicated that the behavioural conditions had improved significantly more than the cognitive conditions on the self-rated measure of functional

impairment (SIP-S). However, this difference was not maintained at either the 6-month or 12-month follow-ups. The less conservative univariate decision-wise error rate also revealed a significant reduction in the use of medication for the behavioural conditions compared to the cognitive conditions at posttreatment and at the 6-month follow-up, but not at the 12-month follow-up.

At the 6-month follow-up the univariate decision-wise error rate also indicated that the combined cognitive and behavioural-relaxation conditions had improved more than the combined cognitive-relaxation and behavioural conditions on the other-rated measure of functional impairment (SIP-O) and in the use of coping strategies, suggesting that relaxation training is slightly more effective with behavioural treatment than with cognitive treatment. However, as was the case with medication use, these differences were not significant when the stricter Bonferroni adjustment was employed and they were not maintained at the 12-month follow-up. At the 12-month follow-up there were no significant differences in improvement between the cognitive and behavioural conditions, with or without relaxation training, on any of the dependent measures.

Thus, these results reveal few differences in efficacy between the cognitive and behavioural treatments and little effect associated with the use of relaxation training. Where there were differences they tended to favour the behavioural treatments over the cognitive treatments, and primarily on the more behaviourally-oriented measures, but maintenance of any differential effects was limited.

In relation to the second question, concerning the efficacy of the sum of the cognitive, behavioural and relaxation treatments, compared to the physiotherapy treatment, the Bonferroni-adjusted results indicated that the psychological treatment conditions improved significantly more than the physiotherapy treatment conditions at posttreatment on measures of average pain intensity, self-rated functional impairment, and pain-related dysfunctional cognitions. The less conservative univariate decision-wise error rate also indicated a significant increase in the use of coping strategies for the psychological treatment conditions compared to the physiotherapy treatment conditions. However, while the univariate decision-wise error rate also indicated that some of these differential improvements were maintained at the 6- and 12-month follow-ups, none of these follow-up results reached significance when the stricter Bonferroni adjustment was employed. Inspection of the mean scores suggested that the reduced differential effects at follow-up between the two conditions were largely due to improvements in the physiotherapy conditions rather than deterioration in the psychological conditions.

Thus, while the results provide evidence of significant overall improvements on a range of measures which were generally maintained at long-term follow-up, the significant pretreatment to posttreatment improvements demonstrated by the psychological treatment conditions compared to the physiotherapy treatment conditions at posttreatment were only weakly maintained at the 6- and 12-month follow-ups.

Before interpreting these results in the light of the findings reported by earlier studies, some cautionary points should be made. The analysis of the pretreatment measure of expectations indicated that while the control conditions were expecting some improvement as a result of attending the programme, their expectations were significantly lower than those of the treatment conditions. It is therefore possible that the results indicating greater improvement for the treatment conditions compared to the control conditions could be explained on the basis that the control conditions were not seen as credible interventions by the subjects in those conditions. However, as Kazdin (1979) pointed-out, interpreting the results of such expectancy measures is not straight forward and poses a number of conceptual and methodological questions. For example, in the present study the expectancy scale was completed at the end of the first session of the programme and therefore presumably reflects the subjects' immediate reactions to what they had been told. How much these first impressions influenced the ultimate outcome of the programme for these subjects is difficult to determine. In this context, it is noteworthy that the attention-control condition which had the lowest expectancy rating also had the equal lowest overall attrition rate for all conditions, given that it might be expected that the attrition rate would be related to the expectancy ratings (or perceived credibility of the treatments). The second control condition, the no-attention condition, on the other hand, with a higher mean expectancy rating than the attention-control condition, had the highest attrition rate of all conditions. It is therefore possible that the impressions gained at the first session may have

later been modified by actual experience of the programme (e.g. Kazdin, 1979).

It should also be noted that the control conditions employed in this study could not be considered to be placebos or inert forms of treatment as both of them were receiving active treatment in the form of instruction in back-care, back exercises and hydrotherapy, all of which might be expected to have high face validity for this sample of patients. Although, it is possible that as almost all the subjects had experienced various forms of physiotherapy, which were to some extent unsuccessful, they may have perceived the psychological forms of treatment as more appealing, despite the fact that the differences between their previous physiotherapy treatments and the methods used in the present study were emphasized repeatedly in the pretreatment descriptions of the programme. Interestingly, as will be seen in the next chapter, the differences in expectation found in this study were not replicated in another study which employed the same physiotherapy plus attention control condition described in this study. Nevertheless, the significant difference in outcome expectations revealed between the treatment and control conditions in the present study does indicate a need for caution in interpreting the results obtained.

The analysis of the mean pretreatment dependent variables scores revealed that the cognitive treatment conditions were significantly less functionally impaired than the behavioural treatment conditions on the self-rated Sickness Impact Profile. The subsequent Bonferroni-adjusted repeated measures ANOVA on the

pretreatment-posttreatment scores indicated that the behavioural conditions improved significantly more than the cognitive condition on this measure. However, given the pretreatment difference, it could be argued that much of this improvement was due to a regression to the mean effect rather than a true treatment effect. Certainly, the size of the difference in improvement between the two conditions was reduced when the data were analyzed by the Analysis of Covariance (ANCOVA) (See Appendix Q) which, nevertheless, still revealed a significant difference in favour of the behavioural conditions, but only if the univariate decision-wise error rate was applied rather than the more conservative Bonferroni adjustment. Thus, while there may be a trend in favour of the behavioural conditions on this measure it cannot be considered firmly established and would require replication.

A similar difference in mean pretreatment self-rated SIP scores was also revealed between the relaxation training conditions and the no-relaxation training conditions, with the relaxation training conditions scoring as significantly more impaired on this measure. However, the Bonferroni-adjusted results revealed no significant treatment outcome differences between the two conditions. Thus, the difference in pretreatment functional impairment between the two conditions would seem unlikely to have influenced the planned contrasts between them.

The subject losses at the two follow-ups were greater in some conditions than others, and left some conditions with as few as four or five subjects on some measures while others retained eight or nine

subjects. Thus, with such variations between conditions, relatively small numbers of subjects and the large number of dependent measures the results of the statistical analyses with the follow-up data should be viewed with caution.

While some caution is clearly needed in the interpretation and generalization of the results of the study, the methodological strengths of the study do represent an improvement on some of the shortcomings noted in a number of previous studies and therefore add weight to the findings.

These strengths include: the assessment of the consistency of the content of the different conditions with the written procedures; the employment of an independent and blind interviewer at most posttreatment and follow-up assessments; the employment of an other-rated Sickness Impact Profile in addition to the self-report measures; the two evenly-spaced long-term follow-ups; the assessment of possible differences in physiotherapist attention; the attempt to control for the possible effects of the clinical psychologist's attention; the division of each condition into 2 cells and their random order of treatment; and the relative homogeneity (in terms of pain complaint) of subjects used.

In addition, inspection of the results of the repeated measures ANOVAs clearly indicates that the use of the Bonferroni adjustment for the number of dependent variables has effectively made the achievement of significant pretreatment to posttreatment and pretreatment to follow-up changes more difficult than would have been the case had the univariate decision-wise error rate been employed.

It was pointed-out in an earlier chapter that the failure to address the possibility of increased risk of Type I errors when a number of dependent variables were being analysed has effectively compromised the significance of many of the findings reported in previous treatment-outcome studies in this area. Thus, despite the shortcomings mentioned earlier, the significant results that were obtained in the present study may be treated with a reasonable degree of confidence.

In comparing the findings of the present study with the findings of previous treatment-outcome studies, differences and similarities in subject samples should also be noted. For example, Turner's (1982) sample of outpatients had a mean duration of back pain of 8.7 years, compared to 8.6 years in Philips' (1987) study and 7.0 years in the present study. In contrast, Heinrich et al. (1985) reported that their outpatient sample had a mean pain duration of 17.9 years and Kerns et al. (1985) 10.5 years. Turner (1982) concluded that her sample was "mildly disabled by pain" (p. 765), with a mean pretreatment self-rated Sickness Impact Profile score of 17.8 for her 3 conditions and mean other-rated SIP score of 10.9.

Although Turner's SIP scores comprised the sum of only the physical and psychosocial subscales while the scores employed in the present study were the total SIP scores, some comparisons are possible. In principle, the sum of the physical and psychosocial dimensions represents roughly 70% of the total SIP score. The mean pretreatment SIP score obtained for subject sample the present study for the self-rated SIP was 30.1 (70%= 21.1, compared to Turner's

17.8). For the other-rated SIP, it was 24.2 (70%= 16.9, compared to Turner's 10.9). Thus, although a similar pattern of differences between the self-rated and other-rated scores was evident in both studies, the subjects in the present study would appear to have been, on this measure, slightly more disabled by pain than those in Turner's (1982) study. In addition, the higher use of pain-related medication by the subjects in the present study relative to those in Turner's study would provide further support for this conclusion.

Unfortunately, such comparisons are more difficult with the other studies mentioned here because of the often mentioned problem of different outcome measures. Nevertheless, judging from the measures of emotional disturbance and subject selection methods that were employed in these studies, it would appear that the subjects in the present study were slightly more emotionally disturbed and more functionally disabled than those in Philips' (1987) study and Heinrich et al.'s (1985) study. Kerns et al. (1985) considered that their sample was more severe than either Turner's (1982) sample or Cohen et al.'s (1983) sample (which was part of Heinrich et al.'s, 1985 study) in terms of analgesic medication use, pain-related surgery and pain history.

In comparison to the subjects in the present study, however, Kerns et al.'s (1985) sample had a slightly longer mean pain history, considerably more pain-related surgeries, about the same level of unemployment, similar levels of disability compensation, and less medication use. Thus, the subjects in the present study were probably closer in terms of general disability to those in Kerns et

al.'s (1985) study than to the others mentioned. However, the generality of the findings from the treatment-outcome studies may also depend on the degree of homogeneity of pain complaints of their subjects. In Turner's (1982) study, and in the present study, for example, only patients with chronic low-back pain as their main complaint were admitted to the programme, whereas Kerns et al. (1985) and Philips (1987) included a variety of pain complaints in their studies - thus making it even more difficult to assess the generality of their findings.

With these considerations in mind, it would appear that the significant overall pretreatment-posttreatment improvements (i.e. the main effects for time) obtained in the present study were generally consistent with those reported by other similar studies (e.g. Turner, 1982; Heinrich et al., 1985; Kerns et al., 1985; Philips, 1987). However, some of the treatment comparisons and long-term maintenance findings do reveal some differences from other studies.

The pretreatment to posttreatment results obtained in the present study indicate little difference in treatment efficacy between the cognitive and behavioural treatments but where they were found, on the more behavioural measures of functional impairment (SIP) and medication use, they favoured the behavioural treatment. This result contrasts with the findings of Kerns et al. (1985), who reported that their cognitive-behavioural treatment was superior to their behavioural treatment on most outcome measures. The reason for this discrepancy between the two studies is not clear, particularly given the generally impressive results of inpatient programmes

employing behavioural procedures similar to those described by Kerns (e.g. Cinciripini and Floreen, 1982; Roberts and Reinhardt, 1980).

One possible explanation for the difference in findings between the Kerns et al. (1985) study and the others mentioned could be that behavioural programmes with the more dysfunctional patients are more effective in inpatient settings (e.g. Linton, 1986). However, the absence of controlled inpatient treatment studies makes this difficult to ascertain.

It is noticeable that most of the published outpatient treatment programmes appear to have used combined cognitive-behavioural methods similar to those described by Kerns et al. (1985) and with, perhaps, generally less disabled patients (e.g. Turner, 1982; Philips, 1987; Heinrich et al., 1985). Given the slightly poorer performance of the cognitive treatment conditions relative to the behavioural treatment conditions in the present study, together with the more limited and less well-maintained treatments versus controls effects, relative to many of the findings reported in the literature, it is possible that the cognitive and behavioural treatments may be more effective when combined. This possibility is supported by the fact that the cognitive treatment employed in the present study appeared to have a much greater proportion of 'cognitive' content than Kerns et al.'s (1985) cognitive-behavioural treatment, which had correspondingly more 'behavioural' elements. Thus, Kerns et al.'s. (1985) cognitive-behavioural treatment would have been more similar to a combination of the cognitive and behavioural treatments employed in the present study, rather than the cognitive treatment.

In the present study, Bonferroni-adjusted pretreatment to posttreatment results indicated that the conditions receiving the cognitive and behavioural treatments, together with physiotherapy, improved significantly more than the conditions receiving physiotherapy treatment alone on a number of measures. However, whether any improvements in efficacy associated with a combination of cognitive and behavioural procedures would be due to a better 'hit-rate' (i.e. some patients might respond more to cognitive treatment and some to behavioural treatment - thus, combining them would increase the chance of reaching both groups) or some additive effect (i.e. between the two treatments to produce a more potent treatment) remains to be determined.

Apart from the differences mentioned between the cognitive and behavioural treatments, progressive relaxation training, as used in the present study, seemed to make little contribution to either. The apparently limited influence of relaxation training in the present study contrasts with some of the findings reported in the literature. For example, Sanders (1983) and Linton and Gotestam (1984) both reported significant effects associated with relaxation training, with the latter study suggesting that it was primarily effective in reducing pain intensity. Such an effect was not observed in the present study. In some ways, the present findings are more consistent with Turner's (1982) study which found that while few pretreatment-posttreatment differences were revealed between a relaxation procedure similar to the one used in the present study and a combined relaxation, cognitive-behavioural treatment, average pain severity rated each day (rather than retrospectively) did not

decrease for the relaxation condition but did for the combined condition. At the one month follow-up, in Turner's study, the differences on measures of pain and behaviour became more marked and all favoured the combined condition.

Although the patient sample in Kerns et al.'s (1985) study had a mixture of pain complaints, their findings also suggest that relaxation training had little effect. The reason for such disparate findings is not clear, but may be related to the fact that Sanders' (1983) study was conducted in an inpatient setting and Linton and Gotestam's (1984) study was conducted in a quasi inpatient setting while, like the present study, the other studies mentioned were in outpatient settings. It may be, for example, that inpatients have more opportunity to practice relaxation than outpatients, or that because they may be more closely supervised they practise more.

While all the studies mentioned encouraged their patients to practice several time a day, the only practice data were reported by Turner (1982) and the present study, both of which reported follow-up practice frequency. In Turner's (1982) study the patients reported practising once a day, while in the present study, the mean was one to three times a week, which may well be insufficient.

Another factor which could have contributed to the discrepant results between these studies was the manner in which the relaxation was taught. There is evidence, for example, that relaxation training conducted in the treatment sessions can be more effective than just assignment to practice at home (Borkovec & Sides, 1979). However, the Kerns et al. (1985) study included practice during the treatment

sessions for both their cognitive-behavioural and behavioural treatments and found no effects for the behavioural treatment. Turner's (1982) study also included relaxation practice during the treatment sessions and found improvements on a number of measures at posttreatment, but less effects 1-month later. In addition, Teders, Blanchard, Andrasik, Jurish, Neff, and Arena (1984) reported little difference in outcome between tension headache patients who were treated by therapist-delivered relaxation and those treated by home practice with a tape and minimal therapist contact. Thus, given the mixed findings across these different studies, the effect of including relaxation training in the treatment sessions with chronic pain patients remains unclear, as does the utility of relaxation training for chronic low back pain.

The finding that the psychological treatments plus physiotherapy were superior to physiotherapy alone, at least at posttreatment, on measures of pain, pain-related dysfunctional cognitions, functional impairment, and to a lesser degree, use of coping strategies, conflicts to some extent with the findings of Heinrich et al. (1985) which revealed few treatment-specific differences on a variety of outcome measures between their cognitive-behavioural and physical therapy conditions. While the present study did not employ the physical functioning measures referred to in Heinrich et al.'s study (which also employed relaxation in the physical therapy as well as in the behaviour therapy conditions), the psychological treatment conditions in the present study appeared to improve more than the physiotherapy condition on measures of psychosocial functioning and pain than was the case in Heinrich et al.'s study.

Heinrich et al. (1985) suggested one reason that their physical therapy condition may have performed better than expected on these measures was the group format of their programme and the associated potential for interpersonal influence and support. In addition, like their behavioural condition, their physical therapy condition involved the dissemination of information, encouragement to change behaviour, and the use of relaxation training. The authors also pointed to evidence that their outpatient sample were more active, used medication less and contained a higher proportion of people still working than the typical chronic low-back pain patient samples admitted to inpatient programmes. Thus, their sample was already functioning reasonably well before treatment.

Two possible reasons, therefore, for the discrepancy in findings between the present study and those of Heinrich et al.'s (1985) study could be firstly, that the subjects in the present study were more functionally impaired and emotionally disturbed than those in Heinrich et al.'s study, and secondly, that Heinrich et al.'s physical therapy condition was in fact closer to a combined behavioural therapy-physical therapy condition than the present study's physiotherapy condition.

The relatively poor maintenance of treatment effects for the cognitive and behavioural treatments relative to the reported findings of other similar studies, despite the significant pretreatment to posttreatment effects, also warrants examination. It has already been canvassed that better effects may be obtained when cognitive and behavioural treatments are combined, but another

possible explanation for this discrepancy with previous findings may relate to differences in the subject samples concerned. It was noted earlier that the subjects in the present study were probably closer, in terms of severity of disability, to the subjects in the Kerns et al. (1985) study than to those in either Heinrich et al.'s (1985) study or Turner's (1982) study. Certainly, the limited maintenance of differential treatment effects (between the treatment and control conditions) obtained in the present study were more similar to those reported by Kerns et al. than those of Heinrich et al. or Turner. Thus, as Kerns et al. suggested, it is possible that the achievement of better long-term outcome effects following outpatient interventions with patients of this degree of disability will require the consideration of additional measures, such as spouse involvement in the programme, and booster sessions, or home-based interventions (e.g. Corey, Etlin, & Miller, 1987). This issue will be reconsidered in the main discussion in Chapter 8.

Another possible explanation for the poorer maintenance of treatment effects obtained in the present study compared to those reported in other similar outpatient studies could have been the relative brevity of the psychological treatment in this study. For example, while the present programme comprised ten sessions over five weeks (5 hours of psychological treatment and 12.5 hours of physiotherapy), Turner's (1982) programme comprised five 90-minute sessions of psychological treatment over five weeks (7.5 hours), Heinrich et al.'s (1985) programme comprised ten 2-hour sessions over ten weeks (20 hours of either psychological or physical treatment), Philips' (1987) programme comprised nine 1.5-hour sessions of

psychological treatment over nine weeks (13.5 hours), and Kerns et al.'s (1985) programme comprised ten 1-hour sessions of psychological treatment over ten weeks (10 hours).

While length of treatment could be related to treatment-outcome, the variations in outcome in the studies mentioned above suggests other factors such as severity of disability, homogeneity of patient sample, and content of treatment programme, may have contributed as well. For example, Philips' (1987) programme not only included a sample which was heterogenous with respect to pain complaint and site but also employed physical exercises, anxiety management and mood control in addition to the more typical cognitive-behavioural treatment components. Furthermore, it was based in a clinical psychology department and excluded patients who had unresolved compensation or disability claims or more than one previous surgery for their specific pain complaint. Thus, not only was her patient sample less emotionally disturbed than those in the present study but the population from which they were drawn and the exclusion criteria would tend to suggest they were less severely disabled and potentially less motivationally complicated than those in the present study who were drawn largely from a general hospital pain clinic population and were accepted irrespective of compensation or surgical history - as was the case in Kerns et al.'s (1985) study as well.

It would seem, therefore, that while treatment length could be a factor in determining outcome, the presence of other potential factors and the limited number of controlled outpatient treatment studies means that the question must remain unresolved at this stage.

In conclusion, the pretreatment to posttreatment results obtained in the present study are generally consistent with many of the findings reported by other similar studies, particularly those dealing with similar patient samples. However, while a main effect for time (with the total sample) was maintained at the follow-up assessments, the greater improvement of the treatment conditions compared to the control conditions at posttreatment was only weakly maintained at the two follow-ups. Furthermore, there appeared to be only slight differences in efficacy at posttreatment between the cognitive and behavioural conditions and these differences were not maintained at the follow-ups. In addition, despite evidence from other studies, relaxation training seemed to add little to either cognitive or behavioural treatment effects.

It has been suggested, however, that treatment components like those examined in this study may result in broader and larger effects if they are combined (Linton, 1986) and that better maintenance of any treatment effects resulting from physical therapy would be obtained if physical therapy was combined with cognitive-behaviour therapy (Heinrich et al., 1985). In the present study the scores obtained on the dependent measures by the behavioural and cognitive treatment conditions (both of which included physiotherapy) were combined and compared to the scores obtained by the two physiotherapy conditions. It would seem appropriate, therefore, to examine the effects of combining the cognitive, behavioural and relaxation procedures and physiotherapy into one treatment and comparing the outcome of this combination with a physiotherapy control condition at posttreatment and long-term follow-up. Consequently, the study to be

described in the next chapter will compare these two conditions on a similar sample of chronic low back pain outpatients on three occasions - pretreatment, posttreatment and 6-months follow-up.

CHAPTER 5STUDY TWO5.1 Introduction

It was demonstrated in the first study that the sum of cognitive, behavioural and relaxation treatments, in conjunction with an educational form of physiotherapy, resulted in significantly greater pretreatment to posttreatment improvements in pain intensity, functional impairment, and pain-related cognitions compared to the improvements achieved following educational physiotherapy and attention from a clinical psychologist. However, these differential effects were poorly maintained at 6-month and 12-month follow-ups. It was also demonstrated that reductions in the use of different types of medication approached levels of significance for the behavioural treatment conditions compared to the cognitive treatment conditions. A similar difference between the physiotherapy conditions and the behavioural treatment conditions was also noted, although it was not tested statistically.

Following the results of the first study it was suggested that a combination of the cognitive, behavioural and relaxation treatments may be more effective than either cognitive or behavioural treatments alone. Consequently, the aim of the present study was to test this prediction by comparing the combined psychological treatments and physiotherapy, with a physiotherapy-attention-control condition similar to the one employed in the first study.

Although the physiotherapy and attention condition in the first study reported significantly lower success expectancies at the start

of treatment compared to the various combined psychological and physiotherapy conditions, it was decided to employ a similar physiotherapy control condition rather than, for example, a waiting list control or alternative psychological intervention. This was because the subjects in this condition in the first study displayed a high level of attendance through the programme and at the follow-ups and, despite their evident early misgivings, anecdotal reports suggested the subjects did gain some satisfaction from being able to meet and talk with other chronic low back pain patients. In addition, it was also considered preferable, if possible, to use an active, non-psychological treatment condition as a comparison to the psychological treatments as most of the multicomponent treatment programmes include similar treatments (e.g. Keefe et al., 1981; Cinciripini & Floreen, 1982). The use of the physiotherapy-attention condition would, therefore, both control for the possible effects of attending an active treatment and allow an evaluation of the relative efficacy of two commonly-used forms of treatment for chronic low back pain.

In many ways the composite psychological treatment package will be similar to the one described by Turner (1982) as her cognitive-behavioural therapy which also contained progressive relaxation training, reinforcement of working towards individual behavioural goals, identifying and learning to deal with cognitive and affective responses to pain using relaxation, imagery and coping self-statements.

Turner (1982) compared her cognitive-behavioural therapy to a progressive relaxation training condition and a waiting-list control. The results indicated general improvements on measures of pain intensity, depression, physical and psychosocial dysfunction for both treatment groups compared to the waiting-list control group, but relatively few differences between the two treatment group. The few areas in which the cognitive-behavioural therapy patients improved more than the relaxation-training group included: ability to tolerate pain, to participate in normal activities and to progress towards behavioural goals.

The results of the present study will, therefore, be compared with those of Turner (1982), as well as those of the other controlled treatment studies mentioned previously (e.g. Heinrich et al., 1985; Philips, 1987). Some of the measures employed by Turner (1982), such as the Sickness Impact Profile, self- and other-rated, and the Beck Depression Inventory, will also be used in the present study. However, instead of employing a visual-analogue scale to assess pain tolerance, a 10-item inventory designed by the author will be used to assess a patient's degree of confidence in his/her ability to function normally despite his/her pain. The inventory was derived from measures aimed at assessing Bandura's (1977) concept of self-efficacy (e.g. Biran & Wilson, 1981), but was intended to focus on self-efficacy in relation to pain. It was also hoped that the new measure would help to shed some light on the mechanisms involved in changes associated with treatment.

FIGURE 12. Experimental Design - Study Two

Initial Interview	Pre TMT Assessment	Condition	Experimental Period (5 weeks)	Post Tmt Assessment (Blind)	6-Month Assessment (Blind)
			- All conditions given same Physiotherapy (PT) - At end Session 1, Expectation Rating		
History	BDI	1	<u>Treatment</u>	BDI	BDI
Explanation of programme	PBQ CSQ		- Cognitive-behavioural procedures - Relaxation tapes	PBQ CSQ	PBQ CSQ
Consent form	SIP-S SIP-O		- Physiotherapy instruction	SIP-S SIP-O	SIP-S SIP-O
	PSEI			PSEI	PSEI
	Hourly pain ratings	2	<u>Control</u>	Hourly pain ratings	Hourly pain ratings
	Medication intake		- Attention from Psychologist - Physiotherapy instruction	Medication intake	Medication intake
	*			Physio-therapist evaluation	Practice of skills Other treatments
				*	*

Note: STAI, MPQ, MSPQ also given, but not used as dependent measures, only for correlations - see Chapter 7.

In summary, the purpose of this study was to evaluate a combined cognitive-behavioural and relaxation treatment programme in comparison with a physiotherapy treatment programme.

5.2 Method

5.2.1 Subjects

Twenty subjects, eleven males and nine females, who had been referred to the chronic Low-Back Pain Programme by the Westmead Hospital Pain Clinic and some specialist medical practitioners and general medical practitioners, and were considered suitable for the programme were randomly divided into two groups of ten subjects. the selection criteria and procedure were the same as those employed in the first study, with the exception that the subjects were informed that there would be only one follow-up assessment - 6 months after the end of the programme.

5.2.2 Experimental Design

The experiment consisted of a two (Conditions) x three (Trials) design. Both conditions underwent repeated measurement on three occasions - pretreatment, posttreatment and six-month follow-up (see Figure 12).

Two groups of 5 subjects were randomly designated the treatment condition and another two groups of 5 subjects as the control condition. The treatment condition received a combination of the same relaxation training, cognitive and behavioural treatments used in the first study, together with the same physiotherapy treatment

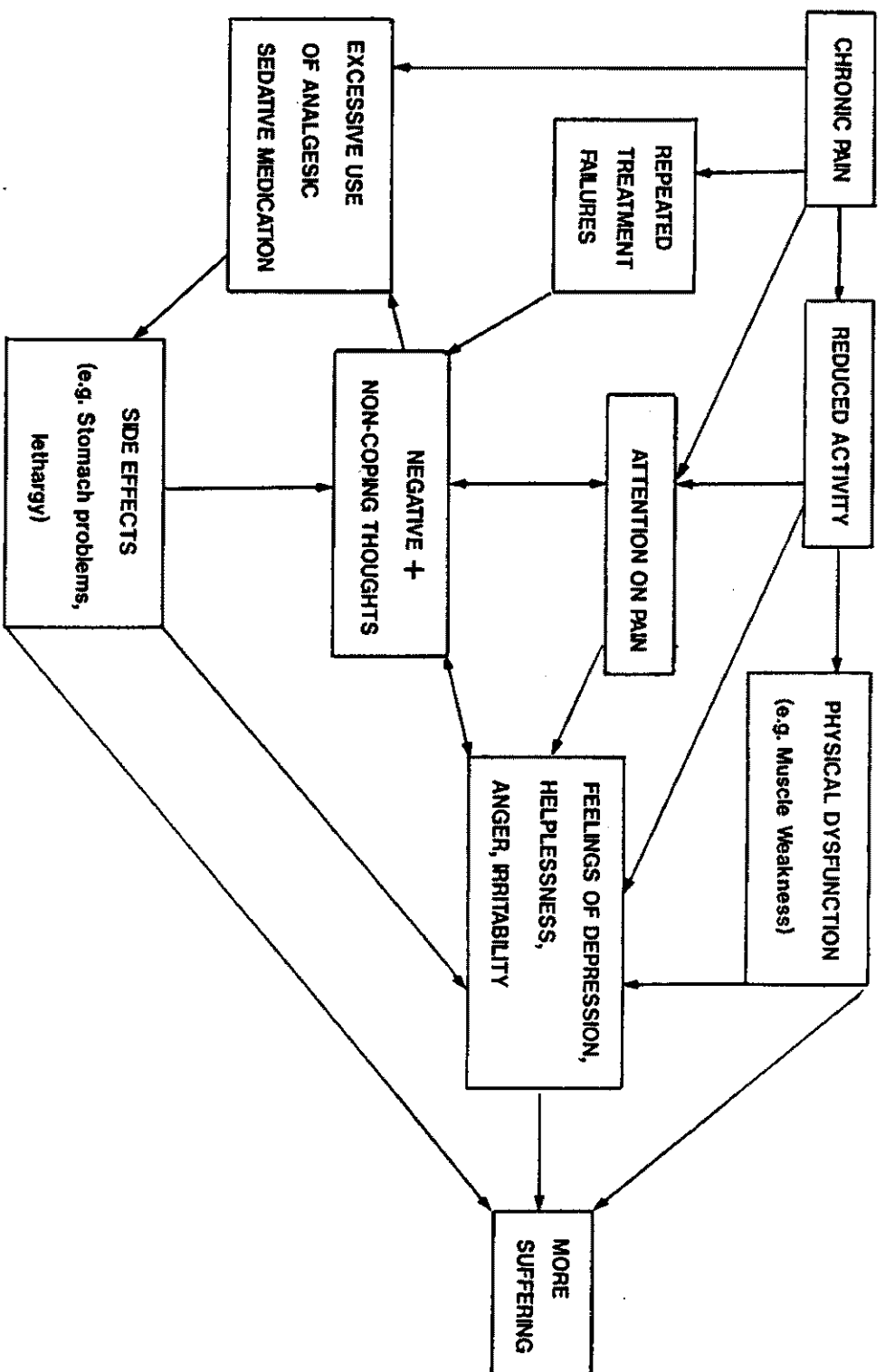


FIGURE 13. Model of Chronic Pain Presented to Cognitive-Behavioural Condition.

used in the first study. The control condition received the same form of attention from the clinical psychologist as the attention-control condition in the first study and the same physiotherapy treatment as in the first study.

Two groups of 5 subjects, one group from each condition, were treated at a time.

5.2.3 Procedure

The treatment programme covered the same amount of time (5 weeks) as the first study and involved the same amount of time with the physiotherapists and clinical psychologist. The division of the twice-weekly sessions was also the same, as were the contents of the physiotherapy and attention-control condition.

(i) Cognitive-Behavioural Treatment

The same cognitive, behavioural and relaxation methods employed in the first study were also employed in this study. However, because the total time for the whole psychological programme remained the same as that of the first study, the amount of time given to the cognitive and behavioural methods was necessarily reduced.

The model of chronic pain presented to the subjects in the treatment groups was also a composite of the two models presented to the cognitive and behavioural groups in the first study (see Figure 13).

5.2.4 Dependent Measures

Apart from the STAI, the same dependent measures as those employed in the first study were used again, with the addition of a measure of self-efficacy in relation to pain which was developed by the author (see below). The STAI was not included because no effects were observed on it in Study One and, with the addition of another dependent measure, statistical power would have been reduced, given the number of subjects. Thus, the dependent variables used in this study included: the Average Pain Rating (APR), the Beck Depression Inventory (BDI), Medications-used, the self-rated Sickness Impact Profile (SIP-S), the other-rated Sickness Impact Profile (SIP-O), the Pain Beliefs Questionnaire (PBQ), the Coping Strategy Questionnaire (CSQ), and the Pain-related Self-efficacy Inventory (PSEI).

The same self-report expectation of improvement and physiotherapist evaluation measures employed in the first study were also used in the present study, as well as the follow-up practise of techniques and other-treatment-received questionnaires.

The experimenter conducted all pretreatment interviews and assessments and the same independent psychologist (again blind to treatment conditions) as employed in the first study conducted 14 of the 18 posttreatment assessments and 12 of the 17 six-month follow-up assessments. As before, the experimenter conducted the remaining posttreatment and 6-month follow-up assessments for those subjects unable to attend when the independent assessor was available.

(i) Pain Self-Efficacy Inventory (PSEI)

The PSEI (see Appendix R) is a self-report inventory which was designed by the author to assess a chronic pain patient's perception of his/her self-efficacy in the presence of pain. As outlined by Bandura (1982), the subjects are asked "to judge whether or not they are capable of performing various activities" (p.195), in this case, despite their pain. In other words, the subjects in this context are being asked to assess capability rather than either intentions or frequency of occurrence. In this sense the PSEI may be considered as addressing a different question to the ones posed by the other cognitive and behavioural measures, such as the Coping Strategy Questionnaire (CSQ), the Pain Beliefs Questionnaire (PBQ) and the Sickness Impact Profile (SIP). For example, the CSQ is asking how often various coping techniques are used; the PBQ is asking how much a subject agrees or disagrees with various beliefs about pain and the SIP is asking the subject to identify which activities he/she has had to alter because of pain. In some ways the PSEI may also be considered to be addressing the issue of ability to tolerate pain.

The PSEI consists of ten statements, such as "I can enjoy things, despite the pain" and "I can do most of the household chores (e.g. tidying-up, washing dishes, etc.), despite the pain." The items were derived from the author's experience with chronic pain patients. The subjects are asked to rate how confident they are that they can do each one of the 10 activities or functions at present by selecting a number on a 7-point scale where 0 equals "not at all confident" and 6 equals "completely confident".

A score for the PSEI is calculated by summing the scores for each of the 10 items. The maximum possible score is 60.

The PSEI was completed at pretreatment, posttreatment and at the 6-month follow-up assessment. As this measure was developed for the present study no previous psychometric data are available. However, a comparison between the PSEI and the other dependent variables employed in the present series of studies will be discussed in Chapter 7.

5.2.5 Experimental Predictions

It was predicted that -

- 1) There would be a significant pretreatment to posttreatment improvement on all the dependent measures for the treatment condition in comparison to the control condition.
- 2) The improvement in the treatment condition relative to the control condition at posttreatment would be maintained at the 6-month follow-up assessment.

5.2.6 Statistical Analysis

(i) Outcome data

As was the case in the first study, the analyses of the multivariate data in this study were planned and each variate was analysed separately. Seven outcome measures (APR, BDI, PBQ, CSQ, SIP-S, SIP-O, and PSEI) were subjected to repeated measures ANOVAs, with each dependent variable being analysed separately using the

Bonferroni adjustment to control for inflation of the possibility of Type I errors due to the number of dependent variables. A family error rate was set at 0.05. However, as in Study One, a brief summary of the significant contrasts obtained with a univariate decision-wise error rate will be presented at the end of each section. Some readers might also be interested to examine the results that would be obtained using an ANCOVA approach to these analyses - see Appendix S.

The following group contrasts were performed:

Within Groups (Trials)

	Pretreatment	Posttreatment	6-Month follow-up
1	1	0	-1
2	1	1	-1
3	1	-1	0

Between Groups

	Treatment	Control
1	1	-1

(ii) As only 2 conditions were being compared it was decided to examine the medication-use data by categorizing the subjects as either users or non-users within each condition and subjecting the resultant summed scores to Chi-square analysis on the 3 assessment occasions.

(iii) Differences between conditions at pretreatment on the dependent variables as well as the expectancy scores were analyzed using a one-way ANOVA for each variable.

(iv) Posttreatment evaluation scores for the physiotherapists and number of other treatments (for low back pain) received in the follow-up period were also analysed using a one-way ANOVA for each variable.

5.3 Results

5.3.1 Subject Losses

Twenty subjects commenced the programme with ten in each condition. By posttreatment one subject had been lost to both condition and by the 6-month follow-up assessment a further subject was lost from the Control condition, leaving nine in the Treatment group and eight in the Control condition. However, one subject from the Treatment condition and one subject from the Control condition did not return their other-rated SIP at the 6-month follow-up.

5.3.2 Analyses of Pretreatment Dependent Variables

One-way analyses of variance (ANOVAs) were performed on each Dependent Variable comparing the scores for the treatment and control conditions. As in Study One, in determining levels of significance, a family error rate was set at 0.05.

In contrast to some of the differences noted in Study One, no significant differences were found on any dependent variable between the two conditions. In particular, no difference between conditions was found on the expectation of improvement measure (treatment condition mean score: 6.2, SD 3.46; and the control condition mean score: 5.2, SD 2.58).

5.3.3 Analysis of Posttreatment Ratings of Physiotherapists

A one-way ANOVA revealed no significant difference between conditions on the perception of the physiotherapists conducting the physiotherapy part of the programme (treatment condition mean

score: 9.1, SD 1.28; control condition mean score: 7.7, SD 1.79).

Both groups perceived the physiotherapists as helpful, friendly and understanding. Thus, any differences between the conditions on the dependent variables are unlikely to be related to perceived differences between the physiotherapists.

5.3.4 Subject Characteristics

Data describing the subjects are presented in Table 29. Examination of the data indicates that the two samples (i.e. treatment and control conditions) do not differ noticeably on demographic variables or on previous non-invasive treatments. However, more subjects in the control condition had had more invasive treatments (i.e. surgery and nerve blocks) compared to those in the treatment condition (11 versus 5). More subjects in the control condition were also taking narcotic analgesics at pretreatment compared to those in the treatment condition (7 versus 2). On the other hand, the use of other types of medication was roughly equivalent between the two conditions. These findings suggest the subjects in the control condition could have had more serious physical pathology than those in the treatment condition. However, as already mentioned, there were no significant differences between them on measures of pain intensity, affective disturbance or functional impairment.

Table 29. Characteristics of Subjects

Demographic Variables	Condition	
	Treatment	Control
N	10	10
Mean	40.8(SD7.6,26-51)	46.6(SD9.7,32-61)
Gender: M	6	5
F	4	5
Mean time with low-back pain (years)	5.9(SD5.9,0.7-20.0)	5.0(SD5.3,0.6-18.0)
Covered by compensation insurance (n)	6	7
Currently employed	1	1
Marital status:		
Married/living with other	8	9
Single/living alone	1	1
Usual Occupation:		
Unskilled manual	2	1
Skilled manual	5	3
Clerical/office	1	1
Professional	0	2
Home duties	2	3
English as first language	10	8
Education:		
< 3 years secondary school:	7	8
> 3 years secondary school:	3	2
"Positive" medical findings (i.e. some abnormality in lower back region reported by referring doctor following physical/radiologic examination)	9	8
<u>Previous Treatments (for back pain)</u>		
Surgery (1 or more operations)	3	6
Nerve blocks	2	5
Physiotherapy	9	8
TENS	4	2
Chiropractic	2	1
Medication	10	10
Psychotherapy/counselling	0	0
<u>Medication at Pretreatment</u>		
Narcotic analgesics	2	7
Non-narcotic analgesics	7	6
Non-steroidal anti-inflammatory drugs (NSAIDs)	3	3
Anti-depressants	3	3
Sedatives/hypnotics	3	3
No medication	0	1

5.3.5 Pretreatment-Posttreatment Changes

The group means and standard deviations for the Dependent Variables at pretreatment, posttreatment and 6-month follow-up are presented in Table 30.

Table 30 Group Means and Standard Deviations for the Dependent Variables at Pretreatment, Posttreatment and 6-month follow-up

Measure	Condition	
	Treatment	Control
1. <u>Average Pain Rating</u>		
Pre mean	3.13	2.84
SD	0.88	0.85
n	(9)	(9)
Post mean	3.07	2.72
SD	0.79	0.77
n	(9)	(9)
6 Month mean	2.89	2.75
SD	0.64	1.11
n	(9)	(8)
2. <u>Beck Depression Inventory</u>		
Pre mean	17.33	20.44
SD	7.41	10.62
n	(9)	(9)
Post mean	14.67	16.44
SD	6.20	10.39
n	(9)	(9)
6 Month Mean	14.44	18.50
SD	5.98	9.26
n	(9)	(8)
3. <u>Pain Beliefs Questionnaire</u>		
Pre mean	53.67	53.56
SD	23.19	21.14
n	(9)	(9)
Post mean	44.78	58.22
SD	18.32	25.18
n	(9)	(9)
6-Month Mean	41.00	55.50
SD	15.43	23.98
n	(9)	(8)

Measure	Condition	
	Treatment	Control
4. <u>Coping Strategies Questionnaire</u>		
Pre mean	30.11	41.89
SD	40.62	34.80
n	(9)	(9)
Post mean	49.33	29.56
SD	36.47	32.14
n	(9)	(9)
6-Month mean	64.89	23.75
SD	22.85	28.62
n	(9)	(8)
5. <u>Sickness Impact Profile - Self</u>		
Pre mean	30.87	32.10
SD	12.17	13.45
n	(9)	(9)
Post mean	18.81	26.08
SD	10.97	16.40
n	(9)	(9)
6-Month mean	18.30	25.31
SD	11.18	14.34
n	(9)	(8)
6. <u>Sickness Impact Profile - Other</u>		
Pre mean	22.86	23.58
SD	13.52	17.61
n	(9)	(9)
Post mean	16.92	24.22
SD	12.03	18.47
n	(9)	(9)
6-Month mean	13.51	23.26
SD	6.80	15.71
n	(8)	(7)

Measure	Condition	
	Treatment	Control
7. <u>PSEI</u>		
Pre mean	23.22	27.78
SD	10.97	17.76
N	(9)	(9)
Post mean	30.78	25.89
SD	10.53	16.84
n	(9)	(9)
6-Month mean	32.78	22.00
SD	14.03	16.19
n	(9)	(8)
8(a). <u>Medications Used</u>		
Pre mean	1.78	1.89
SD	0.97	1.27
n	(9)	(9)
Post mean	0.44	1.56
SD	0.83	0.83
n	(9)	(9)
6-Month mean	0.78	2.00
SD	0.92	1.00
n	(9)	(8)
8(b). <u>Subjects Using Medication</u>		
Pre mean	10	9
n	(10)	(10)
Post mean	2	8
n	(9)	(9)
6-Month mean	4	7
n	(9)	(8)

(i) Average Pain Intensity

No significant pretreatment-posttreatment changes in average pain intensity were revealed by repeated measures ANOVA, either within subjects or between conditions. A summary of the repeated measures ANOVA of mean API scores is presented in Table 31.

TABLE 14. BECK DEPRESSION INVENTORY (BDI)

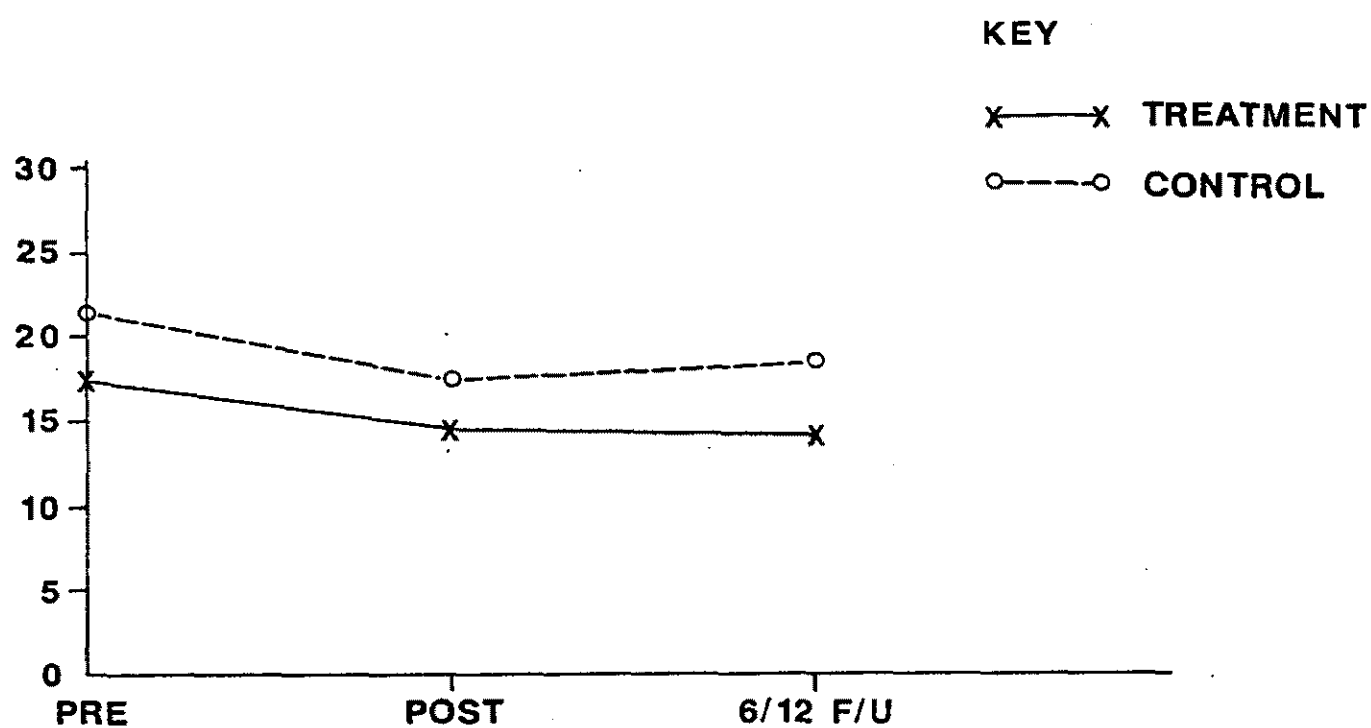


TABLE 31. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment Pain Intensity Scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs. Cntrl)	.902	1	.902	.714
ERROR	20.220	16	1.264	
<u>WITHIN</u>				
B1 (Pre-Post)	.080	1	.080	.449
A1B1 (Group x Trials)	.007	1	.007	.039
ERROR	2.858	16	.179	

(ii) Affective Distress

Although inspection of Figure 14 indicates a slight reduction in mean BDI scores for both the treatment and control conditions, repeated measures ANOVA revealed no significant pretreatment-posttreatment changes in BDI scores either within subjects or between conditions. Table 32 presents a summary of the repeated measures ANOVA of mean BDI scores.

TABLE 32. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment BDI Scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	53.778	1	53.778	.346
ERROR	2488.444	16	155.528	
<u>WITHIN</u>				
B1 (Pre-Post)	100.000	1	100.000	9.302**
A1B1 (Group x Trials)	4.000	1	4.000	.372
ERROR	172.000	16	10.750	

** p < 0.01 (Univariate)

TABLE 15.
SICKNESS IMPACT PROFILE (SELF-RATED)

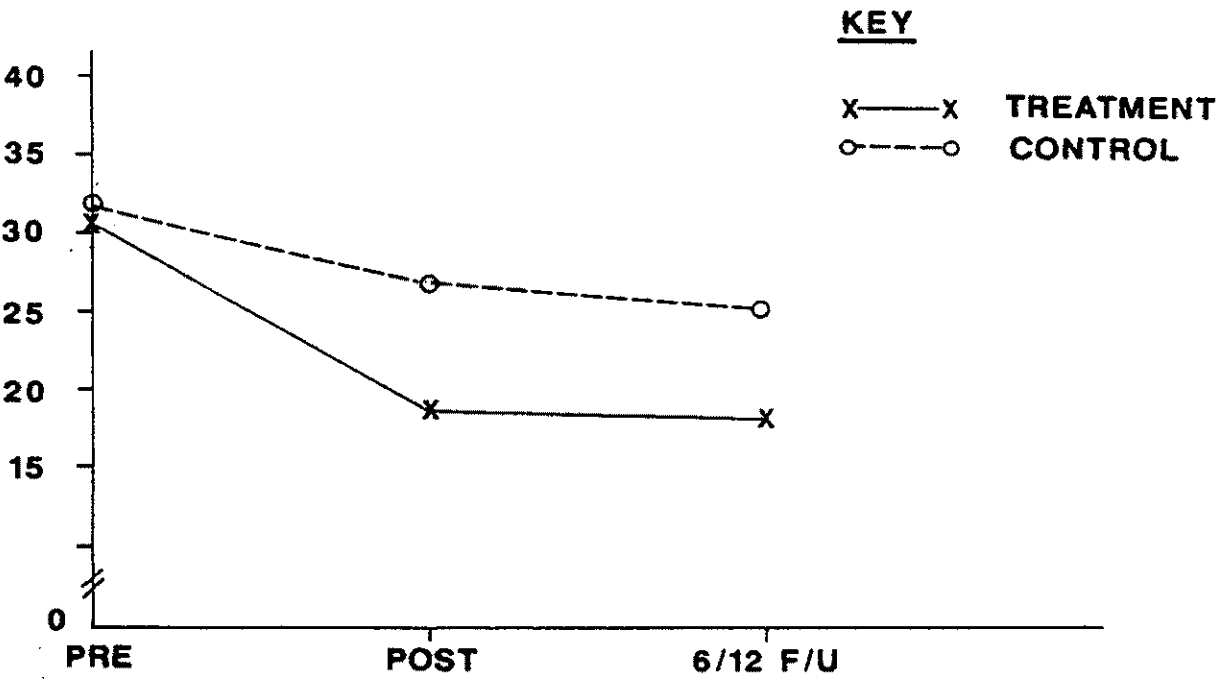
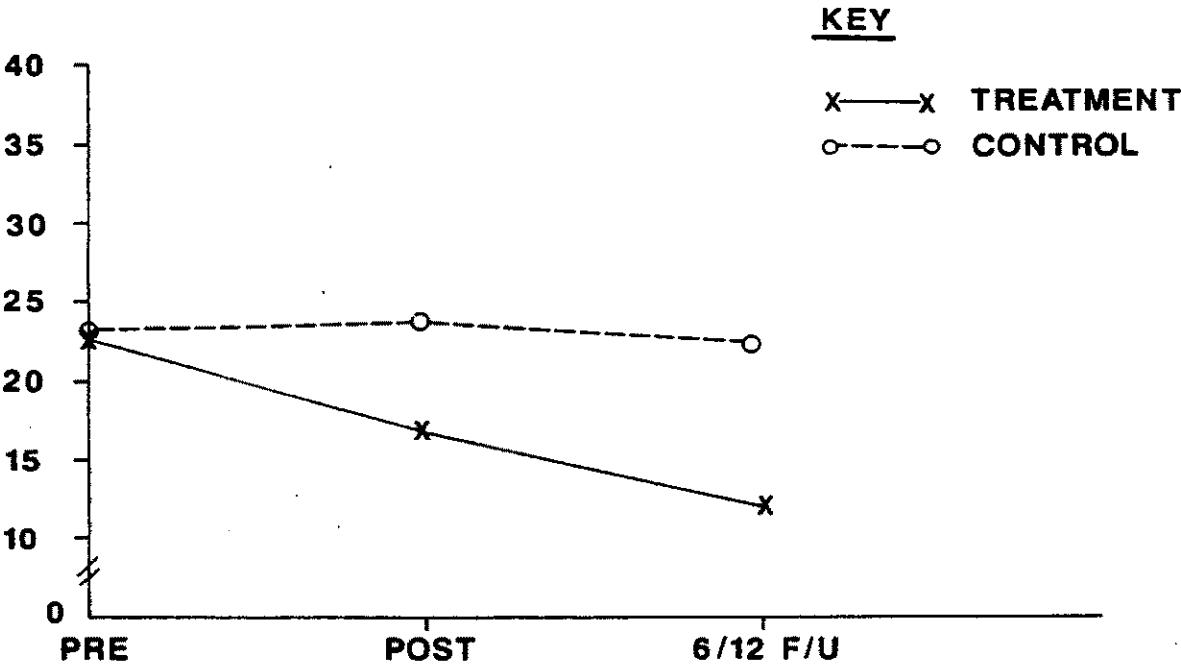


TABLE 16.
SICKNESS IMPACT PROFILE (OTHER-RATED)



(iii) Sickness Impact Profiles (Self- and Other-rated)

Repeated measures ANOVA revealed a significant pretreatment-posttreatment within subjects improvement on the SIP-S, $F(1,16)= 17.62$, $p < 0.01$. However, no significant pretreatment-posttreatment within subjects changes were revealed by repeated measures ANOVA on the SIP-O.

Although, repeated measures ANOVA revealed no significant pretreatment-posttreatment differences between the treatment and control conditions on the SIP-S, a significant difference was revealed on the SIP-O, with the treatment condition improving significantly more than the control condition, $F(1,16)= 10.78$, $p < 0.05$. Tables 33 and 34 present summaries of the repeated measures ANOVAs for the mean SIP-S and SIP-O scores. The mean scores for the SIP-S and SIP-O are presented graphically in Figures 15 and 16, respectively.

TABLE 33. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment SIP-S Scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	14440.028	1	14440.028	.448
ERROR	515251.721	16	32203.233	
<u>WITHIN</u>				
B1 (Pre-Post)	72576.360	1	72576.360	17.618**
A1B1 (Group x Trials)	8341.778	1	8341.778	2.025
ERROR	85909.972	16	4119.373	

** $p < 0.01$ (Bonferroni)

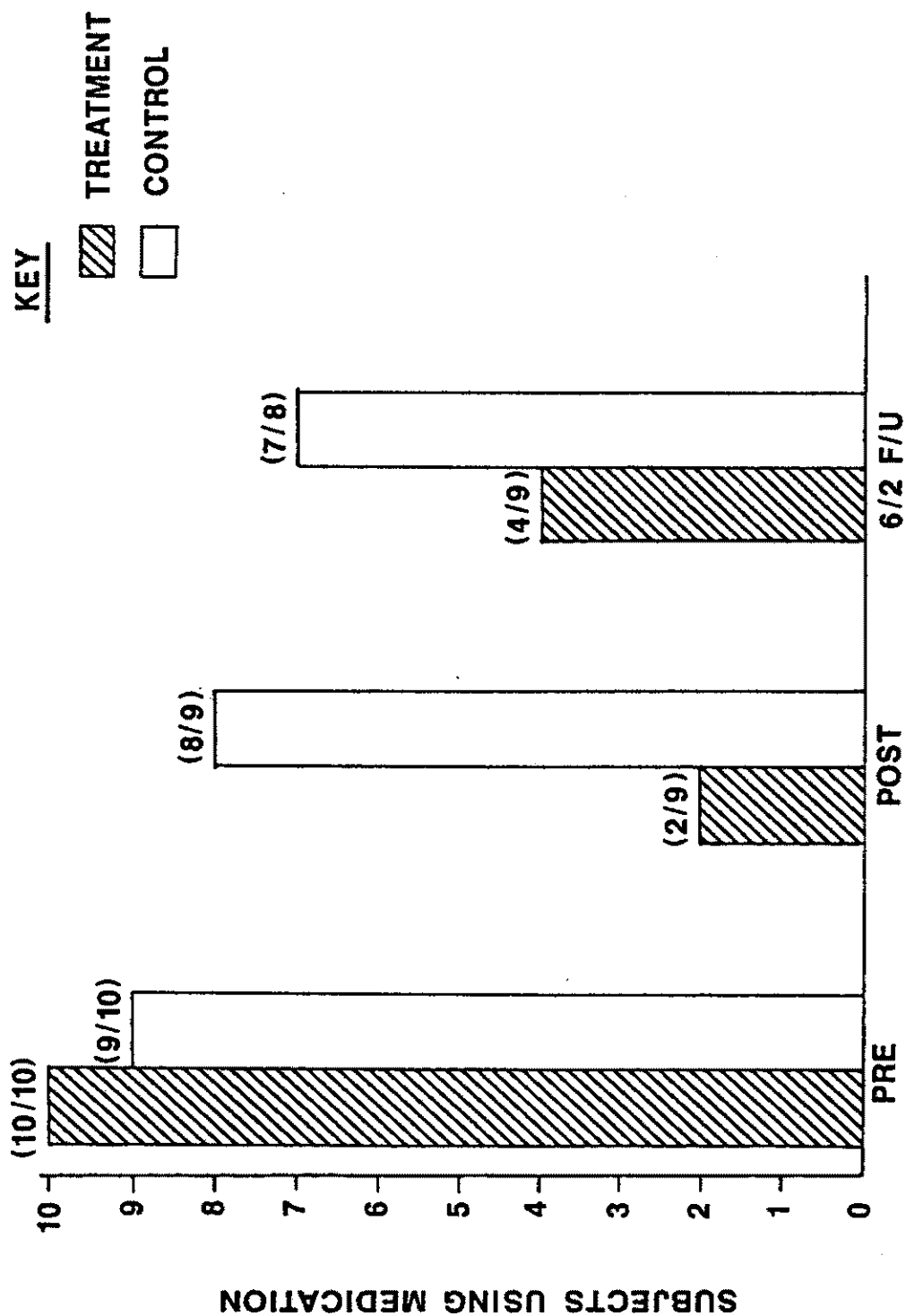


FIGURE 17. USE OF MEDICATION

TABLE 34. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment SIP-0 Scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	13340.250	1	13340.250	.276
ERROR	774308.070	16	48394.254	
<u>WITHIN</u>				
B1 (Pre-Post)	6172.721	1	6172.721	6.903*
A1B1 (Group x Trials)	9636.694	1	9636.694	10.777**
ERROR	14306.434	16		

** $p < 0.05$ (Bonferroni)

* $p < 0.05$ (Univariate)

(iv) Medication Users

As can be seen in Figure 17, the proportion of subjects in the treatment condition reporting continued use of pain-related medication fell markedly from pretreatment to posttreatment (from 10/10 to 2/9) while the proportion in the control condition did not change (from 9/10 to 8/9). A Fisher's Exact Test (which was conducted instead of a chi-square analysis due to small cell sizes) revealed no difference between the conditions at pretreatment, but a significant difference between conditions was revealed at posttreatment ($p < 0.01$).

(iv) Dysfunctional Cognitions

Although the mean Pain Beliefs Questionnaire (PBQ) scores (see Table 30) indicate a reduction in the pretreatment-posttreatment use of dysfunctional cognitions for the treatment condition compared to the control condition, repeated measures ANOVA revealed no

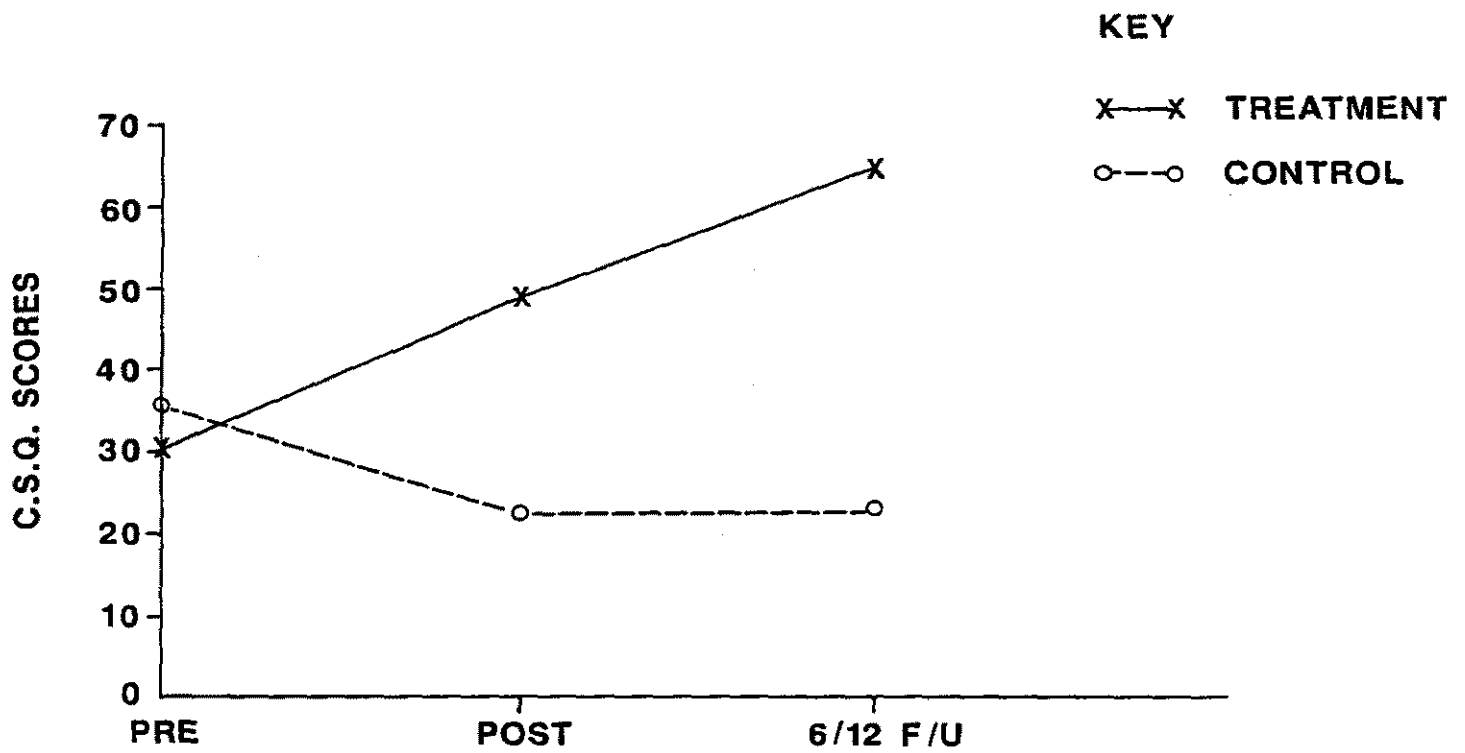


FIGURE 18. COPING STRATEGY QUESTIONNAIRE (C.S.Q)

significant differences either between conditions or within subjects. Table 35 presents a summary of the repeated measures ANOVA results.

TABLE 35. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment PBQ Scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	400.00	1	400.000	.437
ERROR	14659.889	16	916.243	
<u>WITHIN</u>				
B1 (Pre-Post)	40.111	1	40.111	.330
A1B1 (Group x Trials)	413.444	1	413.444	3.404
ERROR	1943.444	16	121.465	

(vi) Coping Strategies

No significant pretreatment-posttreatment within subjects changes were revealed by repeated measures ANOVA on the CSQ. However, repeated measures ANOVA did reveal a significant pretreatment-posttreatment increase in the use of coping strategies for the treatment condition compared to the control group, $F(1,16) = 21.10$, $p < 0.01$. A summary of the repeated measures ANOVA results is presented in Table 36 and Figure 18 presents a graphical account of the mean scores.

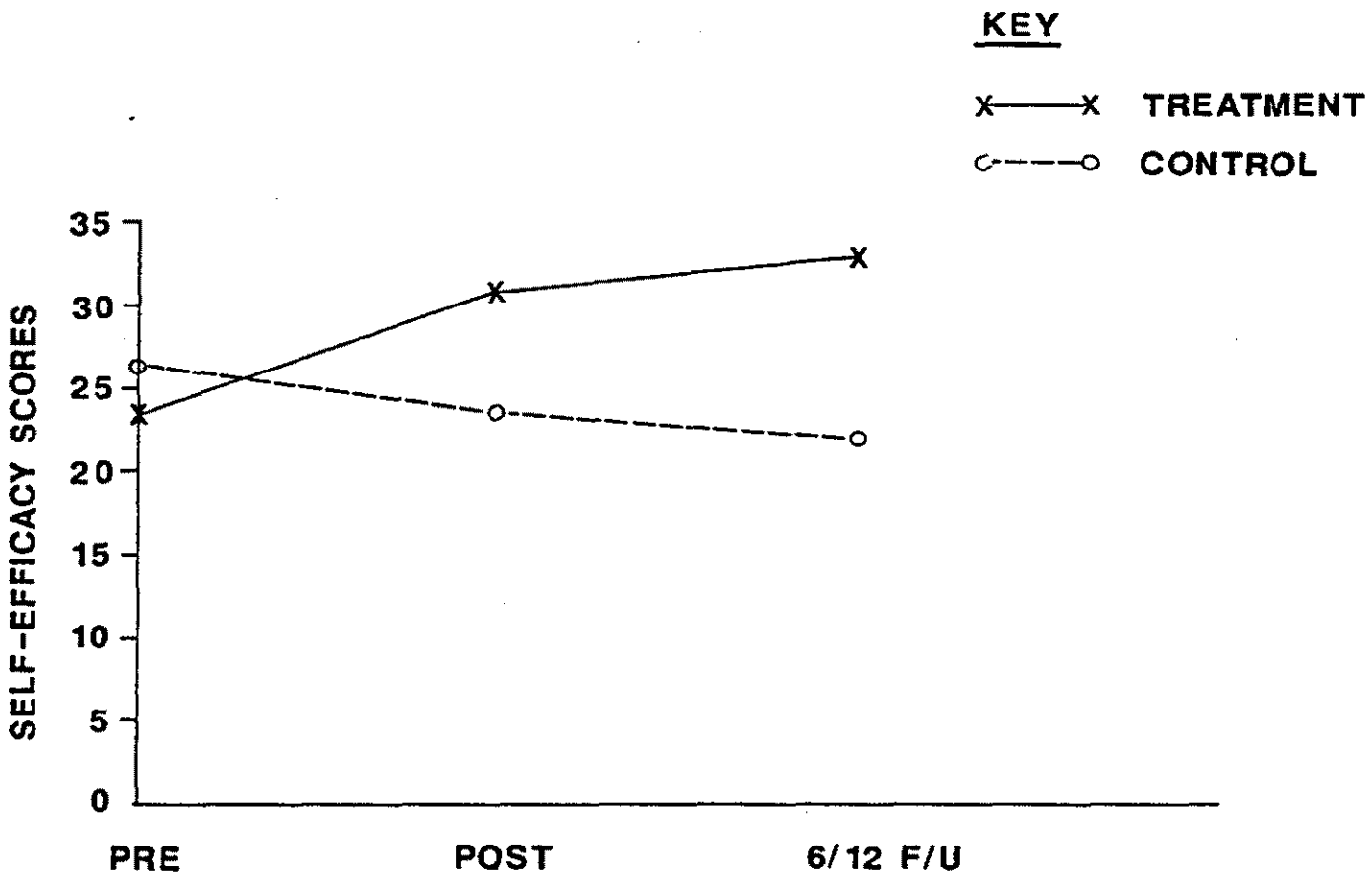


FIGURE 19. PAIN-RELATED SELF-EFFICACY INVENTORY (PSEI).

TABLE 36. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment CSQ Scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
Al (Tmt vs Cntrl)	106.778	1	106.778	.039
ERROR	43386.222	16	2711.639	
<u>WITHIN</u>				
Bl (Pre-Post)	75.111	1	75.111	.660
AlBl (Group x Trials)	2401.000	1	2401.000	21.097**
ERROR	1820.889	16	113.806	

** p <0.01 (Bonferroni)

(vii) Pain-Related Self-Efficacy

No significant pretreatment-posttreatment within subjects changes were revealed by repeated measures ANOVA on the PSEI. However, a significant pretreatment-posttreatment improvement on the PSEI was revealed for the treatment condition compared to the control condition, $F(1,16) = 9.89$, $p < 0.05$. A summary of the repeated measures ANOVA results is presented in Table 37 and Figure 19 presents a graphical account of the mean scores.

TABLE 37. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment PSEI Scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	.250	1	.250	.001
ERROR	7147.000	16	446.687	
<u>WITHIN</u>				
B1 (Pre-Post)	72.250	1	72.250	3.562
A1B1 (Group x Trials)	200.694	1	200.694	9.894*
ERROR	324.556	16	20.285	

* $p < 0.05$ (Bonferroni)

(viii) Univariate Decision-wise Error Rate

The following pretreatment-posttreatment contrasts were significant with a univariate decision-wise error rate:

(a) BDI. A within subjects improvement on the BDI, $F(1,16) = 9.30$, $p < 0.01$. (See Table 32).

(b) SIP-0. A within subjects improvement on the SIP-0, $F(1,16) = 6.90$, $p < 0.05$. (See Table 34).

5.3.6 Pretreatment to 6-month Follow-up Changes

(i) Average Pain Intensity

No significant pretreatment to 6-month follow-up within subjects changes were revealed by repeated measures ANOVA on the APR and no significant pretreatment to 6-month follow-up between condition changes were revealed either. A summary of the repeated measures ANOVA is presented in Table 38.

TABLE 38. Summary of Repeated Measures ANOVA of Mean Average Pain Scores (pre- to 6-month; post- to 6-month)

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	.670	1	.670	.365
ERROR	27.556	15	1.837	
<u>WITHIN</u>				
B1 (Pre to Follow-up)	.309	1	.309	.674
A1B1 (Group x Trials)	.024	1	.024	.053
ERROR	6.870	15	.458	
B2 (Post to Follow-up)	.077	1	.077	.328
A1B2 (Group x Trials)	.058	1	.058	.248
ERROR	3.502	15	.233	

(ii) Affective Distress

Although the mean 6-month BDI score for the control condition was slightly higher than it was at posttreatment (see Figure 14), the repeated measures ANOVA revealed no significant pretreatment to 6-month follow-up differences between the treatment and control conditions on this measure. A summary of the repeated measures ANOVA results is presented in Table 39.

TABLE 39. Summary of Repeated Measures ANOVA of Mean BDI Scores (pre to 6-month; post to 6-month)

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	176.477	1	176.477	.847
ERROR	3126.032	15	208.402	
<u>WITHIN</u>				
B1 (Pre to Follow-up)	76.589	1	76.589	5.397*
A1B1 (Group x Trials)	.118	1	.118	.008
ERROR	212.882	15	14.192	
B2 (Post to Follow-up)	1.281	1	1.281	.121
A1B2 (Group x Trials)	3.163	1	3.163	.299
ERROR	158.778	15	10.585	

* $p < 0.05$ (Univariate)

(iii) Sickness Impact Profiles (SIP-S and SIP-O)

As was found at posttreatment, the repeated measures ANOVA revealed a significant within subjects improvement on the SIP-S $F(1,15) = 15.11$, $p < 0.01$). As at posttreatment also, there was no significant pretreatment to 6-month follow-up difference between the treatment and control conditions on the SIP-S.

However, while there was a significant between conditions difference in improvement on the SIP-O at posttreatment, repeated measures ANOVA revealed that this difference had dissipated at the 6-month follow-up.

Summaries of the repeated measures ANOVAs of the mean pretreatment to 6-month follow-up SIP-S and SIP-O scores are presented in Tables 40 and 41, respectively.

TABLE 40. Summary of Repeated Measures ANOVA of Mean
SIP-S Scores (pre- to 6-month; post- to 6-month)

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	44855.389	1	44855.389	1.009
ERROR	666871.309	15	44458.087	
<u>WITHIN</u>				
B1 (Pre to Follow-up)	91724.360	1	91724.360	15.105**
AlB1 (Group x Trials)	3833.254	1	3833.254	.631
ERROR	91085.784	15	6072.386	
B2 (Post to Follow-up)	1691.677	1	1691.677	.868
AlB2 (Group x Trials)	692.698	1	692.698	.355
ERROR	29239.222	15	1949.281	

** $p < 0.01$ (Bonferroni)

TABLE 41. Summary of Repeated Measures ANOVA of Mean
SIP-O Scores (Pre- to 6-month; post- to 6-month)

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	49486.649	1	49486.649	1.081
ERROR	595163.136	13	45781.780	
<u>WITHIN</u>				
B1 (Pre to Follow-up)	27855.086	1	27855.086	2.734
AlB1 (Group x Trials)	90.350	1	90.350	.009
ERROR	132450.569	13	10188.505	
B2 (Post to Follow-up)	5384.320	1	5384.327	.868
AlB2 (Group x Trials)	.058	1	3388.688	.546
ERROR	80627.079	13	6202.083	

** $p < 0.01$ (Bonferroni)

(iv) Medication Users

The proportion of subjects in the treatment condition who reported continued use of medication increased slightly at the 6-month follow-up assessment (from 2/9 at posttreatment to 4/9 at 6-months). The proportion of reported medication users in the control condition at the 6-months follow-up remained similar to the posttreatment level (8/9). Fisher's Exact Test revealed that the difference between the treatment condition and control condition at the 6 months follow-up was not significant. Figure 17 presents a graphical account of this data.

(v) Dysfunctional Cognitions

As was revealed at posttreatment, although inspection of the mean scores on the Pain Beliefs Questionnaire (PBQ) in Figure 18 indicates a reduction in dysfunctional cognitions for the treatment condition compared to the control condition, repeated measures ANOVA revealed no significant pretreatment to 6-month follow-up within subjects changes and no significant between group differences on this measure. A summary of the results of repeated measures ANOVA of mean PBQ scores is presented in Table 42.

TABLE 42. Summary of Repeated Measures ANOVA of Mean PBQ Scores (pre- to 6-month; post- to 6-month)

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	1405.769	1	1405.769	1.138
ERROR	18526.074	15	1235.072	
<u>WITHIN</u>				
B1 (Pre to Follow-up)	367.118	1	367.118	1.636
A1B1 (Group x Trials)	313.471	1	313.471	1.397
ERROR	3365.000	15	224.333	
B2 (Post to Follow-up)	128.105	1	128.105	1.670
A1B2 (Group x Trials)	.105	1	.105	.001
ERROR	1150.778	15	76.719	

(vi) Coping Strategies

The significant pretreatment-posttreatment increase in reported use of coping strategies for the treatment condition compared to the control condition was maintained at the 6-month follow-up. Repeated measures ANOVA revealed a significant pretreatment to 6-month improvement for the treatment condition compared to the control condition on the CSQ, $F(1,15) = 15.64$, $p < 0.01$). However, as was found at posttreatment, there was no significant pretreatment to 6-month within subjects change on the CSQ. A summary of the repeated measures ANOVA is presented in Table 43 and the mean scores are graphically presented in Figure 19.

TABLE 43. Summary of Repeated Measures ANOVA of Mean CSQ Scores (pre to 6-month; post to 6-month)

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	5375.885	1	5375.885	1.880
ERROR	42891.292	15	2859.419	
<u>WITHIN</u>				
B1 (Pre to Follow-up)	1074.708	1	1074.708	3.389
AlB1 (Group x Trials)	4683.413	1	4683.413	15.641**
ERROR	4491.528	15	299.435	
B2 (Post to Follow-up)	571.687	1	571.687	2.183
AlB2 (Group x Trials)	456.393	1	456.393	1.743
ERROR	3928.549	15	261.903	

** $p < 0.01$ (Bonferroni)

(vii) Pain-Related Self-Efficacy

Although inspection of the mean PSEI scores in Figure 20 suggests that the pretreatment to posttreatment improvement by the treatment condition relative to the control condition was maintained, no significant pretreatment to 6-month follow-up difference between conditions was revealed by repeated measures ANOVA. In addition, as was the case at posttreatment, no significant pretreatment to 6-month follow-up within subjects difference was revealed by repeated measures ANOVA. A summary of the repeated measures ANOVA results is presented in Table 44.

TABLE 44. Summary of Repeated Measures ANOVA of Mean PSEI Scores (pre to 6-month; post to 6-month)

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)				
ERROR	313.543	1	313.543	.487
<u>WITHIN</u>				
B1 (Pre to Follow-up)	59.609	1	59.609	1.056
A1B1 (Group x Trials)	403.609	1	403.609	7.149*
ERROR	846.861	15	56.457	
B2 (Post to Follow-up)	.298	1	.298	.008
A1B2 (Group x Trials)	27.827	1	27.827	.736
ERROR	566.937	15	37.796	

* $p < 0.05$ (Univariate)

(viii) Univariate Decision-wise Error Rate

The following contrasts were significant with a univariate decision-wise error rate:

(a)BDI. A within subjects pretreatment to 6-month follow-up improvement on the BDI, $F(1,15) = 5.40$, $p < 0.05$ (see Table 39).

(b)PSEI. A pretreatment to 6-month follow-up improvement on the PSEI for the treatment condition relative to the control condition, $F(1,15) = 7.15$, $p < 0.05$ (see Table 44).

5.3.7 Posttreatment to 6-Month Follow-up Changes

No significant posttreatment to 6-month follow-up differences were revealed by repeated measures ANOVAs either within or between conditions on any of the seven dependent variables analyzed (i.e. APR, BDI, PBQ, CSQ, PSEI, SIP-S, SIP-O).

5.3.8 Continued Practice of Skills Taught

Table 45 shows the degree of continued practice of the skills taught during the programme for the posttreatment to 6-month follow-up period. No statistical analyses were performed, but inspection of the data indicates that both conditions continued to practise the skills taught between 1 and 3 times a week.

Table 45 Summary of Continued Practice of Skills Taught at 6-Month Follow-up (Means and Standard Deviation)

Measure	Condition	
	Treatment	Control
1. <u>Physiotherapy exercises</u>		
Mean	2.44	1.50
SD	(1.33)	(1.51)
2. <u>Relaxation exercise</u>		
Mean	2.56	
SD	(2.42)	
3. <u>Cognitive Coping Skills</u>		
Mean	3.00	
SD	(1.42)	
4. <u>Maintenance of Increased Activity Level</u>		
Mean	2.00	
SD	(1.00)	
n	9	8

5.3.9 Other Treatments Received

Treatments (other than medication) the subjects reported receiving for their low back pain in the 6-month follow-up period was very low for both conditions: Treatment condition, mean number: 0.22, SD: 0.44; Control condition, mean number: 0.38, SD: 0.74. No statistical tests were performed on this data as the numbers were so small.

5.4 Discussion

The aim of the present study was to compare the immediate and long-term efficacy of a combination of the cognitive, behavioural, relaxation and physiotherapy techniques described in the first study with a combination of attention from the clinical psychologist and physiotherapy techniques in the treatment of chronic low-back pain. In the light of the results of the first study, it was considered that a combination of the psychological techniques might have a greater and more lasting effect than the individual techniques alone.

The present study was also intended to replicate some of the findings of similar, earlier studies, such as those of Turner (1982), Heinrich et al.(1985), Kerns et al.(1986) and Philips (1987). However, comparisons between the present study and others in the literature will be left for the main discussion in the Chapter 8.

In the present study the results of Bonferroni-adjusted analyses of variance indicated significant pretreatment to posttreatment improvements for both conditions only on the self-reported measure of functional impairment (SIP-S). However, using the less conservative

univariate decision-wise error rate, significant pretreatment to posttreatment improvements were revealed for both conditions on the measure of depression (BDI) and the other rated measure of daily functioning (SIP-0).

At the 6-month follow-up assessment, while the Bonferroni-adjusted analyses of variance revealed no significant posttreatment to follow-up changes for both conditions, a significant pretreatment to follow-up improvement for both conditions in the self-rated SIP was revealed. Thus, the effect observed on this measure at posttreatment was maintained for both conditions at follow-up. Similarly, the less conservative univariate decision-wise error rate also indicated that the pretreatment-posttreatment effect observed on the depression measure for both conditions was maintained at follow-up, although no posttreatment to follow-up changes were revealed.

The results of the Bonferroni-adjusted analyses of variance also indicated significant pretreatment to posttreatment improvements in the reported use of coping strategies, the other-rated measure of functional impairment (SIP-0), and in perceived pain-related self-efficacy for the cognitive-behavioural treatment condition compared to the physiotherapy treatment condition. In addition, a separate analysis of the self-reported medication-use results using Fisher's exact probability test indicated a significant pretreatment to posttreatment reduction in the number of medication users for the cognitive-behavioural treatment condition compared to the physiotherapy treatment condition.

At the 6-month follow-up assessment, the Bonferroni-adjusted analyses of variance indicated a significant pretreatment to follow-up improvement for the cognitive-behavioural treatment condition compared to the physiotherapy treatment condition only on the reported use of coping strategies. Using the less conservative univariate decision-wise error rate, the repeated measures analyses of variance also indicated a significant pretreatment to follow-up improvement in perceived pain-related self-efficacy for the cognitive-behavioural treatment condition compared to the physiotherapy treatment condition. Thus, of the differential effects observed between the conditions at posttreatment, only the greater use of coping strategies for the cognitive-behavioural treatment condition, relative to the physiotherapy treatment condition, was maintained at a significant level at the 6-month follow-up. However, inspection of the mean scores indicated that this result was, in the main, related to improvements in the physiotherapy condition in the follow-up period, rather than deterioration in the treatment gains of the cognitive-behavioural condition.

In evaluating the present study a number of factors should be considered. Firstly, the positive methodological features of the study, relative to many of the previous studies in this area, include the use of an alternative-treatment comparison condition which also included a control for the attention of the clinical psychologist, the employment of an independent and blind interviewer at posttreatment and 6-month follow-up assessments, the inclusion of significant-others' reports on the subjects' current level of functional impairment, and an assessment of the treatment-outcome

which could have affected the results included the small number of subjects, possible differences in severity of physical pathology between the two conditions, and the brevity of the treatment programme compared to those reported in other studies.

The employment of the Bonferroni-adjustment to the critical values in the repeated measures ANOVAs could also be seen as a positive feature of the study as it reduced the risk of Type I errors due to the large number of dependent variables. However, together with the small sample size, it also reduced the power of the analyses and increased the risk of Type II errors. It may be argued that such an approach is unnecessarily conservative particularly when it is considered that the dependent variables may be divided into those of major clinical concern (i.e. pain intensity, affective distress, functional impairment, and medication consumption) and those of more theoretical interest (i.e. pain-related cognitions, coping strategies, and perceived pain-related self-efficacy). In the present analyses apart from medication use, all the dependent variables were considered equally important and thus the statistical power available for each test was correspondingly less.

In comparison to the results obtained in the first study, the results of the present study suggest the combination of cognitive and behavioural treatments is associated with larger and more consistent effects (i.e. across a number of measures) at posttreatment than was the case with either treatment alone. Interestingly, despite this, the pretreatment to posttreatment reduction in average pain intensity

probably related more to the larger sample size and to the fact that the control conditions worsened slightly than to any clinically significant treatment effect.

Although the results of the present study suggest that the combined cognitive and behavioural treatments are more effective at posttreatment than either alone, the relatively poor maintenance of differential treatment effects is a cause for concern. While the small sample size would not have helped the poor maintenance findings, in the light of the substantial effects obtained at posttreatment it would seem that whatever led to the pretreatment to posttreatment changes it was not sufficiently present in the follow-up period to maintain continued improvement in the cognitive-behavioural condition relative to the physiotherapy condition.

There are at least two possible explanations for this finding. Firstly, there could have been a failure on the part of the subjects to persist with the coping strategies and exercises taught during the treatment programme. However, both the significant Coping Strategies Questionnaire findings at follow-up and the reports of a moderate level of continued exercise practice at follow-up suggest that this explanation is not totally satisfactory.

Secondly, the poor maintenance effects could have been related to the subjects' family and social environments. During the treatment programme the clinical psychologist provided consistent reinforcement for any attempts the subjects made towards their individual goals and towards implementing the coping strategies and practising the exercises. Although the subjects were encouraged to discuss the programme and its requirements with their significant others, the significant others were not included in the programme and were not therefore specifically instructed to reinforce well behaviours and to avoid reinforcing pain behaviours. In addition, given the relative brevity of the programme and the lack of significant-other involvement, particular personal problems or conflicts which may have existed in the subjects' family and social environments were not specifically dealt with, or not in any depth, during the treatment programme which was, of course, largely oriented towards skills-training. Consequently, it is possible that while the effects of these 'external' factors (i.e. external to the treatment programme and the subject) could have been masked or minimised during the treatment programme, they became more salient in the months following the treatment programme. However, while the data obtained in the present study do not shed any light on this possibility, some recent findings from other studies may do so and they will be discussed in Chapter 8.

Despite the relatively poor maintenance of treatment effects in the follow-up period, the results obtained in the present study do corroborate the findings in the first study that the combination of an active psychological treatment and a physiotherapy treatment is

more effective at posttreatment than a physiotherapy treatment on its own or when coupled with a more passive psychological intervention. However, the relative contributions of the psychological and physiotherapy components to the combined treatment programme employed in this series of studies remains unclear. There could, for example, be an additive effect when the two treatments are combined, or alternatively, the results of Studies 1 and 2 could indicate that the physiotherapy treatment made little contribution to the results obtained. In an attempt to examine this question further it was decided to assess the effect on the posttreatment outcome measures of removing a large section of the physiotherapy treatment from the combined psychological and physiotherapy treatment programme. An account of this attempt will be presented in the next chapter.

CHAPTER 6.STUDY THREE6.1 Introduction

The results of the two previous studies suggested that the conditions which received a combination of psychological and physiotherapy treatments tended to improve more on measures of average pain intensity, pain-related dysfunctional cognitions, functional impairment, medication intake and use of active coping strategies than those conditions which received either physiotherapy or attention plus physiotherapy alone. However, some of these results were not consistent and on some outcome measures (e.g. average pain intensity in Study Two and affective distress in both studies) there was no difference between those groups which received psychological treatment compared to those which did not, particularly at long-term follow-up.

Given the variable results and uncertainty over the degree to which the results obtained reflected the cognitive-behavioural treatment or an additive effect of the combined cognitive-behavioural and physiotherapy treatments, it was decided to further examine the efficacy of the cognitive-behavioural treatment relative to the physiotherapy treatment by varying the physiotherapy treatment. As mentioned earlier, in the broader clinical context this line of investigation could be seen to have particular significance given the frequent use of similar forms of physiotherapy and psychological treatments in multicomponent treatment programmes (e.g. Roberts & Reinhardt, 1980; Keefe et al., 1981). Yet, as Turner and Romano

(1984) pointed-out, because of a lack of adequate control conditions it has been difficult to determine whether the changes reported in such programmes are due to particular treatment components or to more non-specific effects associated with receiving an active treatment. It is also interesting to note that despite the evident popularity of physiotherapy treatments for chronic low back pain, little experimental evidence of their utility has been demonstrated (Flor & Turk, 1984; Wells, 1984).

In the two previous studies all conditions received the same physiotherapy treatment. This was divided into two main parts: first, lectures providing information on spinal anatomy, pathology and function, together with advice on back care and tuition on (but not practice of) exercises aimed at increasing the strength of back support muscles; and secondly, supervised practice of exercises, aimed to some extent at increasing mobility, in the heated hydrotherapy pool.

While it would have been preferable from an experimental point of view, to compare a group receiving the combined psychological and physiotherapy treatments with a group receiving only the psychological treatment, it was decided that as the subjects referred to the programme, and their doctors, were expecting some physiotherapy as part of the programme it would be unethical to deny them any physiotherapy. Thus, it was decided to compare a combined psychological treatment plus full physiotherapy condition with a combined psychological treatment plus lectures-only physiotherapy

condition. The lectures-only physiotherapy condition would receive the same information as the full physiotherapy condition but not the four sessions of exercise practice with the physiotherapists in the hydrotherapy pool. Effectively, this would mean the lectures-only physiotherapy would have about two thirds the contact with the physiotherapists of that received by the full physiotherapy condition (i.e. 8.5 hours versus 12.5 hours). It was also considered that the results of this division of the physiotherapy could have an added benefit in the form of potential cost savings. As a heated indoor hydrotherapy pool is an expensive piece of equipment, if it could be shown that four weekly sessions of exercises in a hydrotherapy pool made no significant contribution to the outcome of a chronic low back pain management programme it would mean that such a programme, providing it was successful, did not require such a pool and could be held away from a hospital or rehabilitation setting.

It was also decided to compare any changes in the two groups on a pretreatment-posttreatment basis rather than over a long follow-up period as the physiotherapists considered it more likely that any effects associated with the hydrotherapy exercises would show-up at posttreatment rather than 6 months later (unless, of course, they continued exercising over that period).

FIGURE 21. Experimental Design - Study Three

Initial Interview	Pretreatment Assessment	Condition	Experimental Period (5 weeks, 2 attendances per week) (Expectancy rating, end of session 1)	Posttreatment Assessment
History	BDI	1	<u>Treatment</u>	BDI
Explanation of programme	PBQ		- Cognitive-behavioural procedures	PBQ
Consent form	CSQ		- Relaxation tapes	CSQ
	SIP-S		- Physiotherapy	SIP-S
	SIP-O		- Information	SIP-O
	PSEI		- exercise instruction	PSEI
	Hourly pain ratings		- exercise practice in pool	Hourly pain ratings
	Medication intake	2	<u>Control</u>	Medication intake
	*		- Cognitive-behavioural procedures	Physiotherapist evaluation
			- Relaxation tapes	*
			- Physiotherapy	
			- Information	
			- exercise instruction	

* STAI, MPQ, MSPQ also given, but not used as dependent measures, only for correlations - see Chapter 7.

6.2 Method

Thirty subjects, eleven males and nineteen females, who had been referred to the programme by the same sources as those in the first two studies, were randomly assigned to one of two conditions. The selection criteria and selection procedure were the same as those employed in the earlier studies.

6.2.1 Experimental Design

The experiment consisted of a two (Conditions) x two (Trials) design. Both conditions underwent repeated measurement on two occasions - pretreatment and posttreatment (see Figure 21).

One condition was designated the treatment condition and the other the control condition. The treatment condition received the same combination of psychological treatments and physiotherapy as used in the second study, namely: cognitive and behavioural treatments, relaxation training, and physiotherapy education, exercise tuition and 4 sessions of exercise practice in the hydrotherapy pool. The control condition received the same combination of psychological treatments (including relaxation training) as the treatment condition and the same information and exercise tuition as the physiotherapy part of the treatment condition but not the 4 sessions exercise practise in the hydrotherapy pool.

Fifteen subjects were randomly assigned to each condition and each condition was divided into cells of five subjects. One cell from each condition was admitted to the programme at a time. This

process was repeated until three cells from both conditions had completed the programme.

6.2.2 Procedure

As in the previous two studies, the treatment programme covered five weeks and involved two sessions each week (see Figure 21 for a description of the study). The programme was held on Monday and Thursday afternoons. The control condition attended the psychological treatment first each Monday while the treatment condition attended the physiotherapy hydrotherapy exercise programme. At the conclusion of these sessions, apart from the first day, the control condition left the unit (to go home) while the treatment condition attended the psychological treatment. On the first Monday the control condition also met with the physiotherapists for an introduction to the programme. Both conditions attended the Thursday physiotherapy sessions jointly, thus ensuring they were given the same physiotherapy information.

As before, both the psychological treatment and hydrotherapy exercise sessions lasted about one hour, while the Thursday session lasted about ninety minutes. Thus, the treatment condition received four hours more contact with the physiotherapists than the control condition.

(i) Treatment Condition

The treatment condition received the same input as that described for the treatment condition in the second study; namely, cognitive and behavioural treatments, relaxation training, and

physiotherapy, which included information on spinal anatomy and function, back care, tuition on back-strengthening exercises and four sessions of exercise practice in the hydrotherapy pool under the supervision of two physiotherapists - who were also in the pool with the subjects.

As in the previous study, the treatment condition subjects were encouraged to practise the exercises (in and out of any available swimming pools) to increase their general activity level, to work towards individualized behavioural goals, to reduce analgesic and sedative medication, and to practise the relaxation technique and the cognitive coping strategies. At each session the subjects were verbally reinforced for any attempts or progress towards these goals.

(ii) Control Condition

The control condition received the same psychological treatment input and the same information and tuition on exercises from the physiotherapists as the treatment condition. However, they did not receive the four sessions of supervised exercise practice in the hydrotherapy pool.

Like the treatment condition, they were verbally reinforced for any attempts or progress towards the goals set during the programme. But they were not encouraged to practise their exercises in swimming pools between sessions.

6.2.3 Dependent Measures

Eight outcome measures were employed on the two assessment occasions. These included: The Pain Rating Chart (from which average pain levels over a week were calculated), the Beck Depression Inventory (BDI), the Pain Beliefs Questionnaire (PBQ), the Coping Strategies Questionnaire (CSQ), the Sickness Impact Profile - self rated (SIP-S), the Sickness Impact Profile - other rated (SIP-O), the Pain Self-Efficacy Inventory (PSEI), and a daily self-report record of medication taken for pain. The State version of the State-Trait anxiety Inventory (STAI-S), the pain descriptors of the McGill Pain Questionnaire (MPQ) and the Modified Somatic Perception Questionnaire (MSPQ) were also administered but only for correlational purposes and not as dependent variables. The previously described self-report evaluation measure rating the physiotherapists was also administered at the posttreatment assessment. As in the previous studies the expectations rating scale was completed at the conclusion of the first session of the programme.

The experimenter conducted all the pretreatment assessments and the independent psychologist employed previously again acted as a blind posttreatment assessor and conducted 18 of the 23 posttreatment assessments. The experimenter conducted the remaining posttreatment assessments for those subjects unable to attend when the independent assessor was available.

6.2.4 Statistical Analysis

(i) As was the case in the previous two studies, the analysis of the multivariate data in this study was planned and seven variates (i.e. APR, BDI, PBQ, CSQ, PSEI, SIP-S, SIP-O) were analyzed separately using repeated measures ANOVAs. The eight variate, medications used, was subjected to chi-square analysis.

In order to reduce the risk of Type I errors due to the large number of dependent variables the Bonferroni adjustment to the critical value was employed once more for the repeated measures ANOVAs.

A family error rate was set at 0.05.

The analyses were planned and the following contrasts were performed:

	<u>Pretreatment</u>	<u>Posttreatment</u>
<u>Within-conditions:</u>	1	-1
	<u>Treatment</u>	<u>Control</u>
<u>Between conditions:</u>	1	-1

(ii) Differences between conditions at pretreatment on the dependent variables as well as the Expectancy scores were analysed separately using a one-way ANOVA.

(iii) Posttreatment evaluation scores for the physiotherapists were also analysed using a one-way ANOVA.

6.2.5 Null Hypothesis:

There would be no significant pretreatment-posttreatment difference between the treatment and control conditions on any dependent variable.

6.3 Results

6.3.1 Subjects

Thirty subjects commenced the programme, with fifteen in each condition. By posttreatment three subjects had been lost from the treatment condition and four from the control condition, leaving twelve in the treatment condition and eleven in the control condition. As in the previous studies, when a subject missed a session without warning an attempt was made by the author to contact him/her. Reasons for not continuing given by those drop-outs who were contacted included: lack of improvement, a preference for a more invasive form of treatment, and difficulties in attending the sessions at the times they were held.

One subject who dropped-out from the control condition did not return her other-rated Sickness Impact Profile (SIP-0). Consequently, the pretreatment data for this measure were analysed with $n=14$ for the control condition.

(i) Subject Characteristics

The pretreatment subject characteristics for both conditions are presented in Table 47. Visual comparison with the subjects in Studies One and Two suggests a general similarity between the subjects in the three studies, apart from a slightly shorter history of low back pain in the present study. Visual comparison of the subjects' characteristics in the two conditions of the present study also suggests they were broadly similar with respect to age, history of low back pain, compensation insurance, marital status, most previous treatments and current medications used. The main differences between the two samples seemed to be that the treatment condition included more unskilled manual workers (9 versus 3) and more subjects in the control condition had been treated by TNS (10 versus 4). While the significance of these differences is unclear, given the similarities between the samples, the differences may be considered unlikely to influence the results of the study.

Table 47 Pretreatment Subject Characteristics

Demographic Variables	Condition	
	Treatment	Control
N	15	15
Mean Age	42.5(SD9.5,28-58)	43.8(SD9.6,22-57)
Gender: M	7	4
F	8	11
Mean time with low-back pain (years)	4.7(SD6.1,1.3-26.0)	5.5(SD7.0,0.8-29.0)
Covered by compensation insurance	12	10
Currently employed	2	3
Marital status:		
Married/living with other	14	13
Single/living alone	1	2
Usual occupation:		
Unskilled manual	9	3
Skilled manual	1	1
Clerical/office	1	4
Professional/managerial	3	4
Home duties	1	3
English as first language	13	14
Education:		
< 3 years secondary school	12	9
> 3 years secondary school	2	4
Tertiary	1	2
"Positive" medical findings	15	15
<u>Previous Treatment (for back pain)</u>		
Surgery (> 1 operation)	7	5
Nerve blocks	4	1
Physiotherapy	15	15
TENS	4	10
Chiropractic	4	2
Medication	15	15
Psychotherapy/Counselling	0	2
<u>Medication at Pretreatment</u>		
Narcotic analgesics	8	6
Non-narcotic analgesics	9	5
Non-steroidal Anti-Inflammatory drugs (NSAIDS)	4	4
Anti-Depressants	3	0
Sedatives/hypnotics	5	7
No medication	0	3

6.3.2 Analysis of Posttreatment Ratings of Physiotherapists

A One-way ANOVA revealed no significant difference between conditions on the perception of the physiotherapists who conducted the physiotherapy sessions. Both conditions perceived the physiotherapists as helpful, friendly and understanding. The mean score for the treatment condition was 8.75 (SD 1.32, range 6.2–10.0) and the mean score for control condition was 9.16 (SD 0.66, range 8.1–10.0). Thus, any differences in outcome between the conditions is unlikely to be related to the perceived characteristics of the physiotherapists.

6.3.3 Analysis of Expectancies at Start of Programme

A one-way ANOVA on the expectancy scores revealed no significant difference between the two conditions. The mean score for the treatment condition was 6.06 (SD 2.48, range 1.10–9.70) and for the control condition, 7.21 (SD 1.22, range 4.90–8.90).

6.3.4 Analyses of Pretreatment Dependent Variables

One-way ANOVAs were performed on seven dependent variables at pretreatment (APR, BDI, PBQ, CSQ, PSEI, SIP-S and SIP-O). However, no significant differences between the conditions were revealed. Chi-square analysis of the number of subjects using medication did not reveal a significant difference between the conditions on this measure either.

6.3.5 Pretreatment-Posttreatment Changes

The means and standard deviations for the dependent variables at pretreatment and posttreatment are presented in Table 48.

Table 48. Means and Standard Deviations for the
Dependent Variables at Pretreatment and Posttreatment

Measure	Condition	
	Treatment	Control
<u>1. Average Pain Rating</u>		
Pre mean	2.59	2.39
SD	0.62	0.31
Post mean	2.36	2.03
SD	0.75	0.35
n	(12)	(11)
<u>2. Beck Depression Inventory</u>		
Pre mean	20.58	16.18
SD	8.37	7.52
Post mean	13.83	9.91
SD	6.28	6.30
n	(12)	(11)
<u>3. Pain Beliefs Questionnaire</u>		
Pre mean	61.25	55.36
SD	21.93	22.81
Post mean	44.33	29.00
SD	19.47	14.89
n	(12)	(11)
<u>4. Coping Strategies Questionnaire</u>		
Pre mean	34.67	41.64
SD	25.56	23.40
Post mean	62.92	80.18
SD	34.05	24.30
n	(12)	(11)
<u>5. Pain Self-Efficacy Inventory</u>		
Pre mean	22.83	29.00
SD	13.99	10.38
Post mean	35.25	42.73
SD	14.74	9.19
n	(12)	(11)

Measure	Condition	
	Treatment	Control
6. <u>Sickness Impact Profile - Self</u>		
Pre mean	33.19	32.10
SD	10.56	9.93
Post mean	21.73	18.84
SD	10.13	8.16
n	(12)	(11)
7. <u>Sickness Impact Profile - Other</u>		
Pre mean	27.45	28.68
SD	10.61	10.99
Post mean	20.58	21.96
SD	9.72	10.81
n	(12)	(11)
8(a) <u>Medication Types Used</u>		
Pre mean	2.08	1.27
SD	0.76	0.86
Post mean	1.00	0.55
SD	0.82	0.66
n	(12)	(11)
8(b) <u>Number Using Medication</u>		
Pre mean	12	8
Post mean	8	5
n	(12)	(11)

(i) Average Pain Intensity

Although there was a slight reduction in average pain intensity for both conditions, no significant pretreatment-posttreatment differences were revealed by repeated measures analysis of variance (ANOVA), either within subjects or between conditions. Table 49 presents a summary of the repeated measures ANOVA results.

TABLE 49. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment APR Scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (Tmt vs. Cntl)	.812	1	.812	1.541
ERROR	11.063	21	.527	
<u>WITHIN</u>				
B1 (Trials)	1.023	1	1.023	8.116**
A1B1 (Group x Trials.)	.049	1	.049	.387
ERROR	2.646	21	.126	

** $p < 0.01$ (Univariate)

(ii) Affective Distress

Repeated measures ANOVA revealed a significant overall (i.e. within subjects) pretreatment-posttreatment improvement on the Beck Depression Inventory, $F(1,21)=13.32$, $p < 0.01$. However, no significant difference was revealed between the two conditions in the amount of pretreatment-posttreatment change. Table 50 presents a summary of the repeated measures ANOVA results.

TABLE 50. Summary of Repeated Measures ANOVA of Mean Pretreatment-Posttreatment BDI Scores

SOURCE	SS	DF	MS	F
BETWEEN				
A1 (Tmt vs. Cntl)	198.913	1	198.913	2.601
ERROR	1605.913	21	76.472	
WITHIN				
B1 (Trials)	486.654	1	486.654	13.321**
A1B1 (Group x Trials.)	.654	1	.654	.018
ERROR	767.216	21	36.534	

** $p < 0.01$

(iii) Sickness Impact Profiles (Self- and Other-rated)

Repeated measures ANOVA revealed a significant overall (i.e. within subjects) pretreatment-posttreatment improvement on the SIP-S, $F(1,21) = 25.20$, $p < 0.01$. However, no significant difference was revealed between the two conditions in the amount of pretreatment-posttreatment change. Similar results were found for the other-rated SIP, with the repeated measures ANOVA revealing a significant within subjects pretreatment-posttreatment improvement on the SIP-O, $F(1,21) = 31.06$, $p < 0.01$, but no significant pretreatment-posttreatment difference was revealed between the two conditions. Tables 51 and 52 present summaries of the repeated measures ANOVA results for the SIP-S and SIP-O.

TABLE 51 . Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment SIP-S Scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (Tmt vs. Cntl)	45.653	1	45.653	.328
ERROR	2922.294	21	139.157	
<u>WITHIN</u>				
B1 (Trials)	1753.809	1	1753.809	25.197**
A1B1 (Group x Trials.)	9.352	1	9.352	.387
ERROR	1461.687	21	69.604	

** $p < 0.01$

TABLE 52 . Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment SIP-0 Scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (Tmt vs. Cntl)	19.580	1	19.580	.087
ERROR	4739.807	21	225.705	
<u>WITHIN</u>				
B1 (Trials)	529.573	1	529.573	31.056**
A1B1 (Group x Trials.)	.063	1	.063	.004
ERROR	358.102	21	17.052	

** $p < 0.01$

(iv) Dysfunctional Cognitions

Repeated measures ANOVA revealed a significant overall (i.e. within subjects) pretreatment-posttreatment reduction in dysfunctional cognitions for both conditions, $F(1,21) = 25.96$, $p < 0.01$. However, there was no difference in improvement between the

two conditions. Table 52 presents a summary of the repeated measures ANOVA of the PBQ scores.

TABLE 52. Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment PBQ Scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	1292.095	1	1292.095	1.920
ERROR	14132.731	21	672.987	
<u>WITHIN</u>				
B1 (Pre-Post)	5375.225	1	5375.225	25.957**
A1B1 (Group x Trials)	256.095	1	256.095	1.137
ERROR	4348.731	21	10.750	

** $p < 0.01$

(v) Use of Coping Strategies

Repeated measures ANOVA revealed a significant overall (i.e. within subjects) pretreatment-posttreatment increase in the use of coping strategies as measured by the CSQ, $F(1,21) = 22.74$, $p < 0.01$. However, there was no significant pretreatment-posttreatment difference between the two conditions. Table 53 presents a summary of the repeated measures ANOVA of the CSQ scores.

TABLE 53 . Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment CSQ Scores

<u>SOURCE</u>	<u>SS</u>	<u>DF</u>	<u>MS</u>	<u>F</u>
<u>BETWEEN</u>				
A1 (Tmt vs. Cntl)	1685.376	1	1685.376	1.576
ERROR	22452.277	21	1069.156	
<u>WITHIN</u>				
B1 (Trials)	12802.946	1	12802.946	22.743**
A1B1 (Group x Trials.)	304.164	1	304.164	.540
ERROR	11821.489	21	562.928	

** $p < 0.01$

(vi) Pain-Related Self-Efficacy

Repeated measures ANOVA revealed a significant overall (i.e. within subjects) pretreatment-posttreatment improvement in sense of self-efficacy for both conditions, $F(1,21) = 19.27$, $p < 0.01$. However, there was no difference in improvement between the two conditions. Table 54 presents a summary of the repeated measures ANOVA of the PSEI scores.

TABLE 54. Summary of Repeated Measures ANOVA for Mean Pretreatment-Posttreatment PSEI Scores

SOURCE	SS	DF	MS	F
<u>BETWEEN</u>				
A1 (Tmt vs Cntrl)	534.190	1	534.190	2.276
ERROR	4928.549	21	234.693	
<u>WITHIN</u>				
B1 (Pre-Post)	1961.364	1	1961.364	19.269**
A1B1 (Group x Trials)	4.929	1	4.929	.048
ERROR	2137.549	21	101.788	

** $p < 0.01$

(vii) Medication Users

Chi-square analysis of pretreatment and posttreatment reported users of pain-related medication indicated no significant differences between the two conditions on either occasion, although the proportion of reported medication users was reduced at posttreatment in both groups compared to the proportion at pretreatment.

6.4 Discussion

The aim of the present study was to evaluate the contribution of 4 sessions of physiotherapy exercise practice to the results obtained by the combined psychological and physiotherapy treatment programme.

The results of the Bonferroni-adjusted analyses of variance indicated there was an overall improvement for both conditions on measures of functional impairment, pain-related dysfunctional cognitions, use of coping strategies and sense of pain-related

self-efficacy. However, there were no significant pretreatment to posttreatment improvements on the outcome measures for the condition receiving physiotherapy exercise practice relative to the condition not receiving the exercise practice. These results suggest that the 4 sessions of physiotherapy exercises add little to the results obtained by the combined psychological and physiotherapy treatment programme.

These results do not, of course, allow judgements to be made about possible long-term effects of continued practice of these exercises. However, in the absence of continued practice of the exercises, it would seem unlikely that long-term effects would be found.

These results also suggest that a reduction in contact time with the physiotherapists had no effect on treatment outcome. This finding would seem to be corroborated by the analysis of the physiotherapist evaluation scale which indicated no significant difference between the conditions on how friendly, understanding and helpful the subjects found the physiotherapists.

In the two previous studies of this series it was suggested that the psychological treatments may have had an additive effect to that of the physiotherapy treatment. In other words, the combined psychological and physiotherapy treatments were more effective at posttreatment than the physiotherapy treatment alone. In this context the results of the present study suggest that any effect related to the physiotherapy treatment is most likely to be

associated with the information and exercise tuition components, rather than the exercise practice sessions.

Consequently, it was decided to further examine the relative contributions of the psychological and physiotherapy components of the combined treatment package in a small trial (see Appendix Q for a summary). In this trial both the physiotherapy exercise tuition and practice were withdrawn and replaced by additional time, but not content, in psychological treatment for one condition and compared to another condition which received same combined psychological and physiotherapy treatment package employed in the second and third studies. In addition to examining the contribution of physiotherapy exercise tuition and practice to the results obtained by the combined psychological and physiotherapy treatment package, it was also intended that this trial would shed some light on the possible effect of doubling the amount of psychological treatment time relative to that provided in the usual treatment package (i.e. 10 one hour sessions versus 5 one hour sessions). However, despite the small subject numbers in the trial ($N=15$), the results indicated that exercise tuition and practice add little to the treatment effects obtained by the full psychological and physiotherapy treatment package as employed in Studies Two and Three. The results also indicated that additional time in the psychological treatment condition made little difference to the treatment effects.

When the results of Study three and the additional trial are considered together, it would seem that on the measures employed, varying the amount and content of physiotherapy had little effect on

pretreatment to posttreatment changes. It could, of course, be argued that more physical or behavioural measures, such as walking rate, muscle strength, range of motion and low back control, as employed by Heinrich et al. (1985), could have revealed differences between the conditions when the physiotherapy components were varied. While this is clearly possible, it could also be argued that if such changes (in physical or behavioural functions) were meaningful to the subjects concerned then they might be expected to have been reflected in the more psychological measures that were employed. In sum, these results indicate that the results obtained by the combined psychological and physiotherapy treatments in Studies One and Two are not due to the exercise tuition or practice given in the physiotherapy sessions.

Before reviewing the present series of studies, the relationships between the dependent measures employed will be examined and compared with the findings reported for similar measures in previous studies. Thus, the next chapter will examine the relationships obtained in the present studies between the measures of pain, functional impairment, affective distress, cognitions and use of coping strategies.

CHAPTER 7

RELATIONSHIPS BETWEEN DEPENDENT MEASURES

7.1 Introduction

The conceptual model underlying the employment of cognitive-behavioural treatments for chronic pain posits relationships between reported pain intensity, level of functional impairment, dysfunctional cognitions, affective distress and the use of different coping strategies.

In particular, those chronic pain patients who employ adaptive coping strategies are thought to adjust well to persistent pain and lead more active and satisfying lives than those who employ maladaptive coping strategies (Brown & Nicassio, 1987; Keefe et al., 1987; Turk et al., 1983; Turner & Clancy, 1986). Evidence in support of this model has come from both correlational and treatment research. For example, after administering the Coping Strategies Questionnaire (CSQ) to 61 chronic low back pain patients, Rosenstiel and Keefe (1983) reported that while regression analysis revealed no particular coping strategy was related to better adjustment, some strategies, particularly the tendency to catastrophize and to use prayer and hope, were related to poorer adjustment, though not to pain intensity ratings. More recently, in a treatment outcome study with 74 chronic low back pain patients, Turner and Clancy (1986) reported significant changes in types of pain coping strategies on the CSQ following treatment. In particular, they found the increased use of praying and coping strategies and the decreased use of

catastrophizing were significantly related to decreases in reported pain intensity. Decreased catastrophizing was also related to reductions in physical and psychosocial impairment, as measured by the Sickness Impact Profile (SIP).

In another recent cognitive-behavioural treatment study with a heterogeneous group of 40 chronic pain patients, Philips (1987) found a significant association at pretreatment between depression severity (as measured by the BDI) and a self-report measure of the impact of pain on the patient's life. Both measures were also significantly related to levels of pain complaint behaviour. Philips (1987) also reported that the level of avoidance behaviour (as measured by the Pain Behaviour Checklist) was negatively associated with a measure of perceived control over pain or self-efficacy. At posttreatment Philips (1987) reported that for the treatment group (N=25), the number of significant correlations between the dependent measures had increased. In particular, she noted that not only was there a large increase in self-efficacy ratings, but also a corresponding reduction in the patients' estimates of the size of their pain problems. Philips (1987) concluded that her results suggested "the possibility that an important effect of treatment is the development of a sense of control over pain" (p. 375).

A number of other treatment studies have reported similar effects on pain intensity, affective distress, dysfunctional cognitions and daily functioning when the use of adaptive coping strategies, increases in activity level, reduction in medication intake and relaxation training have been the foci of treatment (e.g.

Turner, 1982; Kerns et al., 1985). Of course, because of the number of components in such treatment programmes such findings do not, of themselves, establish a causal connection between the use of certain coping strategies and the changes observed, although the findings are consistent with such a relationship.

Recently, Brown and Nicassio (1987) described two categories of coping strategies which were differentially related to various criterion measures. They defined active coping strategies as ones which involve "an effort on the part of the patient to function in spite of the pain, or to distract himself from the pain" (p. 58) and passive coping strategies as ones which involve "depending on others for help in pain control (e.g. calling health care providers, engaging in wish-fulfilling thoughts, and restricting one's functioning due to pain)" (p. 58). Using a sample of 361 rheumatoid arthritis patients and a questionnaire which measured active and passive coping strategies, as they had defined them, Brown and Nicassio (1987) reported that active coping strategies were associated with patient reports of less pain, less depression, less functional impairment and higher sense of general self-efficacy while the associations with passive coping strategies were in the reverse direction.

Other studies have also reported significant correlations between reports of pain, pain behaviours, level of functional impairment, and depression severity. Keefe et al. (1986), for example, reported that after controlling for demographic and medical status variables in a regression analysis with 207 low back pain

patients, depression severity (as measured by the BDI) was a significant predictor of pain severity and observed pain behaviours (e.g. guarding, grimacing, bracing, and sighing).

In sum, there is a considerable amount of evidence that reports of pain, various behaviours and cognitions, affective distress and the use of coping strategies are related. Although the correlational findings, by themselves, do not provide evidence for the direction of causation in these relationships, the findings from the treatment studies are consistent with the view that the use of some types of coping strategies and the non-use of other types contribute to the maintenance of a reasonably active and satisfying life despite persistent pain. However, there appears to have been less unanimity in the research findings on the question of which coping strategies have been relevant to the successful adjustment to chronic pain. Rosenstiel and Keefe (1983), for example, found that factors containing catastrophizing, prayer and hoping were associated with poorer adjustment to pain but not to pain intensity. In contrast, in their treatment study, Turner and Clancy (1986) found that both increased use of prayer and hoping and decreased use of catastrophizing were associated with decreases in pain intensity and also that decreased use of catastrophizing was related to decreases in physical and psychosocial impairment. Brown and Nicassio (1987), on the other hand, would have classified prayer and hoping as passive coping strategies which they found were related to poorer adjustment and functioning.

It would seem, therefore, that it would be important to replicate the findings of these earlier studies on a chronic pain sample in another setting, in fact in another country. This section will examine the correlations obtained between the pretreatment dependent measures employed in the four studies of the present series. The scores on the dependent measures of 123 subjects who met the entry criteria and began the treatment programme, but not necessarily completed it, will be subjected to Pearson product-moment correlations. The scores on the pretreatment dependent measures for the 70 subjects in Studies Two and Three and the experiment reported in Appendix Q will then be subjected to a principal components analysis. Finally, the pretreatment Coping Strategy Questionnaire (CSQ) scores of 123 subjects will be subjected to a principal components analysis.

7.2 Pretreatment Correlations

Table 55 presents a summary of the significant intercorrelations of measures of pain, affective distress, cognitions, functional impairment and use of coping strategies for the total sample of 123 subjects. Because of the large number of intercorrelations strict significance criteria were imposed. Thus, only intercorrelations of $r > 0.40$ and $p < 0.001$ were considered significant. Table 56 presents a summary of the significant intercorrelations of the self-efficacy measure (PSEI) designed during the present series of studies. As this measure was not developed until the end of the first study, the intercorrelations will only apply to the subjects in Studies Two and Three and the trial in Appendix Q (i.e. $N=70$).

**Table 55. Significant Intercorrelations of Pretreatment
Dependent Variables for 123 subjects
(insignificant r's not reported)**

	Sens	Aff	Eval	APR	MSPQ	STAI	BDI	PBQ	SIPS	SIPO
MPQ ¹										
Sensory(Sens)	x									
Affective(Aff)		x								
Evaluative(Eval)			x							
Ave.Pain (APR)				x						
MSPQ					x					
STAI-S		.46				x				
BDI		.42			.51	.54	x			
PBQ						.43	.65	x		
CSQ (Total)					-.43	-.48	-.46	-.41		
Divert Attention										
Reinterpret										
Catastrophize		.48			.51	.67	.72			
Ignore										
Pray/Hope										
Cop. statements										
Increase Behaviour										
Control pain						-.49	-.50			
Decrease pain										
SIP-Self (SIPS)		.48			.54	.56	.70	.61	x	
SIP-Other (SIPO)		.42			.42	.40	.57	.51	.73	x

Examination of Table 55 reveals a significant correlation between the Sensory and Affective descriptor scores on the McGill Pain Questionnaire (MPQ)(see footnote 1), $r=0.55$, and significant correlations between the Affective score and affective disturbance (STAI, $r=0.46$; BDI, $r=0.42$), tendency to catastrophize ($r=0.48$) and functional impairment (SIP-S, $r=0.48$; SIP-O, $r=0.42$). These findings are generally consistent with those of Turk et al.(1985) which indicated that the Sensory, Affective and Evaluative dimensions were highly intercorrelated. However, the MPQ descriptor scores were not significantly related to any of the other dependent measures, and in particular, they were not significantly related to the Average Pain Intensity scores. In fact, the Average Pain Intensity scores were

¹ The McGill Pain Questionnaire (MPQ) and Modified Somatic Perception Questionnaire (MSPQ) were not used as dependent measures, but only for correlational purposes. For a description see Appendix T.

not significantly related to any of the other dependent measures, which suggests that average pain intensity has little bearing on affective distress, dysfunctional cognitions or functional impairment, and vice versa.

The measure of somatic focussing, the MSPQ, was significantly related to the depression severity (BDI, $r=0.51$) which is consistent with the findings of Main (1983). The MSPQ was also significantly related to functional impairment (SIP-S, $r=0.54$; SIP-O, $r=0.42$). However, the MSPQ was not significantly related subjectively experienced anxiety (STAI), which is also consistent with Main's (1983) distinction between somatic awareness and anxiety. These findings suggest that degree of somatic preoccupation, rather than average pain intensity, is related to affective distress and functional impairment.

The STAI was, however, significantly related to depression severity (BDI, $r=0.54$), dysfunctional cognitions (PBQ, $r=0.43$), the tendency to catastrophize ($r=0.51$), and functional impairment (SIP-S, $r=0.56$; SIP-O, $r=0.40$). The STAI was also inversely related to the total Coping Strategies Questionnaire score ($r= -0.43$). These findings would seem to suggest that level of anxiety is associated with adjustment in chronic low back pain patients.

Depression severity (BDI) was also significantly related dysfunctional cognitions (PBQ, $r=0.65$), the tendency to catastrophize ($r=0.67$), and functional impairment (SIP-S, $r=0.70$; SIP-O, $r=0.57$). The BDI was inversely related to the CSQ total ($r= -0.48$) and ability to control pain ($r= -0.49$). Together with the findings for the STAI,

these findings would seem to confirm that level of affective distress is associated with adjustment in chronic low back pain patients.

The measure of dysfunctional cognitions (PBQ) was also significantly correlated with the tendency to catastrophize ($r=0.72$) and the level of functional impairment (SIP-S, $r=0.61$; SIP-O, $r=0.51$). As was the case for the BDI, the PBQ was also inversely related to the CSQ total ($r=-0.46$) and ability to control pain ($r=-0.50$). These findings would tend to provide support for the construct validity of the PBQ and they are consistent with the view expressed by Follick et al. (1983) that dysfunctional cognitions may be associated with behavioural dysfunction.

Interestingly, the self-rated SIP was significantly related to the other-rated SIP ($r=0.73$), indicating a strong association between what the subjects said about their current level of functional impairment and what their significant-others observed to be the case. While this is somewhat inconsistent with earlier findings of discrepancies between the two sources of information, inspection of the actual ratings presented previously reveals that, in general, the subjects rate themselves as more impaired than do their significant-others, which is consistent with Turner's (1982) findings.

Table 56. Significant Intercorrelations of Pretreatment
PSEI Scores and all Dependent Variables for 70 subjects

	PSEI
MPQ	
Sensory	
Affective	
Evaluative	
Average Pain	
MSPQ	
STAI-S	-0.49
BDI	-0.57
PBQ	-0.74
CSQ (Total)	0.49
Divert Attention	
Reinterpret	
Catastrophize	-0.54
Ignore	0.49
Pray/Hope	
Cop. statements	0.42
Increase Behaviour	0.47
Control pain	0.51
Decrease pain	
SIP-Self	-0.60
SIP-Other	-0.50
Medications - used	-0.42

Examination of Table 56 reveals significant positive relationships between the self-efficacy measure (PSEI) and the CSQ total ($r=0.49$), the tendency to ignore pain ($r=0.49$), to use coping self-statements ($r=0.42$) and to increase behaviour as a method of coping ($r=0.47$). There was also a significant positive relationship with ability to control pain ($r=0.51$). However, there were inverse relationship between the PSEI and the STAI ($r=-0.49$), the BDI ($r=-0.57$), the PBQ ($r=-0.74$), the tendency to catastrophize ($r=-0.54$), the two SIPs (SIP-S = -0.60 ; SIP-O, $r=-0.50$) and use of pain-related medications ($r=-0.42$). The latter variable was only included in the analysis with the N=70 sample and thus does not appear in the

analysis with N=123 sample. These findings would, therefore, tend to support the construct validity of the PSEI, and indicate that sense of self-efficacy has a bearing on levels of affective distress, functional impairment and approaches taken by chronic low back pain patients to deal with their problems, and vice versa. The findings are also consistent with those reported by Philips (1987) in relation to self-efficacy, although she measured self-efficacy by means of a visual analogue scale on which her subjects rated the amount of control they felt they had over pain.

In sum, these results suggest generally strong positive relationships between the measures of affective distress, dysfunctional cognitions and functional impairment. In contrast, the results also suggest strong negative relationships between these measures of dysfunction and the use of active coping strategies and sense of self-efficacy, which, in turn, are positively related to each other. Interestingly, however, none of these measures were significantly related to the measures of pain, apart from the affective pain descriptor component of the McGill Pain Questionnaire (MPQ) which was significantly related to measures of depression, anxiety, tendency to catastrophize and functional impairment.

7.3 Principal Components Analysis of Pretreatment

Dependent Variables

To determine how the pretreatment dependent variables in Studies Two and Three and the trial in Appendix Q (N= 70) were related to each other a principal components analysis was performed using varimax rotation with Kaiser normalization. Only those factors having

eigen values of 1 or more were considered and variables were only included in a factor if (i) they had a factor loading of 0.50 or more and (ii) their highest loading was on that factor. It can be seen in Table 57 that this procedure revealed four factors which accounted for 65.5% of the variance in scores.

Table 57. Principal Component Analysis of Dependent Variables at Pretreatment (N=70). (Varimax Rotation)

FACTOR	COMPONENT MEASURES	FACTOR LOADINGS			
		1	2	3	4
1. <u>General Dysfunction</u>					
STAI	0.76	-0.14	-0.10	0.02	
MSPQ	0.61	0.13	-0.15	0.15	
BDI	0.86	-0.15	0.03	0.03	
PBQ	0.76	-0.17	-0.15	0.18	
Catastrophize	0.83	0.02	0.05	0.10	
SIP-S	0.88	-0.15	-0.05	0.08	
SIP-O	0.72	-0.05	-0.14	0.11	
Control Pain	-0.53	0.36	0.17	-0.25	
PSEI	-0.63	0.34	0.25	-0.35	
2. <u>Active Coping</u>					
CSQ (Total)	-0.42	0.81	-0.04	-0.09	
Divert attention	0.25	0.76	0.16	0.19	
Reinterpret	-0.07	0.83	-0.15	-0.06	
Ignore	-0.26	0.71	-0.17	-0.33	
Coping Self-Statements	-0.06	0.79	0.28	-0.03	
Increase Behaviour	-0.27	0.59	0.41	0.07	
3. <u>Passive Coping</u>					
Pray/Hope	0.51	0.19	0.61	0.11	
Decrease Pain	-0.19	0.01	0.59	-0.25	
Expectations	-0.28	0.00	0.74	0.06	
4. <u>Painfulness</u>					
Medications - Used	0.16	-0.26	0.03	0.81	
Average Pain Ratings	0.25	0.39	-0.16	0.61	

Factor 1, which accounted for 34.8% of the variance, might be described as General Dysfunction because it loads highest on measures of affective distress, dysfunctional cognitions and functional impairment. Conversely, measures of self-efficacy in relation to pain (i.e. control over pain and PSEI) loaded highest on this factor in a negative direction.

Factor 2, which accounted for 16.9% of the variance, might be described as Active Coping because it loads highest on the strategies in the Coping Strategies Questionnaire which involve the subject actually doing something active to cope with his/her pain and hence could be considered similar to the active coping pain construct of Brown and Nicassio (1987). Interestingly, the inclusion of the CSQ total in this factor, along with the strategies already mentioned, could be considered to confirm the scoring method employed throughout the four studies for the CSQ. In this scoring method diverting attention, reinterpreting pain, ignoring pain, coping self-statements, and increasing behaviour were designated as active coping strategies, while praying/hoping and catastrophizing were designated as passive or non-adaptive coping strategies. The scores of the passive coping strategies were subtracted from those of the active strategies to produce a total CSQ score.

Factor 3, which accounted for 8.1% of the variance, might be described as Passive Coping because it loads highest on the use of prayer and hope, expectations of improvement and ratings of ability to decrease pain. This factor could be considered similar to the passive coping construct of Brown and Nicassio (1987).

Factor 4, which accounted for 5.6% of the variance, might be described as Painfulness because it loads highest on Average Pain Ratings and use of pain-related medication.

7.4 Principal Components Analysis of Pretreatment

CSQ Scores

To determine how the strategies making up the CSQ were related to each other and to the ratings of the ability to control and to decrease pain the pretreatment CSQ strategy scores for all 123 subjects were subjected to a principal components analysis using oblique rotation and Kaiser normalization. As was the case in the previous section, only those factors which had eigen values of 1 or more were considered. Similarly, the strategies comprising the factors were only included if (i) they correlated >0.50 with the factor and (ii) they had their highest loadings on that factor. As can be seen in Table 57, unlike the previous findings of Rosenstiel and Keefe (1983) and Turner and Clancy (1986) the present analysis produced two only factors which accounted for 57.3% of the variance.

TABLE 57. Principal Component Analysis of CSQ Scores at Pretreatment (N= 123).

FACTOR	COMPONENT MEASURES	FACTOR LOADINGS	
		1	2
1.	<u>Active Coping</u>		
	Divert Attention	0.80	0.26
	Reinterpret	0.80	0.04
	Ignore	0.73	-0.21
	Coping Self Statements	0.79	-0.14
	Increase Behaviour	0.71	-0.12
2.	<u>Passive coping/Helplessness</u>		
	Catastrophize	0.09	0.84
	Pray/Hope	0.50	0.65
	Control Pain	0.28	-0.69

Factor 1, which accounted for 36.9% of the variance, was essentially identical to Factor 2 in the previous section, apart from CSQ total which was not included in the present analysis. Thus, as in the previous section this factor could be labelled Active Coping as it loaded highest on strategies which involved the subject doing something himself/herself to deal with the pain.

Factor 2, which accounted for 20.5% of the variance, could be labelled Passive Coping or Helplessness because it was similar to the factor of that name reported by Rosenstiel and Keefe (1983) and also Turner and Clancy (1986). This factor loaded highest on a tendency to catastrophize, to use prayer and to feel unable to control pain.

7.5 Discussion

The results obtained from the analyses of the pretreatment data in the present series of studies are generally consistent with the findings of previous studies referred to earlier (e.g. Rosenstiel & Keefe, 1983; Turner & Clancy, 1986; Philips, 1987a; Brown & Nicassio, 1987). This is of particular interest when it is considered that these results were obtained with a chronic low back pain patient sample from a country outside North America, albeit another English speaking country, and thus is supportive of the generality of many of the North American findings. It should, of course, be remembered that the generality of the findings from any correlational study such as this is limited not just by the type of pain complaint of the sample but also by the manner in which the sample was selected. In the present studies only chronic low back pain patients who were seeking help for their ongoing problems with chronic pain were included in the sample. Those people with chronic low back pain but not seeking help for it may well be different to the present sample (e.g. Murphy & Fischer, 1983). Thus, caution is required in generalizing from the present findings.

To the degree that significant relationships were observed between measures of functional impairment, dysfunctional cognitions, affective distress, self-efficacy and use of coping strategies the central tenets of the cognitive-behavioural approach to chronic pain were generally supported by the present findings. However, apart from the affective pain descriptors' score of the McGill Pain Questionnaire (MPQ), no significant associations were observed

between any of the pain measures and the other variables mentioned above. While this is somewhat inconsistent with some previous findings, such as those of Rosenstiel and Keefe (1983) and Turner and Clancy (1986), which showed significant relationships between some coping strategies and pain severity, it is consistent with Philips' (1987) pretreatment findings. The lack of a relationship between average pain severity and functional impairment is also consistent the operant view of a variable relationship between experience of pain and general dysfunction (e.g. Fordyce et al., 1985).

The associations between the affective descriptors on the MPQ and the measures of affective distress, dysfunctional cognitions and functional impairment are supportive of the construct validity of the affective subscale of the MPQ and are also consistent with the findings of Leavitt and Garron (1979) who reported that affective pain descriptors were associated with psychological disturbance in chronic pain patients. However, the significant association found between affective and sensory descriptors ($r=0.55$) is also supportive of Turk et al's. (1985) findings of poor discriminative validity for the MPQ's subscales, although the low association between the MPQ's pain descriptor subscales and the Average Pain Rating in the present study did not support their contention that the MPQ was only reflecting pain intensity.

The finding that the CSQ active coping strategies could be discriminated from the CSQ passive coping strategies in the principal components analyses of both the total data set and the CSQ strategy scores provides support for Brown and Nicassio's (1987) similar

division of pain coping strategies and confirms the method of scoring the CSQ adopted in the present series of studies. In addition, the finding that the active coping strategies formed a separate factor from amongst the outcome measures and accounted for a substantial proportion of the variance in scores suggests that the CSQ describes a dimension that is relevant to the understanding of chronic low back pain.

Although the factor structure derived for the CSQ in the present series of studies was not identical to those of Rosenstiel and Keefe (1983) and Turner and Clancy (1986), the two factors in the present series accounted for a similar amount of the variance as the first two factors of the earlier studies. The factor loadings were most similar to those found in these earlier studies on the helplessness factor in which the tendency to catastrophize and to feel unable to control pain were dominant features. The association between these two subscales and other measures of dysfunction, particularly affective distress, functional impairment and affective descriptors of pain was strongly consistent with the earlier studies. Furthermore, while the total CSQ score, which reflected the sum of the scores of the first factor less the catastrophizing and praying strategy scores, was inversely associated with the measures of affective distress, dysfunctional cognitions, and functional impairment, the only individual coping strategy to be significantly associated with the other dependent variables was the tendency to catastrophize. These findings are also strongly supportive of those reported by Rosenstiel and Keefe (1983) and Turner and Clancy (1986)

which emphasized the importance of refraining from catastrophizing in coping successfully with chronic pain.

It could also be argued that this finding is further corroborated by the self-efficacy measure (PSEI) which was found to be inversely associated with catastrophizing, affective distress, cognitive dysfunction, functional impairment and medication use, but positively associated with the total CSQ score, the use of ignoring, coping self-statements, and increase behaviour strategies as well as sense of control over pain. This finding is consistent with the view expressed most recently by Philips (1987a) that dysfunctional cognitions, such as catastrophizing, which may be reflected in self-efficacy ratings, play a central role in influencing the impact of chronic pain on a patient's life.

However, whether cognitive coping strategies need to be made specific targets for intervention is unclear. For example, the cognitive treatment condition in the first study of the present series improved no more by posttreatment than the behavioural condition on the CSQ, while Turner and Clancy (1986) found that catastrophizing was decreased by both operant and cognitive treatments.

In conclusion, examination of the relationship between the measures of pain, functional impairment, affective distress, dysfunctional cognitions, self-efficacy and the use of coping strategies obtained from the present series of studies indicates broadly similar findings to those obtained with North American chronic pain samples. The findings generally corroborate a number of

the tenets of both the behavioural and cognitive-behavioural models of chronic pain. However, unlike some previous studies, no relationship was found between pain intensity measures and the cognitive, affective and behavioural variables measured. Some of these matters will be further discussed in the next chapter which will review the present series of studies in relation to the current pain literature.

CHAPTER 8

DISCUSSION

In this chapter the main findings of the present studies will be reviewed and then discussed in the context of the existing literature. In addition to the main findings, several broad themes will be covered, including the issues of differential treatment effects, maintenance of treatment effects and methodological problems.

8.1 Main Findings

The present series of studies attempted to evaluate the relative efficacy of cognitive, behavioural and relaxation methods, in the outpatient treatment of patients presenting with chronic low back pain as their main complaint. It was pointed out in the introduction that much of the evidence for the efficacy of cognitive, behavioural and relaxation methods in the treatment of chronic low back pain was based on either uncontrolled studies or comparisons with waiting list control groups rather than alternative treatment groups, especially non-psychological treatment groups. Consequently, the efficacy of cognitive, behavioural and relaxation treatments relative to each other, or relative to non-psychological forms of treatment, had not been fully established, particularly over long posttreatment follow-ups.

In Study One of this series the results of the Bonferroni-adjusted repeated measures analyses of variance indicated that the cognitive and behavioural treatments, together with

physiotherapy, were more effective at posttreatment than physiotherapy alone on measures of pain intensity, functional impairment and dysfunctional cognitions. However, apart from reduced dysfunctional cognitions, long-term maintenance of these differential effects was generally weak. Few pretreatment to posttreatment differences were revealed between the cognitive and behavioural treatments, although the behavioural treatment was more effective in reducing functional impairment as measured by the self-reported Sickness Impact Profile. Once again, this differential effect was not maintained at the follow-ups. No significant effect was revealed for relaxation training as part of either the cognitive or behavioural treatments. In Study Two, Bonferroni-adjusted analyses of variance indicated that the combined cognitive, behavioural and relaxation treatments, together with physiotherapy, were more effective than physiotherapy alone on measures of functional impairment, self-efficacy and use of coping strategies. There was also a significant reduction in use of pain-related medication for the combined cognitive-behavioural treatment condition relative to the physiotherapy-only condition. However, at the 6 month follow-up, apart from reported use of active coping strategies, the differential treatment effects for the combined cognitive-behavioural and physiotherapy treatment condition were not maintained. In the main, this was due to some improvements in the physiotherapy-only condition in the follow-up period. The treatment gains made by the combined cognitive-behavioural condition were generally maintained, although there were few continued improvements.

Considered together these results indicate that:

- (i) In the short-term, cognitive, behavioural and relaxation treatment methods, together with physiotherapy are more effective than physiotherapy alone.
- (ii) In the short-term, cognitive and behavioural treatments are more effective when combined in one treatment package with physiotherapy than when used singly with physiotherapy.
- (iii) In the short-term, the behavioural treatment is slightly more effective than the cognitive treatment on the more behaviourally-oriented dependent measures.
- (iv) There are no differential effects between the behavioural and cognitive treatments on the more cognitive dependent measures.
- (v) The relaxation technique, as employed in these studies, makes little contribution to the efficacy of either cognitive or behavioural treatments.
- (vi) Long-term maintenance of the differential treatment gains, relative to the physiotherapy treatment, is generally weak, whether or not the cognitive and behavioural treatments are combined. This was due mainly to improvements in the physiotherapy treatment condition in the follow-up period, together with limited further gains by the psychological treatment conditions.

In order to further examine the relative contributions of the cognitive-behavioural treatment and the physiotherapy treatment to the results achieved in the first two studies a third study evaluated the effect of removing the exercise-practice component from the physiotherapy treatment. Bonferroni-adjusted results indicated no significant pretreatment to posttreatment differences between the two treatment conditions, although significant within subject improvements were obtained on a number of dependent measures. A small, fourth experiment found that removing both the exercise-practice and the exercise-tuition from the physiotherapy treatment and replacing them with additional cognitive-behavioural treatment sessions had no effect on the outcome measures.

In the light of the results from the first two studies these results indicate that:

- (i) Relative to the cognitive-behavioural treatments, the physiotherapy exercise programme made little contribution to the pretreatment to posttreatment effects obtained with the combined cognitive-behavioural-physiotherapy treatment programme.
- (ii) The pretreatment to posttreatment effects of the cognitive-behavioural treatment were not related to the relative shortness of the treatment programme compared to some previous treatment studies.

In sum, these results indicate that long-standing cognitive and behavioural dysfunction associated with chronic pain can be altered

by a cognitive-behavioural treatment in an outpatient setting, and that these effects are unlikely to be related to simply attending an active treatment programme. As such, these results provide further support for the efficacy of cognitive-behavioural treatments for chronic low back pain syndromes. The significance of these results is underscored when it is considered that the treatment was outpatient based (and thus may have cost-efficiency benefits relative to inpatient treatments), it involved a comparison with a commonly-used non-psychological form of treatment (as opposed to a non-treatment condition), and it employed stricter criteria for statistical significance in evaluating the ANOVA results than many previous studies in this area.

However, while many of the pretreatment to posttreatment results of the combined cognitive-behavioural and relaxation treatments are consistent with a number of previous findings (e.g. Heinrich et al., 1985; Kerns et al., 1985; Moore & Chaney, 1985; Philips, 1987a; and Turner, 1982), examination of the relative contributions of the cognitive, behavioural and relaxation techniques in the first study suggests a more complicated picture.

8.2 Behavioural Versus Cognitive Treatments

The finding that the behavioural treatment was superior to the cognitive treatment on the more behaviourally-oriented measures (i.e. the self-rated SIP and, to a lesser extent, medication use) appears to conflict with the findings reported by Kerns et al. (1985) which showed a substantial superiority for a cognitive-behavioural treatment over a behavioural treatment on a range of standardized

measures. However, the present results are consistent with the Kerns et al. (1985) finding of an improvement for their behavioural treatment on reported progress towards individualized behavioural goals. The present findings are also consistent with the findings of the only other primarily behavioural or operant outpatient treatment studies which were reported by Linton and Gotestam (1984) and Linton et al. (1985). In sum, the results suggest that the behavioural treatment employed in this first study is effective in producing changes in reported clinically-relevant behaviours.

In comparison to the cognitive treatment, these results would also suggest that, while somewhat limited, greater behavioural changes result from treatment focussing on behavioural changes than from treatment focussing on cognitive changes. This finding would appear to conflict with the findings reported by Rybstein-Blinchik (1979) which showed an improvement on an observer rating of pain behaviour following training in cognitive coping strategies similar to the ones included in the cognitive condition in the present studies. However, it should be noted that in Rybstein-Blinchik's study only pain behaviours in the inpatient setting were assessed. Whereas, in the present studies the behaviours assessed were related to daily functioning in the home environment.

It is of further interest to note that the cognitive treatment in the present series did not prove correspondingly more effective than the behavioural treatment on the more cognitive dependent measures (i.e. the PBQ and CSQ). These results suggest that cognitive treatment is not necessary to achieve changes in

dysfunctional cognitions or cognitive coping strategies. In other words, the cognitive changes can also occur as a result of behavioural treatment. That cognitive changes occurred following treatment is reflected in the significant pretreatment to posttreatment reduction in dysfunctional cognitions for the summed treatment groups relative to the physiotherapy groups. However, there were also no differences between the cognitive and behavioural treatments in the amount of change on the measure of pain intensity, suggesting that neither treatment is differentially effective on experienced pain.

To some extent, therefore, the results of this analysis support the behavioural approach to the treatment of chronic pain described by Fordyce et al. (1985); namely, that by consistently reinforcing occurrences of well behaviours and not reinforcing occurrences of pain behaviours, functional disability associated with chronic pain can be reduced (as measured by the SIP). At the same time, the results cast some doubt on the relative utility of the cognitive approach to the treatment of chronic pain, or at least the cognitive methods employed in this study. However, that is not to say that cognitive variables, such as dysfunctional thoughts and cognitive coping strategies, do not play a role in chronic pain modulation and maintenance. But it does suggest that such variables may not need to be directly targeted in treatment for behavioural changes to occur.

When these results are compared directly with those reported by Kerns et al. (1985), it could be concluded that while a behavioural treatment is more effective at posttreatment on behavioural measures

than a cognitive treatment, a combined cognitive-behavioural treatment is more effective than either alone. Evidence in support of this proposition may be seen in the second study which resulted in larger and more consistent effects at posttreatment than were obtained in the first study.

8.3 Relaxation Training

The results from the first study would suggest that the relaxation training added little to either the cognitive or behavioural treatments. This finding would seem to be inconsistent with those reported by Turner (1982), Sanders (1983), and Linton and Gotestam (1984), which indicated that relaxation had significant effects on pain intensity reports as well as some activity and mood measures. However, it was noted earlier that these results were not consistent across studies (e.g. Kerns et al., 1985) and may be related to differences in technique employed, practice frequencies, and degree of disability of the sample treated. For example, while Turner (1982) used the same progressive muscular relaxation technique employed in the present series, Linton and Gotestam (1984) used what they called applied relaxation which involved the use of cognitions and appeared to place more emphasis on relaxation as an active coping skill.

It may be considered somewhat surprising that Turner's (1982) relaxation condition demonstrated both behavioural, and pain intensity improvement at posttreatment, while Linton and Gotestam's (1984) relaxation condition demonstrated effects mainly on pain intensity. One possible explanation of Turner's findings, relative

to the findings of the first study in the present series, is that her results reflected the effect of participation in an active treatment programme for a slightly less functionally-impaired patient sample than those in the first study. This possibility would be supported by her finding that the treatment effects were not as well maintained at 1-month follow-up for her relaxation group compared to her cognitive-behavioural-relaxation group, despite the fact that both groups reported practising relaxation equally often. Thus, it could be argued that the cognitive-behavioural-relaxation group was performing better at 1-month follow-up because of the cognitive-behavioural treatment rather than the relaxation. In the first study of this series, participation in an active treatment was controlled for and relaxation was found to have little effect.

Another possible explanation for the relative ineffectiveness of relaxation in the first study could be related to the method of training and frequency of practice. In the present study patients did not practise relaxation during the treatment sessions, but were given a tape to use at home and progress and any problems with it were discussed at subsequent sessions. Turner (1982), Linton and Gotestam (1984) and Kerns et al. (1985), in contrast, trained their patients in the relaxation techniques during the sessions. Home practice was encouraged in all four studies and recommended practice frequencies were about the same, although Linton and Gotestam later recommended use of a brief technique more frequently. Given these similarities, it would seem unlikely that differences in effectiveness in relaxation training across studies would be related to the training methods and practice frequencies. Linton and

Gotestam's (1984) finding with a different relaxation technique would, perhaps, suggest that the technique employed may be a more significant factor.

To conclude, the present results, in contrast to some previous findings appear to suggest that relaxation training adds little to either cognitive or behavioural treatments for chronic low back pain. As the few controlled studies which have assessed the effects of relaxation training in the treatment of chronic low back pain have found such varying results, it would seem premature to attempt an examination of possible mechanisms by which relaxation might operate with this pain population. It was noted earlier, for example, that the varying results of many EMG studies with this population would tend to suggest that muscle relaxation of itself is insufficient an explanation for any pain reducing effects. Despite the impressive results obtained by various relaxation techniques with headaches and acute pain conditions (e.g. Blanchard & Andrasik, 1982), the utility of relaxation training for chronic low back pain remains to be fully established. Certainly, it does not appear to offer any advantages over cognitive or behavioural treatments alone, and the present results suggest it has only a slight additive effect to behavioural treatment.

8.4 Physiotherapy Treatment

It was noted earlier that the findings concerning the utility of the physiotherapy intervention in the present studies conflict with those reported by Heinrich et al. (1985). It was suggested that the discrepancy might be accounted for by differences in treatment

content and severity of disability between the present studies and that of Heinrich et al. (1985). While the present studies do not allow judgements to be made concerning the utility of the physiotherapy treatment in increasing the strength of back support muscles or other physical functions, the results do indicate that, relative to a cognitive-behavioural treatment, attending an educational form of physiotherapy treatment with a group of similarly disabled people does not result in significant pretreatment to posttreatment improvements on measures of pain intensity, functional impairment, dysfunctional cognitions and mood.

It is possible that an additive effect could occur between the physiotherapy and the psychological treatments. For example, it is conceivable that the cognitive treatment could help the patients to alter cognitions which interfere with the performance of physical exercises or appropriate back care. Follick et al. (1983), for example, citing a case study, argued that covert pain behaviours, such as self-evaluative statements concerning physical limitations and fear of injury, could inhibit the generalization of well behaviours, at least in some cases. The results of the present group findings with cognitive treatment alone, however, do not support this contention. Of course, such findings do not rule out the possibility that such an effect has relevance in individual cases or when cognitive treatment is combined with behavioural treatment.

An additive effect between the behavioural and physiotherapy interventions is also possible, particularly considering the reinforcement for practising the physiotherapy exercises, the pacing

of daily activities and the gradual increase in daily activities included in the behavioural treatment. Cairns and Pasino (1977), for example, reported significant improvements in physiotherapy exercises following verbal reinforcement, with and without graphic feedback, whereas graphic feedback and no feedback had no appreciable effects. A comparison of exercise practice frequency between conditions was not made at posttreatment in this study due to irregularities in the recordings made by the non-behavioural conditions who were not reinforced for practising the exercises, and thus, probably did not pay as much attention to recording their exercise practice accurately. However, reports of continued exercise practice at the follow-ups did not appear to differ appreciably between conditions. Nevertheless, the improvement of the behavioural condition on the self-rated SIP at posttreatment, relative to the cognitive condition, may be seen as consistent with an additive effect between the behavioural and physiotherapy treatments.

Given the probable superiority of the combined cognitive-behavioural treatments over either treatment alone, it is also possible that a greater additive effect occurred in the second study when the cognitive-behavioural treatment was combined with the physiotherapy treatment. However, the results of the third study and the small trial reported in Appendix Q suggest that this possibility requires qualification.

In the case of the third study the results indicate that actually practising physiotherapy exercises under supervision is unnecessary and that simply demonstrating exercises to the patients

is sufficient. The trial comparing cognitive-behavioural treatment plus physiotherapy without exercises with the full cognitive-behavioural-physiotherapy combination indicated that the exercises themselves do not contribute to the improvements on the dependent measures used. Thus, if there is an additive effect between the psychological and physiotherapy treatments, these results indicate that it is related to the information given on back anatomy, function and back care. This would suggest that the cognitive-behavioural treatment may help patients to overcome dysfunctional self-statements, to increase daily activity level, and to cope better with pain, while the physiotherapy information shows them how to go about the daily activities, such as lifting, vacuuming, cleaning the house, etc., by, for example, holding the back in appropriate positions, bending the knees, etc. Unfortunately, the evidence available does not allow firm conclusions to be drawn about this contention but it would seem worthy of further examination.

To the extent that significant pretreatment to posttreatment improvements were achieved in measures of functional impairment, pain intensity, pain-related medication use, dysfunctional cognitions, sense of self-efficacy and use of coping strategies, the present results are consistent with the findings of many previous controlled and uncontrolled treatment studies (e.g. Cinciripini & Floreen, 1982; Kerns et al., 1986; Linton et al., 1985; Philips, 1987a; Turner, 1982). However, not all the findings were consistent with those reported in previous studies. In particular, affective distress, as

measured by the STAI and BDI, was not reduced to the extent commonly reported in previous studies (e.g. Philips, 1987a; Turner, 1982) and maintenance of treatment effects at long-term follow-ups was poor compared to the findings of many previous studies (e.g. Heinrich et al., 1985; Moore & Chaney, 1985; Philips, 1987a; Turner, 1982).

8.5 Differential Treatment Effects

The failure of the cognitive-behavioural treatments employed in the present studies to effect significant reductions in affective distress would appear inconsistent with the significant improvements found on measures of self-efficacy, functional impairment, dysfunctional cognitions and use of coping strategies - all of which were found to be related to the measures of affective distress at pretreatment in the previous chapter.

Interestingly, however, some other controlled treatment studies with chronic pain patients have also reported inconsistent changes in affective distress relative to other dependent variables. Linton, et al. (1985), for example, reported no significant difference in improvement in BDI scores between behavioural plus relaxation treatment, regular rehabilitation treatments and a waiting list control, although significant differences in improvement were obtained, for the behavioural-relaxation treatment relative to the others, on measures of pain intensity, daily activities and sleep disturbance. Similarly, Kerns et al. (1986) found no significant improvement on their affective distress factor for a behavioural plus relaxation treatment group which did make significant progress towards their individualized behavioural goals, although they did not

improve on standardized measures of instrumental activity and dependency. In addition, Moore and Chaney (1985) also reported significant improvements on measures of pain, pain behaviour, general dysfunction, and utilization of, health-care resources, but no change in level of depression.

To some extent this apparent inconsistency in change between the measures of affective distress and the measures of cognitive, behavioural and coping skill variables suggests a limited linkage between them in some pain patient samples. Philips (1987a) suggested that "the chronic pain sufferer may be characterized as one who has lost the capacity to distinguish his pain problem from other emotional and behavioural difficulties" (p. 375), and that one result of successful psychological treatment may be to clarify (for the patient) the links between the emotional and other behavioural difficulties and the pain problem. Thus, even though a chronic pain patient may initially attribute his/her affective distress to the pain problem, Philips' (1987a) thesis would predict that even after successful psychological treatment (in terms of coping better with pain) the patient could say that he/she was still depressed, but not due to the pain problem. Presumably, the patient could then tackle his/her other problems more directly.

The findings of the present studies, could be considered consistent with this thesis, although it was not directly tested. Indirect evidence in support of this proposition may be derived from the observation that of the dependent measures employed only the anxiety and depression measures did not specifically ask the patients

to relate their answers to their pain, although it is not clear if that was how they perceived it, and these were the only dependent measures on which significant improvements were not found. A recent study by Turner, Clancy and Vitaliano (1987) adds further weight to role of non-pain factors in determining the degree of affective distress in chronic low back pain patients when they found that only 43% of their sample (N=85) indicated that pain or physical limitations were their primary current stressor.

Given the relationship between activity level and depression found in a number of depression studies (e.g. Lewinsohn, 1975), the finding that functional impairment was reduced (on the SIP), but not affective distress (on the STAI and BDI) might be seen as inconsistent. However, it should be remembered that the measure of daily functioning employed in these studies, the Sickness Impact Profile, did not assess activity level per se, but only pain-related activity dysfunction - as perceived by the patient and a significant other. Thus, the relationship between activity level and affective distress was not directly addressed in these studies.

Similarly, the relationship between dysfunctional cognitions and affective distress was also not directly addressed because the measure employed, the Pain Beliefs Questionnaire, primarily focusses on pain-related dysfunctional cognitions. While the pretreatment correlations between PBQ scores and STAI and BDI scores were high ($r=0.43$ and $r=0.65$, respectively) and consistent with Lefebvre's (1981) findings with a similar pain sample, the significant reduction in PBQ scores following treatment for the treatment groups in the

This conclusion would suggest a need for a behavioural or functional analysis of the chronic pain patient's presenting problems followed by individually tailored treatment, rather than simply assessing the type or severity of the problems with a questionnaire or rating scale and then treating each patient according to a packaged programme. Although such packaged programmes may be broad enough or contain enough components for some to be relevant to most patients, it would seem a rather inefficient approach and, given the limited evidence for the efficacy of different treatment components, it does not resolve the question of which components to include or exclude (Linton et al., 1984).

Some authors have argued that psychological treatments for chronic pain patients should focus on enhancing their self-esteem and generalized coping abilities (i.e. for dealing with non-pain-related events, such as marital problems) rather than pain coping skills (e.g. Cobbin, Lewis & Elton, 1982; Elliott, Trief & Stein, 1986). On the other hand, many cognitive-behavioural treatment studies, including the present series, have tended to focus on training in pain coping skills (e.g. Keefe et al., 1981; Kerns et al., 1985; Turner, 1982), in the expectation that skills acquired in coping with pain would allow the patients to return to more active and satisfying lives despite their persistent pain. The general assumption of such cognitive-behavioural treatment programmes seems to be that the gaining of greater control over pain and reaction to pain would result in an enhanced sense of self-efficacy which would generalize to other areas of a patient's life and be associated with reductions in generalized dysphoria (Turk & Holzman, 1986). However, the results obtained in the present studies would suggest that despite

the evidence of increased use of pain coping skills and enhanced self-efficacy in relation to pain, it does not always follow that dysphoria, as measured by general anxiety and depression scales, is necessarily reduced.

This analysis would suggest that where dysphoria or affective distress has been reduced following cognitive-behavioural treatment for chronic pain such a reduction is because either the patient sample concerned did, in fact, have a functional relationship between their pain problems and their mood, or because the treatment programme included components which provided help in dealing with non-pain-related events. However, the lack of improvement on depression scores in Moore and Chaney's (1985) treatment programme, which included training in both pain coping skills and non-pain-related events (via stress management, assertiveness and active listening techniques), would suggest that other factors must also be involved.

It would seem, therefore, that in order to further elucidate the factors involved in the changes associated with treatments for chronic pain, treatment outcome studies should include an examination of the effects of treatment components on particular events or dimensions, such as affective distress or dysfunctional cognitions, and the possible effects of individual variations in functional relationships between variables. As yet, however, there do not appear to have been any comparative studies between the pain coping versus general coping approaches, or between the functional analysis/individually tailored approach and the packaged programme approach, or controlled treatment evaluations of any differential contributions to different outcome measures of such patient variables

as severity of disability, pain type, work status or disability/insurance claim status. Thus, the issues outlined here await empirical investigation.

8.6 Maintenance of Treatment Effects

The second main discrepancy between the findings of the present studies and some of those in the literature concerns the problem of maintenance of treatment effects. The results of the first and second studies in the present series indicated that, despite significant pretreatment to posttreatment improvements on a number of dependent measures for the cognitive-behavioural treatments relative to the physiotherapy treatment, few of those differential effects were maintained at the 6-month follow-ups and none at the 12-month follow-up. Similarly, the only significant differential pretreatment to posttreatment effect achieved by the behavioural treatment over the cognitive treatment in the first study (on the self-rated SIP) was also not maintained at the two follow-ups.

Despite the poor maintenance of these differential effects (i.e. between treatments) however, a number of overall (i.e. within subjects) effects were maintained at the 6- and 12-month follow-ups in the first study and one in the second study (on the self-rated SIP). In addition, inspection of the mean scores indicates that many of the treatment gains for the psychological treatments were actually maintained, although the difference between the psychological and physiotherapy treatments was no longer significant, largely due to some improvement by the physiotherapy conditions in the follow-up period. However, given that the physiotherapy conditions did not receive significantly more treatment in the follow-up periods and

that they were not practising their exercises more than the psychological treatment conditions, the apparent maintenance of treatment gains for the psychological treatment conditions should be treated with caution. It is possible, for example, that such an apparent maintenance of treatment effects simply reflects maturational effects or regression to the mean over time. Unfortunately, the absence of a no-treatment control condition precludes a clearer assessment of this possibility.

It is also interesting to note that, apart from the use of coping strategies in Study Two, further improvements on most dependent measures in the follow-up period were generally limited for the psychological treatment conditions, despite a number of substantial pretreatment to posttreatment improvements. Given that the psychological treatments were aimed at teaching the patients skills they could continue to use to deal with their pain-related problems, it might be expected that after only 5 weeks of treatment improvements would be limited as the patients were only starting to use the skills. However, it would also be expected that continued practice of the skills and exercises would lead to increased competence in using them and, hence, greater success in dealing with their pain-related problems. Thus, it might be expected that improvement on the dependent measures would actually increase with the passage of time.

Philips (1987a), for example, reported continued improvement, or a lag effect, following the end of her multicomponent treatment programme. However, apart from the increased use of coping strategies, there was no clear evidence of such an effect in the present studies - despite self-reports which indicated that practice

of the relevant skills and exercises taught during the treatment programme was maintained at moderate levels (between 1 and 3 times a week) at the follow-ups for all groups in both studies. The apparent inconsistency between these reports of continued practice of the exercises and techniques and the findings of limited improvements in the follow-up period, together with limited maintenance of differential treatment effects, could suggest that the practice of the relevant skills and exercises in the follow-up periods was not frequent enough to have a noticeable effect on the dependent measures. During the treatment programme, for instance, the patients in the cognitive and behavioural treatments were encouraged to practice their relevant skills and exercises several times daily, whereas at the follow-ups the rate was clearly less than that.

Another possible explanation, suggested in a previous chapter, for the apparent discrepancy between the reports of continued practice of the skills and exercises and the poor maintenance of differential treatment effects in the follow-up period, could be related to the patients' family and social environments. Recent findings by Gil et al. (1987), for example, have provided evidence of the potential reinforcing effects of a family on pain behaviour. Their results showed that the reinforcing effects of a family were not related so much to the presence of significant others, but rather to the patient's satisfaction with the support given by the significant others.

It was pointed out earlier that during the present treatment programme attempts by the subjects towards achieving their individual goals and towards implementing the coping strategies and practising the exercises were consistently reinforced by the clinical

psychologist. Similarly, pain-behaviours, such as pain complaints, groans, or limping, etc. were not followed by attention or solicitous concern from the clinical psychologist during the treatment sessions. However, apart from discussion of such interactions with the patients and encouragement for them to discuss the issue at home, little attention was given to arranging for such contingencies to be maintained in the home or social environment following the programme. Thus, it may be argued that the reduced practice of the skills and exercises in the follow-up period indicates that more attention needs to be given to ensuring such a rearrangement of reinforcement contingencies actually occurs at home.

It is possible, however, that the home situation may require more than a simple rearrangement of contingencies. Flor, Kerns and Turk (1987), for example, found that the patients' perception of the spouses' behaviour, whether solicitous or punishing, is more closely related to the patients' self-reported pain and activity levels than reports by the spouse of their own behaviour. In other words, simply encouraging the spouse to reinforce well behaviour and ignore pain behaviour could result in misinterpretation by the patient, of his/her spouse' behaviour, and further complicate matters. In the light of this finding, the lack of significant-other involvement in the treatment programme could not only have reduced the chances of maintaining the appropriate reinforcement contingencies at home, but also effectively hampered attempts to deal with any relationship or communication problems the patients may have had which could have interfered with the maintenance of any treatment effects.

Irrespective of the issue of spouse involvement in the treatment programme, it could also be argued that another possible explanation

for the relatively poor maintenance of treatment effects is that the pain coping skills approach of the treatment programme did not allow any real opportunity to explore more general problems in the patients' lives which may have been masked or minimised during a fairly intensive and active programme but became more intrusive once the programme was completed. For example, Turk, Flor and Rudy (1987) presented evidence of considerable problems in the families of chronic pain patients which had been found in a number of studies. These problems included a high incidence of depression in pain patients' spouses, a high incidence of marital and sexual dissatisfaction, and also indications of an increased incidence of health problems in the patients' spouses.

While there is also evidence that not all spouses of chronic pain patients are psychologically distressed or maritally dissatisfied (e.g. Block & Boyer, 1984; Kerns & Turk, 1984), Ahern and Follick (1985) did report that spouses' MMPI scores and marital satisfaction ratings were predictive of treatment success in chronic pain patients. However, the only controlled treatment study to evaluate the effect of including the patients' spouses in the programme found no differential maintenance effects at follow-up for the spouse condition (Moore & Chaney, 1985). Interestingly, Moore and Chaney (1985) also found that level of marital satisfaction improved more for the individual treatment condition (e.e. without spouse involvement), compared to both the waiting list control and to the spouse involvement condition. Nevertheless, as the study did not really address the issue of marital dissatisfaction at pretreatment, by for example, treating two groups of high marital dissatisfaction patients, it remains to be established that reducing marital

dissatisfaction materially affects treatment outcome. In addition, as Gil et al.'s (1987) findings suggest, increased marital satisfaction could even be detrimental to treatment outcome if it leads to increased reinforcement of pain behaviours.

Clearly, the issue of spouse involvement in the treatment programme raises many issues and, given the maintenance of treatment effects reported by studies which did not include spouses in the treatment, it would seem unlikely that simply including spouses in the treatment programme will necessarily lead to improved maintenance effects. However, in the absence of more controlled treatment studies, it can only be concluded that the value of spouse involvement in the treatment process remains to be established.

It was noted earlier that, relative to other studies, the maintenance results of the present studies are most consistent with the findings of Kerns et al. (1985) who reported significant maintenance of treatment effects for the cognitive-behavioural group at the 3-month follow-up but not at the 6-month follow-up. In discussing their results, Kerns et al. (1985) suggested that the poor maintenance of treatment effects for the cognitive-behavioural treatment relative to previous findings, such as those reported by Turner (1982) and Heinrich et al.'s (1985) group, could have been related to differences in patient variables such as severity of pain-related dysfunction, as reflected in use of analgesic medication, number of pain-related surgeries, and length of pain history. Kerns et al. (1985) considered that their patient sample was probably more severely impaired by pain than those in Turner's (1982) and Heinrich et al.'s. (1985) studies and were probably more similar to patients seen in inpatient pain programmes. In a previous

chapter it was argued that the patient sample employed in the first study of the present series was broadly comparable, in terms of severity of pain-related dysfunction, to the sample studied by Kerns et al.(1985).

It was also argued that the sample in the first study was generally more impaired by pain than the sample studied by Turner (1982), Heinrich et al. (1985), and Philips (1987a), all of whom reported substantially better long-term treatment maintenance effects than either the present studies or Kerns et al. (1985). It is possible, therefore, that the relatively poor maintenance of treatment effects obtained in the present series compared to some of the previous studies was related to the degree of pain-related dysfunction. Keefe et al. (1981) for example, in an uncontrolled treatment study with chronic low back pain patients, did report that those patients who improved after a programme of relaxation training, reduction of medication intake, and physical therapy, were characterized by having had fewer surgeries, not being on disability payments, having continuous pain for a shorter period of time and higher initial pain rating than those subjects who improved least.

Other studies, however, have reported equivocal findings. Painter, Seres and Newman (1980), for example, reported that regression in the follow-up period for patients attending their inpatient treatment programme was associated with such factors as continuing financial compensation for pain, dependent and passive attitudes towards the pain problem, depression and continued reinforcement for pain behaviour. Degree of disability at admission or discharge, duration of disability and pain severity were not related to regression in their study. More recently, McArthur,

Cohen, Gottlieb, Naliboff and Schandler (1987) reported finding no significant relationships between long-term outcome and psychological and physical measures at pretreatment.

It would seem, therefore, that the possible influence of severity of pain-related dysfunction on long-term outcome has not been firmly established. Thus, while comparisons between patient samples in the controlled treatment studies may suggest that differences in disability could account for differences in the findings, no conclusions can be drawn.

Another possible contributor to differences in maintenance of treatment effects between studies could have been differences in pain problem-type. For example, Philips (1987a) included a mixture of pain problem-types in her study and reported that outcome effects were not related to type of pain problem. However, she also noted that some of her patients were experiencing only episodic pain, rather than continuous pain, during the follow-up period but did not identify the problem-type to which they belonged. Given that her sample included a large proportion (33%) of headache patients and the high success rate of headache treatments (e.g. Blanchard & Andrasik, 1982) relative to treatments for chronic low back pain (e.g. Linton, 1986) it would seem likely that the headache cases would have had some influence on Philip's results. However, Kerns et al.'s (1985) study also included a mixed pain problem-type sample and yet found relatively poor follow-up results. Thus, the question of pain problem-types affecting follow-up findings must also remain open.

In addition to spouse involvement in the treatment, Kerns et al. (1985) also proposed the use of booster sessions in the follow-up

period as a means of enhancing maintenance effects, but as yet no controlled trials of their use with a chronic low back pain sample have been reported. Follick et al. (1983) did report the regular use of a follow-up programme consisting of a number of sessions which included both physical therapy and conjoint sessions involving counselling and emotional support. During these session Follick et al. reported that the patients are encouraged to examine any setbacks which they may have had since discharge and to mobilize the coping skills and strategies which they had been taught. Unfortunately, no data were presented concerning the efficacy of this approach.

In sum, while some studies have reported good maintenance effects of treatment gains, the findings are not consistent across all studies. Despite a number of possibilities, it remains unclear why such apparently similar treatments have such different long-term results. More controlled treatment studies with long-term follow-ups are clearly required to examine the influence on maintenance of treatment effects of severity of disability, pain-type, family involvement in treatment, and booster sessions.

8.7 Methodological Issues

The present studies have addressed a number of the methodological problems noted in many previous studies, including: the use of an active treatment comparison condition, a relatively homogeneous patient sample who were randomly assigned to treatment condition, long-term follow-up evaluations, treatments derived from those employed in previous studies, evaluation of treatment

integrity, similar or identical evaluation measures to those used in previous studies, evaluation of multiple pain-related dimensions, significant-other ratings of behaviour in the home environment, evaluation of treatment credibility, an independent and blind interviewer to conduct most posttreatment and follow-up assessments, assessment of posttreatment use of techniques taught and other treatments received, and a statistical procedure which controlled for the number of univariate analyses performed.

Of course, a number of methodological problems were also identified in the present studies, including: the absence of an observer-rated measure in the clinic setting (e.g. Keefe & Block, 1982); the absence of measures sampling more physical changes, such as a movement cycle (e.g. Fordyce, 1976), the questionable credibility of the alternative treatment conditions in Study One, the problem of accurate recording of medication consumption, the questionable reliability and validity of the rating scales developed to assess practice of the exercises and techniques taught in the programme and follow-up use of health-care services, and the failure to formally assess whether or not the patients were properly performing the exercises and techniques taught. A number of these methodological issues have already been discussed. However, some deserve particular mention.

In the introduction to Study One it was pointed-out that the cognitive, behavioural and relaxation treatments being evaluated were based on the treatment described by Turner (1982) and Turk et al. (1983). In addition, the studies in this series were specifically

compared with the other controlled, cognitive-behavioural treatment studies in the literature (e.g. Linton & Gotestam, 1984; Linton et al., 1985; Heinrich et al., 1985; Kerns et al., 1985; Philips, 1987a). In a number of cases the dependent measures employed were the same as those referred to in Turner's (1982) paper (e.g. STAI, BDI, SIP-S, SIP-O) and others were selected from the other controlled treatment studies in the recent literature (e.g. Pain Rating Chart, MPQ, CSQ, MSPQ, PBQ).

In addition to these generally widely-used, standardized, and validated measures a number of scales were devised to assess particular issues of interest. These included: other treatments received in the last 6-months, current practice frequency of skills and exercises taught during the programme, practice of physiotherapy exercises during the programme, evaluation of the physiotherapists, and expectations of treatment. The scores obtained from some of these measures for the different treatment conditions were analyzed statistically and compared with the results derived from similar scales reported in other studies.

It could be argued, however, that while it is clearly useful from a clinical evaluation point of view (e.g. Keefe et al., 1986), to obtain information on further use of the health care system following a clinical treatment, for example, the measures often employed are a weak link in the evaluation of such treatments. Compared to the established psychometric properties of the Sickness Impact Profile or the Beck Depression Inventory, for example, the rating scales used in the present study and in many other studies to

assess often clinically important information are an unknown quantity.

In the case of use of the health care system, the patient, effectively, is usually asked to recall events that may have occurred months earlier and the scores derived are of unknown reliability and even validity. This problem is particularly pressing in a health system where patients are free to go from doctor to doctor, where no centralized records of attendance are usually available as a reliability check. Some investigators have been fortunate enough to work within a given organization, such as a Veterans Hospital, to which patients would normally go for many of their health care needs. In such cases medical records are usually available to provide information about continued use of the health care system (e.g. Kerns et al., 1985; Moore & Chaney, 1985). However, where that is not the case, results obtained from such scales should be treated with caution, particularly if details, such as number of visits or number of pain-related versus non-pain-related visits are being recalled.

Problems concerning the adequacy of assessment measures were also referred to earlier in relation to the assessment of treatment credibility. While a considerable amount of work has been done on developing psychometrically adequate measures of treatment outcome, such as the BDI and SIP, relatively little seems to have been done on measures of treatment credibility or treatment generated expectations of success. In reviewing Borkovec and Nau's (1972) commonly used self-report questionnaire, for example, Kazdin (1979) concluded that "no strong case can be made for what actually is measured by the

items" (p. 88). Yet, of the controlled treatment studies reviewed here only Turner's (1982) and Kerns et al.'s (1985) studies assessed treatment credibility or expectations of success and Kerns et al. used Borkovec and Nau's (1972) measure. It would seem, therefore, that considerably more attention needs to be paid to the psychometric properties of the many scales or questionnaires developed for particular studies.

This problem of the reliability and validity of non-standardized and non-validated measures applies particularly to the determination of medication intake. In the present studies the patients were requested to record on their pain rating chart their daily intake of medication (name and number of tablets) for a week before and after the treatment programme, and for a week on each of the follow-up assessment (e.g. Elton, Stanley & Burrows, 1983). At each assessment interview the patients were also asked for details of their current medication intake. Inspection of the patients' pain charts, however, revealed poor compliance. As a result the medication intake data used for analysis were based on what the patients said they were taking and what they recorded on their pain charts. It was considered that this method would be a reasonable guide to the type of medication being taken and whether or not they were taking any (e.g. Turner et al., 1982). Attempts to assess dosage were discarded as unreliable. Discussions with the patients' doctors revealed that they held similar concerns.

A number of other investigators have also struck this problem. Moore and Chaney (1985), for example, reported finding that "patient

self-report, chart review, and pharmacy records frequently were at variance with each other" (p. 329). They also noted that although the pharmacy records were probably the most reliable source of information a substantial number of them were not accessible. Turner et al. (1982) reported similar problems and Ready et al. (1982) reported evidence that patients with chronic pain tend to underestimate their medication use, particularly the narcotics. However, casual conversation with a number of the patients in the present series suggested a frequent neglect to record intake of 'over the counter' or non-prescribed analgesic medication, such as paracetamol. Explanations for this neglect to record the use of such analgesics usually ran along the lines that these medications were mild or not 'serious' drugs like the ones their doctors prescribed. Such observations, when contrasted with Ready et al.'s (1982) findings, would suggest a difference between Australian and North American populations in regard to attitudes towards medication use.

A number of proposals have been made on ways of dealing with this common problem, though none is completely satisfactory, especially in outpatient settings where there is clearly less opportunity for control and observation compared to an inpatient setting. Turner et al. (1982), for example, in an outpatient setting, also recorded type rather than quantity of medication. McCauley and Frank (1983), on the other hand developed a Q-sort technique with which physicians rated reported medication intake according to their concern over the abuse potential, possible side effects and over-medication on a 0 to 5 scale, where 0 meant not at all concerned and 5 meant very concerned. While this method may

offer practical advantages over attempts to determine equivalences of different medications, its weak point is that the physicians' judgements are based on patient self-reports of medication type and dosages consumed which are recorded in daily diaries. Furthermore, its comparability across different groups of physicians may also be problematic.

Consequently, while some record of medication intake is important in the evaluation of clinical treatments, given the evident reliability problems it would seem that self-reports of dosages consumed in outpatient programmes must be treated with caution. More reliance may be placed on self-reports of medication-type, but this makes it more difficult to determine clinically relevant findings. For example, an average reduction from 8 to 2 Nembudeine tablets a day may be seen as a clinically significant result, but if only type of medication consumed is noted the record would show no change had occurred. In the present studies, for example, the pretreatment to posttreatment reduction in type of medication used for the treatment conditions compared to the control conditions in Study One was significant when analysed with a univariate decision-wise error rate. However, this finding provides little indication of whether the amounts of medication changed. While this could be a clinically significant finding because, presumably, the risk of undesirable interactions between medications was reduced (e.g. McCauley & Frank, 1983), the coarseness of the measure severely restricts interpretation.

Another common assessment problem is the use of some form of observer-rating of patient behaviour, particularly in the home environment. In an earlier chapter mention was made of Turner's (1982) adaptation of the Sickness Impact Profile (SIP) for rating by another person. Since that study this use of the SIP had not been reported in any controlled treatment studies until the present series of studies. However, the finding of a high and significant correlation between the self-rated SIP and the other-rated SIP scores in the present studies, together with the finding that other-rated SIPs generally scored lower than the self-rated SIPs, which is both consistent with Turner's (1982) findings and inpatient findings that patients tend to underestimate their activity level (e.g. Kremer et al., 1981), would seem to support its further use in this manner. A number of studies have reported alternative approaches to this problem but as Turner and Romano (1984) noted, it would make comparisons across studies considerably easier if a standardized and validated measure like the SIP was used more widely.

Another methodological problem which has been noted by a number of reviewers (e.g. Turner & Romano, 1984; Moore & Chaney, 1985; concerns the use of comparison treatment conditions rather than waiting list control conditions. Turner and Romano (1984), for example, referred to the tendency of many of the multicomponent programmes to include other active treatments, such as physical and occupational therapy, along with operant and cognitive-behavioural treatments, making it difficult to determine the relative contribution of the different components. They concluded that there was a need for studies to employ control conditions which could

determine "whether changes are due to active treatment ingredients or to nonspecific effects associated with receiving treatment" (p. 290). In a similar vein, Moore and Chaney (1985) referred to a lack of "a plausible attention/placebo control condition for psychological interventions for chronic pain" (p. 332).

The results of Study Two and those of Rybstein-Blinchik's (1979) study, from which the psychological attention condition was derived, would suggest that a plausible attention/placebo control condition is possible. However, the credibility problem noted in Study One suggests that further replication of this condition is necessary. Nevertheless, the approach used here, whereby the attention-control condition was coupled with a physiotherapy treatment, also goes a considerable way towards addressing the problem of evaluating the contribution of different treatment components to the changes obtained in multicomponent programmes. It could also be argued that by comparing the psychological treatments with a commonly-used physiotherapy treatment this approach also provides a means of dealing with the ethical problems of both a waiting list control and a purely placebo control (e.g. Fordyce et al., 1985; Keefe et al., 1986).

In sum, while a number of methodological problems in chronic pain treatment studies remain unresolved, the more recent studies reviewed here, together with the present studies, indicate that considerable advances have been made in this area since the earlier reviews of Keefe (1982), Linton (1982) and Turner and Chapman (1982a&b).

8.8 Conclusion

The results of this series of studies support earlier findings of the efficacy of cognitive-behavioural treatments for chronic low back pain. Significantly, it was shown that these effects were not related to participation in an active treatment programme. It was also shown that while behavioural treatment was superior to cognitive treatment on some of the more behaviourally-oriented measures, there were no differences between them on measures of pain intensity or the more cognitive domains. Furthermore, the addition of relaxation training made little difference to the efficacy of either cognitive or behavioural treatments. It was concluded that a combination of cognitive, behavioural, and relaxation treatments was probably more effective than the cognitive or behavioural treatments alone.

It was also considered that while the combined cognitive-behavioural and relaxation treatment did have measurable effects on measures of cognitions as well as overt behaviours, no conclusions could be drawn on the direction of causality between cognitions and overt behaviours, although relationships between treatment contingencies, cognitions and behaviours were indicated. Interestingly, little evidence was found of a functional relationship between average pain intensity, affective distress and pain-related cognitions and overt behaviours.

These studies also showed that while a number of significant pretreatment to posttreatment improvements were associated with the cognitive-behavioural treatments, maintenance of treatment gains at 6-month and 12-month follow-ups was generally poor.

It was concluded that more research is required to examine:

- (i) the effects of the family and social environment on the maintenance of treatment gains;
- (ii) the effects of cognitive variables, such as beliefs, coping repertoire and sense of self-efficacy on the processes of change within treatment;
- (iii) the effects of different relaxation methods in the treatment of chronic low back pain;
- (iv) the effects of treatment length on outcome;
- (v) the effects of degree of disability on treatment outcome;
- (vi) the utility of an individualized treatment programme based on a behavioural analysis compared to a packaged multicomponent treatment programme;
- (vii) the effects of booster sessions on long-term maintenance of treatment gains;
- (viii) the effects of different types of spouse involvement in the treatment programme; and
- (ix) the development of more psychometrically adequate assessment and treatment evaluation measures designed specifically for chronic pain samples.

Finally, it was noted in the review of previous treatment studies that many of the studies examining the utility of psychological treatments for chronic pain patients have been conducted in virtual isolation, often employing only waiting list control conditions or sometimes other psychological treatments for comparison. Yet, in the usual clinical setting, psychological

treatments typically operate within multicomponent treatment programmes. So far, however, until the present studies, only Heinrich et al. (1985) and Linton et al. (1985) have attempted to compare psychological treatments with the usual fare offered by multicomponent, multidisciplinary programmes. In addition, the present studies are the first on a large scale to examine possible additive effects between psychological and non-psychological treatments.

Given the now well-established superiority of the psychological treatments for chronic low back pain over waiting list control conditions (e.g. Turner, 1982; Kerns et al., 1985; Philips, 1987a), it would seem that more controlled treatment studies need to be conducted in the context of the multicomponent treatment settings, employing other active treatments for comparison. Research in such settings is, of course, often problematic (e.g. Fordyce et al., 1985) particularly when the issues of costs, ethics, and different philosophic and training backgrounds of the different health care workers are considered (e.g. Keefe et al., 1986). Nevertheless, the present studies, together with those of Heinrich et al. (1985) and Linton et al. (1985), demonstrate that it is possible, at least in outpatient settings. What is especially required is controlled treatment research in multidisciplinary inpatient settings.

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13th February, 1985

Dear Doctor,

Suitable patients are being sought for a new back-pain management programme being established at Westmead Hospital. The programme is being run by members of the Departments of Physiotherapy, Clinical Psychology and Anaesthetics who also work at the hospital's Pain Clinic. The programme is intended for people suffering from chronic, benign, back-pain who are not considered suitable for further invasive treatment. The aim of the programme is to help such people learn to live with their pain rather than cure it.

The programme is research-oriented so that current physiotherapy, psychological, and analgesic reduction methods can be continually evaluated and, hopefully, improved. The actual nature of the programme will be explained to each prospective patient so that he/she can give his/her informed consent before participating.

This letter is intended to give you some information about the programme and provide guidelines on the type of patient being sought. We would, of course, be happy to answer any questions you may have about the programme.

To refer patients and for further information you should ring Mr. Michael Nicholas in the Department of Clinical Psychology, Westmead Hospital. The phone number is 633 6688.

Yours faithfully,

*M.K. Nicholas*M.K. NICHOLAS,
(Clinical Psychologist)*Jocelyn Lemon*J. LEMON
(Physiotherapist)

BACK-PAIN MANAGEMENT PROGRAMME

A. Patients

For patients who meet the following requirements:

- a) have chronic (i.e. more than 6 months), benign (i.e. non-malignant) low-back pain.
- b) are not considered suitable for further invasive treatments.
- c) are aged between 20 and 60 years.
- d) have no compensation claim due for settlement within 12 months (to the best of his/her knowledge).
- e) are able to read and speak English.
- f) are willing to participate in this research-oriented management programme which will mean
 - i) attending pre-treatment assessment sessions (with physiotherapist, clinical psychologist, and anaesthetist) as well as complete post treatment and two follow-up assessments (at 6 and 12 months following the programme).
 - ii) attending two treatment sessions each week for five weeks. Each session will last 1½ to 2 hours.
 - iii) agreeing not to seek alternative forms of treatment for the pain during the treatment phase of the programme (5 weeks) unless medically advised.
 - iv) agreeing to carry-out required home-work activities between treatment sessions.
 - v) agreeing to allow the results of the programme to be used for research purposes and possible publication (naturally, the patients' identities will be kept anonymous in any publications).

B. Time Involved

- a) Pre-treatment assessment:

Physiotherapy:	30 minutes (approx.)
Clinical Psychology:	75 minutes (approx.)
Medication:	5-15 minutes
- b) Treatment sessions:

Mondays - approximately 4 to 6 pm.
Thursdays - approximately 4 to 5.30 pm.

Treatment sessions will cover 5 consecutive weeks (allowing for public holidays).

C. Programme

The patients will receive various combinations of components of the following treatments (i.e. all patients will receive some form of current treatment, although the actual form will vary from patient to patient).

a) Physiotherapy

- Individualised advice and exercises.
- Instruction on back-pain and such topics as methods of lifting.
- Advice from a dietitian on recommended eating habits.
- Patients will participate in small groups (5 per group) with an experienced physiotherapist.
- Exercises will be conducted in the Physiotherapy gym and hydrotherapy pool.
- Patients will be expected to carry-out specified exercises at home between sessions.

b) Clinical Psychology

- Advice and instruction in ways of coping with pain. This will include:
 - . information to improve understanding of chronic pain.
 - . training in various coping skills (e.g. relaxation, distraction techniques, changing attitudes towards chronic pain).
 - . patients will participate in groups of 5 with an experienced Clinical Psychologist.
 - . patients will be expected to carry-out specified tasks at home between sessions.

c) Medication Reduction

- The aim will be to reduce analgesic medication usage. This will be conducted under medical supervision.
- The patients' pre-treatment analgesic medication usage will be assessed on an individual basis by a staff specialist anaesthetist who will then determine a suitable medication reduction regime for each patient.

The Parramatta Hospitals

CONSENT FOR RESEARCHTitle of Project:Cognitive-Behavioural Treatment
of Chronic Low Back PainName(s) of Chief Investigators:

Mr. Michael Nicholas, Senior Clinical Psychologist

General Purposes, Methods and Demands:

The aim of the study is to evaluate the effectiveness of a cognitive-behavioural treatment of chronic low back pain. The term "cognitive-behavioural treatment" means helping people learn different ways of thinking about their pain problems and different ways of living with or coping with their pain. The study will use a number of small groups of patients who have chronic low back pain as their main complaint. They will also be asked to carry out some homework tasks between sessions. All patients will be asked to fill in a number of rating forms and questionnaires, both during the study and on two further occasions, one six months later and one twelve months later.

The study, itself, will consist of an initial assessment session, followed by 10 bi-weekly meetings, each of 120 minutes duration.

Possible risks, inconvenience and discomforts:

It is envisaged that there will be no risks in participating in the study. The only inconvenience being that it will take some of the patients' time.

I have been asked to participate in the above research study, and give my consent by signing this form on the understanding that:

1. The research study will be carried out in a manner conforming with the principles set out by the National Health and Medical Research Council, which appear overleaf.
2. I comprehend the general purposes, methods and demands and possible risks, inconvenience and discomforts of the study.
3. If I do not volunteer to participate in the research study, I can still receive appropriate treatment for my condition.
4. In giving my consent, I acknowledge that my participation in this research study is voluntary and that I may withdraw at any time.

Signature: _____ Date: _____
(By subject, if over 18 years, otherwise by guardian or next friend.)

Witnessed by: _____

of: _____

MR- 5

Project approval no: _____

Binding Margin-No Writing

CONSULTANT'S SIGNATURE

NOTICE TO PARTICIPANTS:

Research projects approved by the Parramatta Hospitals are to conform to the principles set out in the National Health and Medical Research Council's "Statement on Human Experimentation". The latest statement issued in August 1982 is reproduced below:

STATEMENT ON HUMAN EXPERIMENTATION

The collection of data from planned experimentation on human beings is necessary for the improvement of human health. Experiments range from those undertaken as part of patient care to those undertaken either on patients or on healthy subjects for the purpose of contributing to knowledge, and include investigations on human behaviour. Investigators have ethical and legal responsibilities towards their subjects and should therefore observe the following principles:

1. The research must conform to generally accepted moral and scientific principles. To this end institutions in which human experimentation is undertaken should have a committee concerned with ethical aspects and all projects involving human experimentation should be submitted for approval by such a committee.
2. Protocols of proposed projects should contain a statement by the investigator of the ethical considerations involved.
3. The investigator after careful consideration and appropriate consultation must be satisfied that the possible advantage to be gained from the work justifies any discomfort or risks involved.
4. The research protocol should demonstrate knowledge of the relevant literature and wherever possible be based on prior laboratory and animal experiments.
5. In the conduct of research, the investigator must at all times respect the personality, rights, wishes, beliefs, consent and freedom of the individual subject.
6. Research should be conducted only by suitably qualified persons with appropriate competence, having facilities for the proper conduct of the work; clinical research requires not only clinical competence but also facilities for dealing with any contingencies that may arise.
7. New therapeutic or experimental procedures which are at the stage of early evaluation and which may have long-term effects should not be undertaken unless appropriate provision has been made for long-term care, observation and maintenance of records.
8. Before research is undertaken the free consent of the subject should be obtained. To this end the investigator is responsible for providing the subject at his or her level of comprehension with sufficient information about the purpose, methods, demands, risks, inconveniences and discomforts of the study. Consent should be obtained in writing unless there are good reasons to the contrary. If consent is not obtained in writing, the circumstances under which it is obtained should be recorded.
9. The subject must be free at any time to withdraw consent to further participation.
10. Special care must be taken in relation to consent, and to safeguarding individual rights and welfare where the research involves children, the mentally ill and those in dependant relationships or comparable situations.
11. The investigator must stop or modify the research program or experiment if it becomes apparent during the course of it that continuation may be harmful.
12. Subject to maintenance of confidentiality in respect of individual patients, all members of research groups should be fully informed about projects on which they are working.
13. Volunteers may be paid for inconvenience and time spent, but such payment should not be so large as to be an inducement to participate.

APPENDIX C - Physiotherapy Programme

BACK PROGRAMME

WEEK ONE

MONDAY: Introduction
Anatomy - basic anatomy of the spine
Exercises - bracing

THURSDAY: Anatomy - disc, aging, posture
Common conditions
plus xrays
of - osteoporosis, scoliosis, sciatica, osteoarthritis, rheumatoid arthritis, spondylosis, ankylosing spondylitis
Exercises - theory of bracing
- abdominal exercises, pelvic tilting
Discussion- of the aims of hydrotherapy.

WEEK TWO

MONDAY: Hydrotherapy

THURSDAY: Pain sensitive structures in the spine.
Activities of daily living.
Posture.
Exercises - hip abduction/adduction
- quad exercises.

WEEK THREE

MONDAY: Hydrotherapy

THURSDAY: Dietitian 4.15-5.00pm.
Why exercise?
Myths and exercise
Do's and Don't's with exercise
Exercises - assess and increase if required

WEEK FOUR

MONDAY: Hydrotherapy

THURSDAY: Treatment, surgery, and drugs used for back pain.

WEEK FIVE

MONDAY: Hydrotherapy

THURSDAY: Revision and questions
Reassessment of patient.

WEEK 1

SESSION 1

AIM

To help you live with your pain, and prevent further damage to your back, through-

EDUCATION

and

EXERCISE

(Overhead)

1. EDUCATION

- Anatomy of the back.
- Posture.
- Protecting your back in A.D.L.
- Medical terms.
- Treatment available.

2. EXERCISE

- Specific.
- General.

ANATOMY

In order to understand the reasons for low back pain, and the treatments used, you need to have some knowledge of the anatomy of the spine

Why do humans have a spine?

Overhead of spine

- maintains upright position
- permits locomotion and purposeful movement

Therefore the spine has to be flexible, and provide antigravity support.

There are 5 sections of the spine:

1. Cervical (neck)	-	7 vertebrae
2. Thoracic (chest)	-	12 vertebrae
3. Lumbar (low back)	-	5 vertebrae
4. Sacrum	-	5 fused vertebrae
5. Coccyx	-	3-4 small fused bones

Cervical and lumbar have a LORDOSIS - curve towards the front.

Thoracic has a KYPHOSIS - curve towards the back.

The spine consists of vertebrae, separated by discs, attached by ligaments, and moved by muscles.

1. VERTEBRAE

Use O/H
and spine
to
demonstrate
these.

Each Lumbar vertebrae has:-

- body
- 2 vertebral arches made up of pedicles and laminae
- 2 transverse processes
- a central spinous process
- 2 paired articulating facets - (superior and inferior)

The transverse and spinous processes are points of attachment for muscles and ligaments.

The facet joints control the direction of movement between 2 adjacent vertebrae. In the lumbar spine, most movement is in flexion and extension (i.e. bending forward and backward)

Nerve Roots branch off the spinal cord and exit through the neural foramina.

Between each vertebrae lies an INTERVERTEBRAL DISC, which acts like a hydraulic system. Pressure in the disc maintains the STABILITY of the spine, with help from the spinal ligaments.

(Because the disc is such an important structure, we will spend more time talking about it later on).

2. LIGAMENTS

- point out on spine:

Anterior Longitudinal Ligament.
Posterior Longitudinal Ligament.
Interspinal Ligament.
Supraspinal Ligament.
Intertransverse Ligament.
Ligamentum Flavum - (connects laminae).

- The Ligaments are made of thick fibrous tissue.
- They are tough, but flexible - they give NO resistance to normal movement.
- They are designed to prevent ABNORMAL, or too much movement.
- They are protected from excessive tension by reflex contraction of muscles.

3. The MUSCLES which support the spine are:

- the abdominals
- the back (and buttock) muscles

These muscles enable the spine to sustain loads of several hundred pounds. HOWEVER, a spinal column that does not have any muscles can only sustain 4½ pounds. So, the support of the muscles at the front and back of the spine is crucial for the normal functioning of the back in activities of daily living, for lifting, and just for remaining upright.

EXERCISES

(overheads first)

1. Pelvic tilt
2. Abdominals (hands either on thighs or behind neck to support neck if sore).
3. Low back extensors and gluteals: 1 exercise only today.
either - prone over pillow → alternate leg lift
or - bridging.
Whichever is most comfortable. (Add the other one later if wanted).
4. Bracing - basic only - if time.

Give out Hydro Aims.

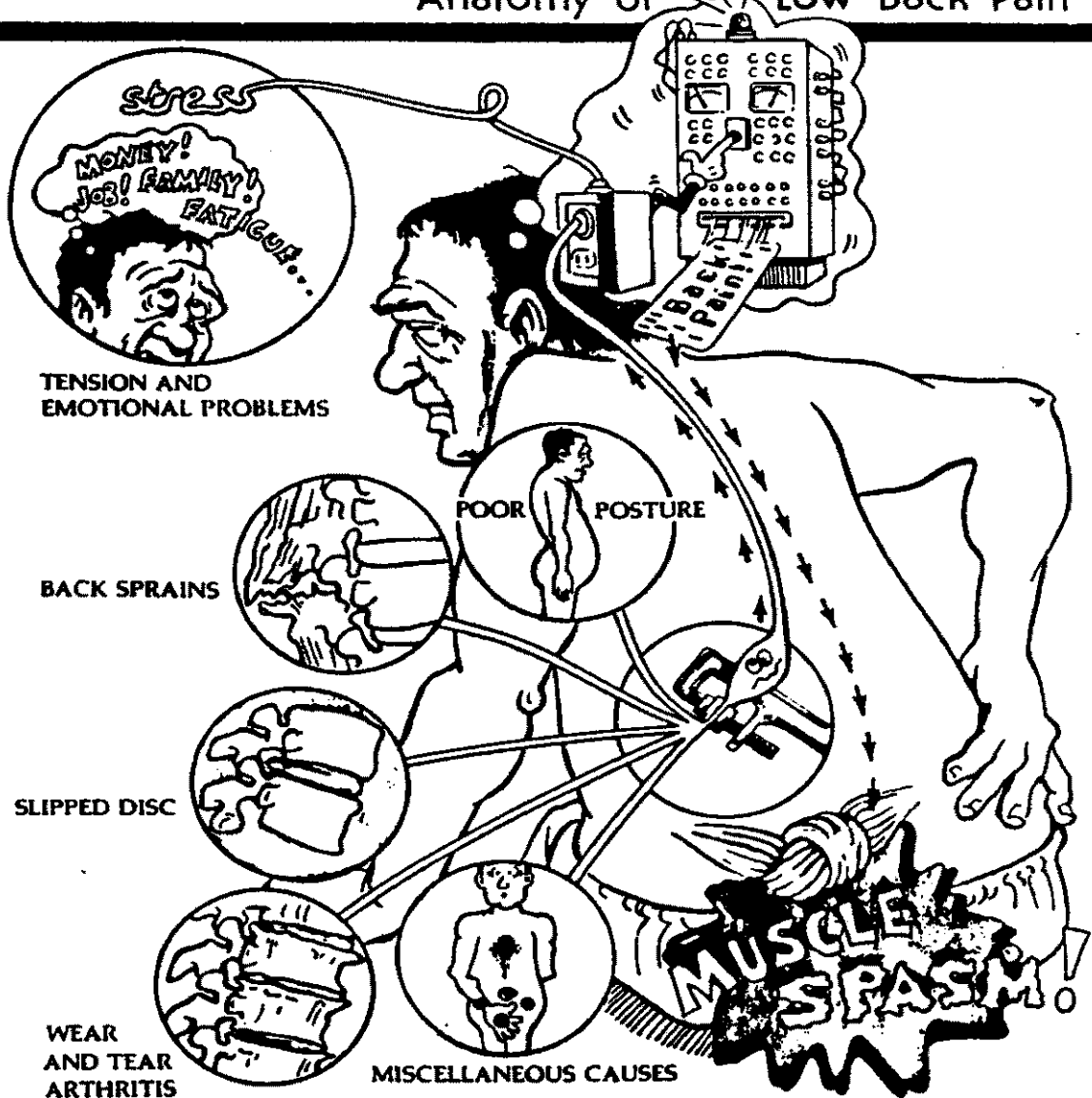
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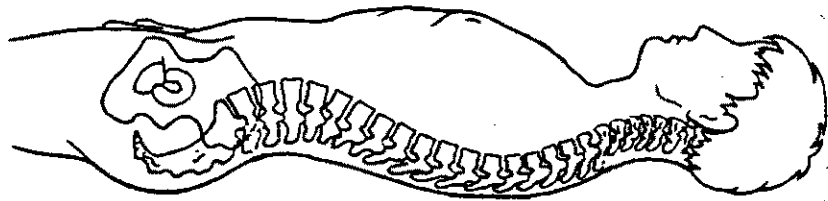
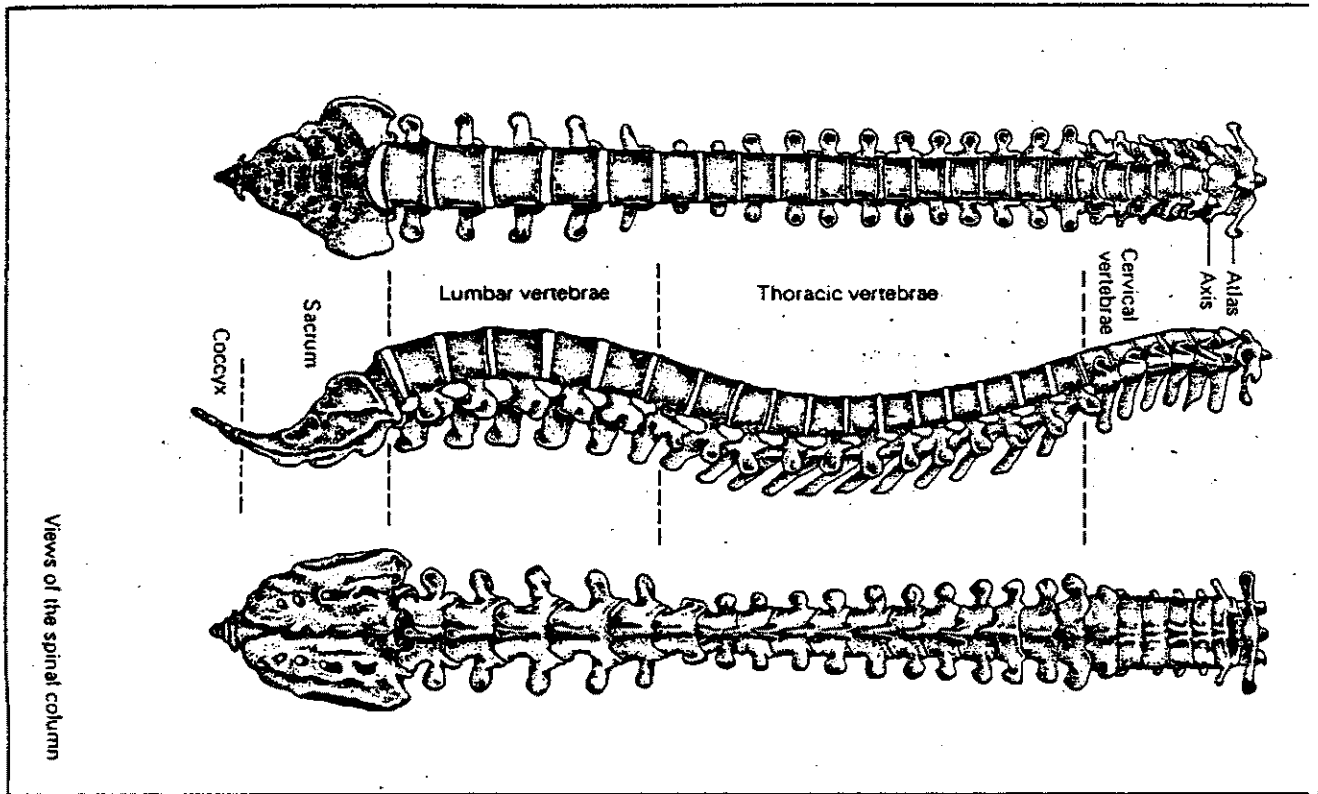
Next Session - PREVIEW

1. DISCS
2. TERMS AND CONDITIONS - XRAYs
3. POSTURE
4. EXERCISING AND BRACING

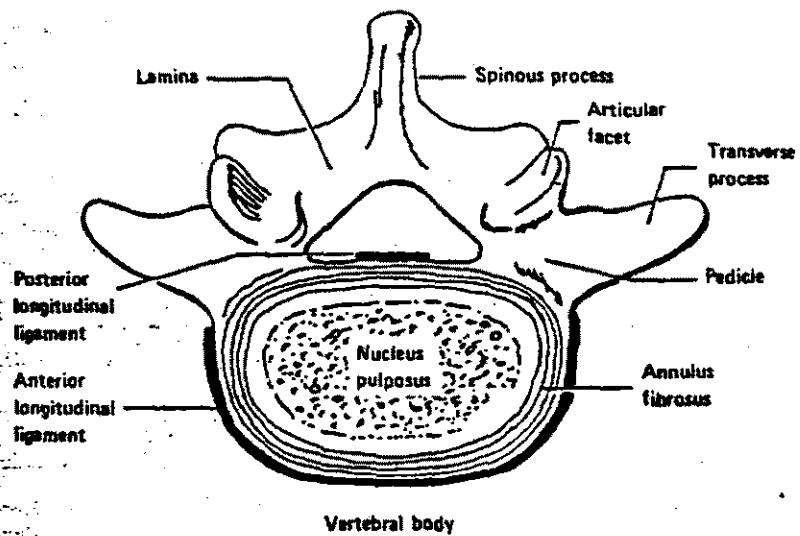
← In Gym

Anatomy of Low Back Pain

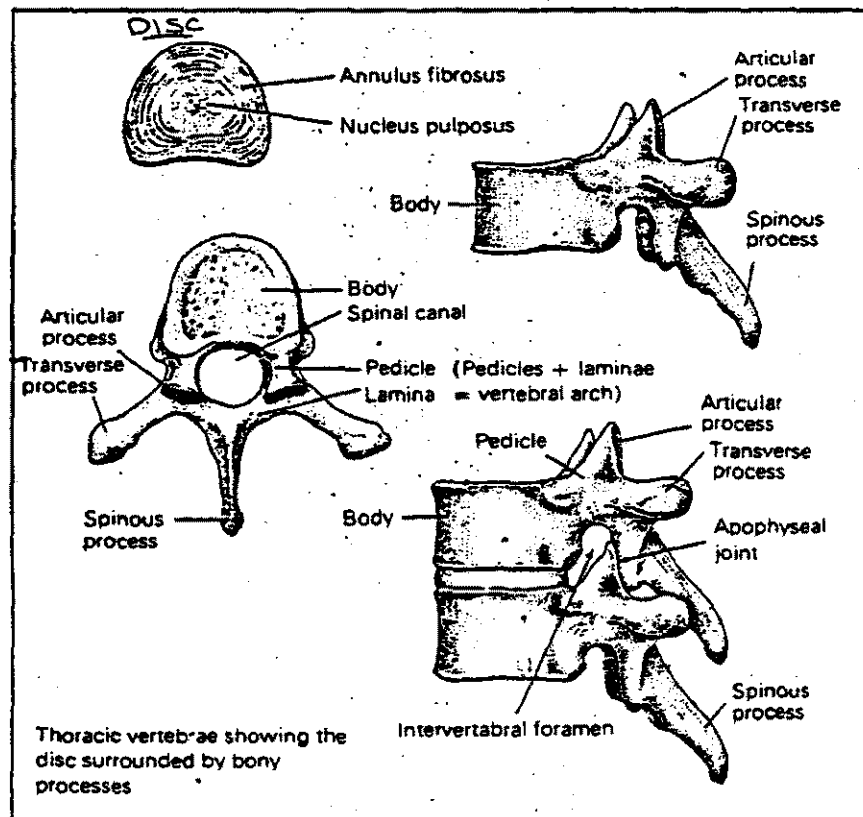




Cervical; thoracic; lumbar and sacral curves of the human spine (from Kapandji, 1974)



Vertebral segment. As viewed from above, the vertebral segment is divided into the anterior and posterior segments. The anterior portion is the vertebral body and the disc structures. The posterior portion consists of the lamina, pedicles, and facets. In this segment the posterior longitudinal ligament is incomplete, placing it at the lower lumbar (L_5) level.



EXERCISES

Bracing

Bracing helps strengthen the abdominal and back extensor muscles, and also helps prevent further back injury. It does this by increasing the intra-abdominal pressure of the lower trunk (by tightening the abdominals and deep back muscles) thus reducing the strain on the spine when moving. This makes a tight cylinder of muscles around the spine and reduces the stress/strain on the vertebrae when doing activities; eg. lifting, pushing etc.

1. Place hands just below the waist.
2. Tighten the abdominal and back extensor muscles so that a widening is felt at the sides of the waist. Think of pushing the hands gently sideways.

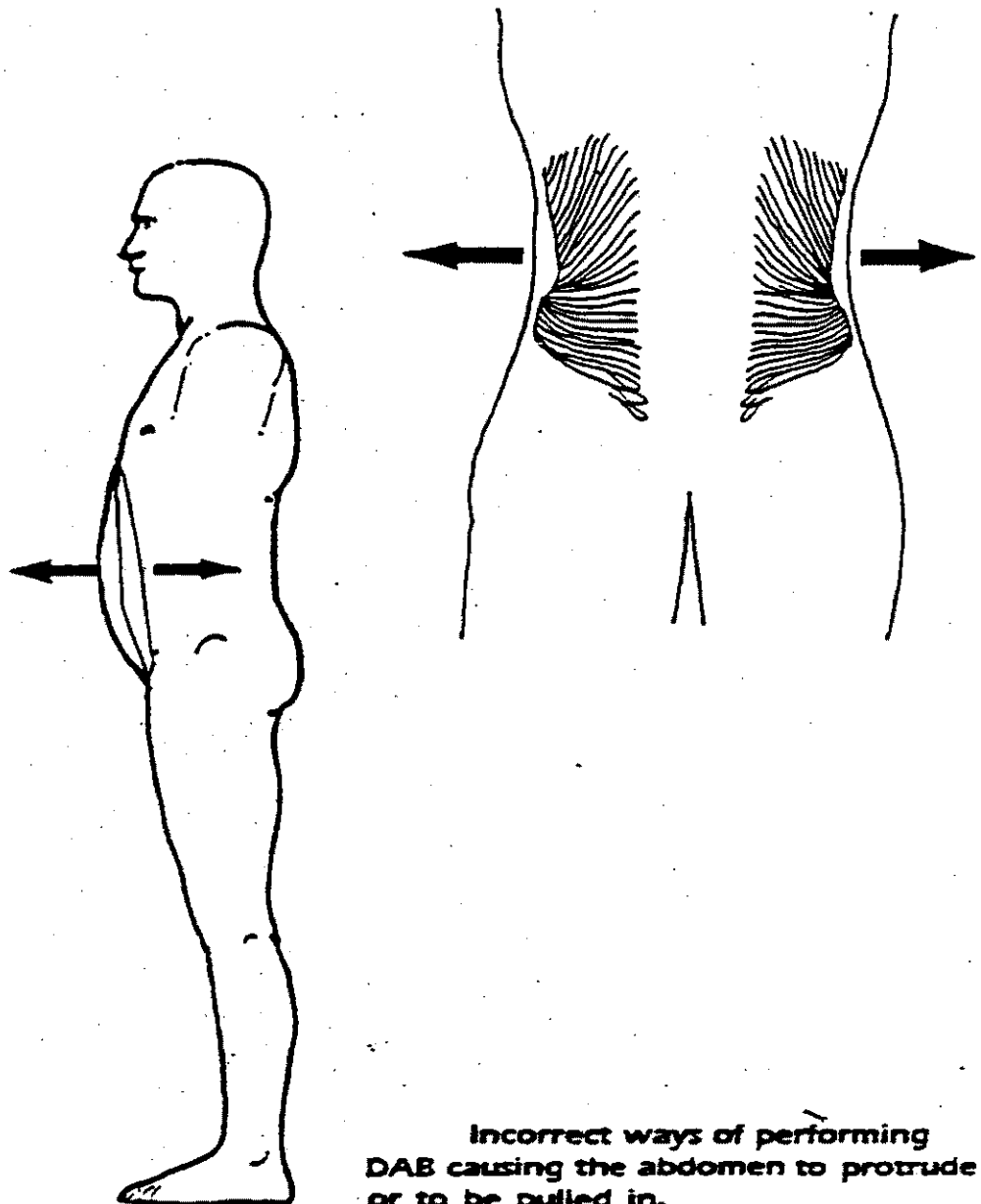
DO NOT - pull in or balloon out the stomach
- do not hold your breath whilst doing the exercise.

If can't seem to obtain the idea of the contracting try:

1. Blowing out through pursed lips
2. Making a hissing sound.

Then try bracing in different positions ie. lifting, sitting, standing. Thus bracing should become automatic when doing any activity that may stress the spine or may be used to ease back pain.

The oblique abdominal muscles.
Arrows indicate the level where
initiation of muscle contraction occurs
with DAB. The muscles contract
and the bulk expands in a lateral
direction.



Incorrect ways of performing
DAB causing the abdomen to protrude
or to be pulled in.

DISC

As we said last session, the disc is like a hydraulic system between the vertebrae.

It is made up of 2 parts:

1. ANNULUS FIBROSIS
2. NUCLEUS PULPOSIS

write on white board

1. Overhead of discs.

The annulus is like a containing wall - it is made up of intertwining fibrous mesh, and surrounds the nucleus. The annulus keeps the nucleus intact with its fibres, which have some elasticity, allowing movement between the vertebrae. The fibres criss-cross at certain angles to each other, which helps to control rotation movements.

2. Overhead of disc as "BARREL"

- This shows how the fibres of the annulus hold the nucleus in, and resist damage.

Back to first overhead

The Nucleus Pulposus is made up of a gel, and is the centre of the disc. It is made up of 80% water, and this fluid system takes the shock of compression and weight bearing forces, thus keeping the vertebral bodies on either side apart.

Overhead of Bill Back-Pain and Disc pressures

This diagram shows how disc pressure changes in different positions of the back, and with a load being lifted.

DISC PROLAPSE (or herniation)

When the load on the disc is too great, some of the fibres of the annulus may rupture, and the nucleus may bulge out.

This usually happens in a disc which has degenerated somewhat i.e. it has lost some of its fluid, and therefore some of its shock-absorbing capacity, so less load is needed to damage the disc.

It may (rarely) happen in a healthy disc, with extremely large loads.

While in most cases there is lifting injury or similar which causes the disc prolapse, repeated strains over a long time can have similar effects, which come on more slowly.

Overhead —

TERMS AND CONDITIONS

SPONDYLOSIS
OSTEOARTHRITIS
RHEUMATOID ARTHRITIS
SCIATICA
OSTEOPOROSIS
SCOLIOSIS
ANKYLOSING SPONDYLOSIS
SPONDYLOLISTHESIS

1. SPONDYLOSIS:

- affects the central joints
- degeneration and narrowing of the intervertebral disc (as previously discussed) - this causes increased pressure at the areas where the disc meets the bone, and bony spurs form (osteophytes).

SHOW XRAY

These spurs can grow into the neural foramen, and interfere with the nerve root.

2. OSTEOARTHRITIS:

- also a degenerative process, from wear-and-tear, which occurs in joints that have been affected by age, decreased blood supply, previous disease or injury, or in a few cases, congenital defect.
- wear-and-tear is the important point here: if a joint was never put under stress, it would never become osteoarthritic.
- in the spine, Osteoarthritis affects the facet joints.

XRAY

3. RHEUMATOID ARTHRITIS

- a chronic disease, of inflammation of the joints.
 - the continued inflammation ultimately can result in destruction of the cartilage, and the bone itself
- (The cartilage is the surface of the joint - coated with fluid to decrease friction between the bones).
- in the spine, Rheumatoid Arthritis affects the facet joints.

XRAY

4. SCIATICA

- referred leg pain.

This pain may come from a number of different structures in the back

- pressure on the nerve root
- chemical irritation of the nerve root
- facet joints

5. OSTEOPOROSIS

- decreased mineralisation of the bones
- usually occurs in middle age, especially in women following menopause.
- can also be a result of prolonged bed-rest or inactivity.

XRAY

6. SCOLIOSIS

- a lateral curve of the spine.

Several causes:

- idiopathic - i.e. comes on for no apparent reason, commonly in young girls
- poor posture/muscle imbalance
- muscle spasm due to pain on one side
- often associated later in life with osteoporosis.

?XRAY

7. ANKYLOSING SPONDYLOSIS:

The intervertebral discs are replaced by connective vascular tissue and then made into bone (ossification). This occurs especially around the annulus and ligaments thus on X-ray showing a "bamboo" spine. Their main problem is stiffness of the spine.

XRAY

8. SPONDYLOLISTHESIS:

A shift of one vertebrae on another, usually forwards. This mainly occurs in the lower lumbar region (L4/5, L5/S1) and can be caused by defect in the laminar stretching of the pars interarticularis ligament or trauma e.g. car accidents. This may produce disc prolapse and pressure on nerve roots, thus giving back pain. Care must be taken that the vertebrae does not slip forward onto the spinal cord, as this may produce paralysis in the legs.

XRAY

DISC

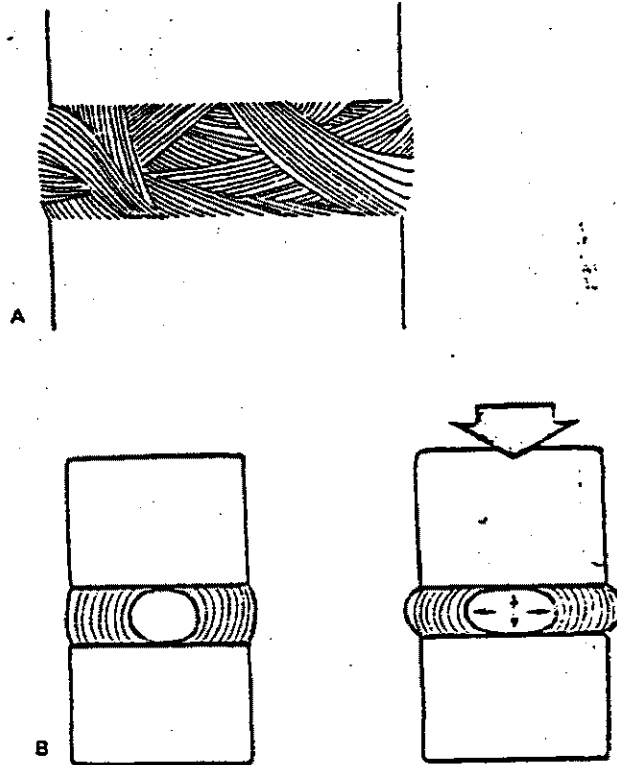
Between each vertebrae is a disc which acts as a shock absorber and as a type of joint. Each disc has a tough fibrous outer casing firmly attaching it to the vertebral body above and below, called the annulus. A capsule of soft gelatinous (like toothpaste consistency) is found inside the disc and this is called nucleus pulposus. A disc is quite adjustable and copes easily with the shifting movements and normal shocks/strains of the spine.

The anterior (front) fibres of the annulus are quite strong and thick due to the anterior longitudinal ligament. But the fibres posteriorly (back) are relatively weak due to the thin posterior longitudinal ligament supporting it. Thus any disc protrusions usually occur backwards or sideways through the disc.

The highest incidence of disc trouble occurs from 35-55 years of age. This is due to degeneration of the disc occurring: small cracks start to appear in the firm outer layer and a decrease in fluid content, thus making the disc thinner and less elastic.

Thus if a disc has started to degenerate and/or if excessive pressure is applied to it, the annulus may rupture and the soft interior may bulge out or leak out of the disc, pressing on nerve roots causing severe pain and muscle spasm.

Thus there is no true "slipped" disc problem just a 'slip' in the terminology used.



A, the annulus is a laminated structure with the fibrous lamellae running obliquely. This disposition of the fibers permits resistance of torsional strains. B, the nucleus pulposus is constrained by the fibers of the annulus. When a vertical load is applied to the vertebral column, the force is dissipated radially by the gelatinous nucleus pulposus. Distortion and disruption of the nucleus pulposus are resisted by the annulus.

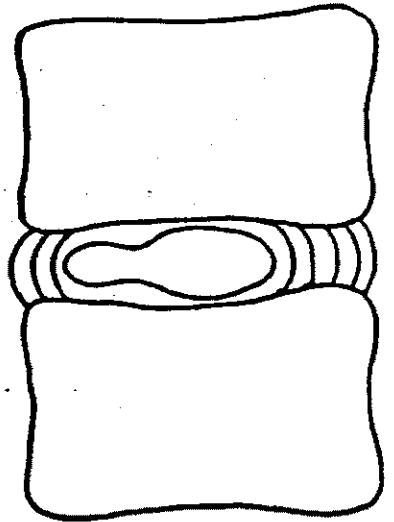
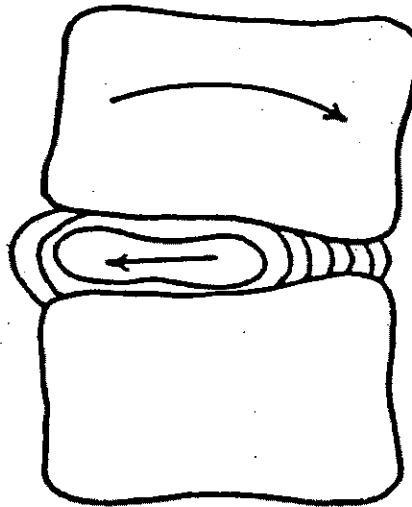
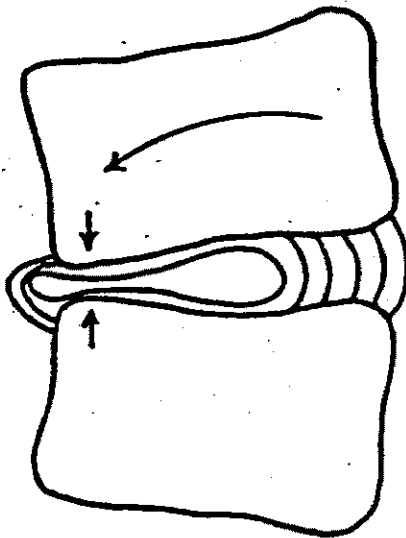
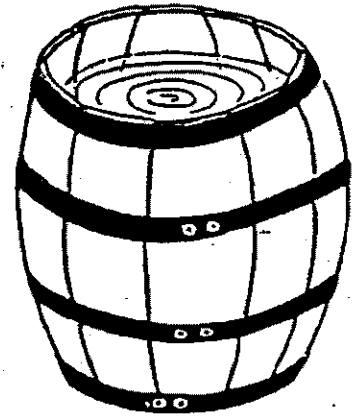
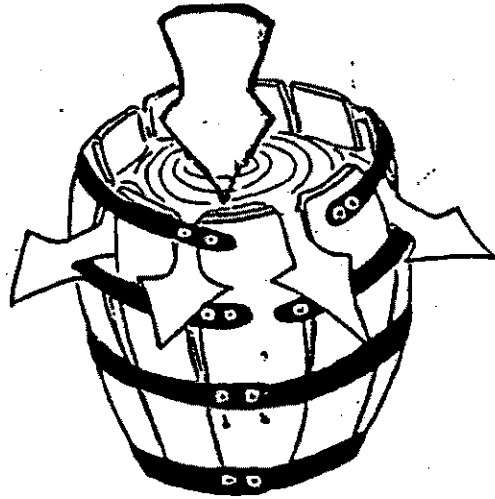
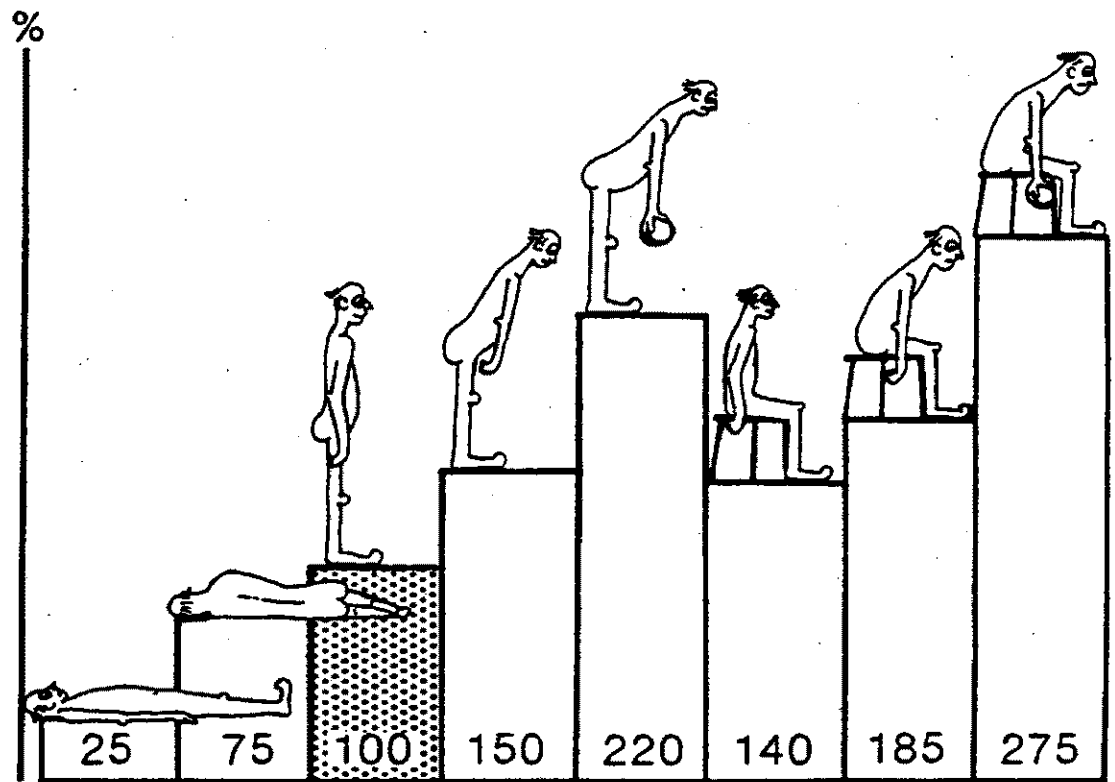


Fig. 4. Left. Large prolapse centered. Center. Prolapsed nucleus shifted further posteriorly by forward bending. Right. Impingement of prolapsed material by backward bending.

THE ROLE OF THE DISCS



Relative change in pressure (or load) in the third lumbar disc in various positions in living subjects.

HYDROTHERAPY

AIMS

- To introduce the class to exercising in water.
- To show that the exercises can be done assisted, actively or resisted.
To gradually increase the exercises during the sessions.
- To strengthen the back and abdominal muscles without trying to increase the active range of movement of the back.

SESSION ONE:

The exercises are to be started assisted or active (no resisted) and are to be repeated 5 times each. They are only to be done within the person's pain limits.

EXERCISES SHOWN:

1. Walking in water - forwards
 - backwards
 - sideways
2. Hip - flexion/extension
 - abduction/adduction
3. Thoracic spine - protraction/retraction
4. Single arm - flexion/extension
 - horizontal abduction/adduction
 - circles

SESSION TWO:

The exercises are only to be done within pain limits and modified as necessary.

EXERCISES:

1. Walking in water - forwards
 - backwards
 - sideways
2. Hip - flexion/extension
 - abduction/adduction
3. Standing up onto toes
4. Single then double arm - Flexion/extension (alternate arms)
 - horizontal abduction/adduction
 - circles (faster and larger)
5. Trunk rotation - hands clasped in front the rotating whole body side to side (do not turn trunk on pelvis).

SESSION THREE AND FOUR:

Exercises are to be increased, after reassessment of their exercise tolerance.

1. Walking in water to warm up.
2. Standing up onto toes.
3. Stepping up and down step in pool.
4. Single and double arm exercises with hands cupped
 - flexion/extension (alternate arms)
 - horizontal abduction/adduction
 - circles (larger, smaller, fast, slow)
5. Leg bicycling with arms and back supported on the rail.
6. Bunny hops.
7. Trunk rotation with hands clasped in front.

EXERCISES

1. Flattening Lumbar Spine.

Lie on back with knees bent and two hands under the small of the back. Brace then press the small of the back against your hands. Relax the back muscles first, then relax the brace.

2. Gluteal exercise.

Lying on stomach with head to one side. Brace then straighten one leg and lift it 4" off the bed. Hold for approx 5 seconds then lower leg and relax the brace.

- Modify this if it increases back pain by only tightening gluteals only.

3. Abdominal exercise.

Lie on back with knees bent and hands resting on thighs. Brace then tuck chin in and raise head and shoulders off the bed. Lower your head to the bed and relax the brace.

- Progress by doing diagonal abdominal exercises

- place both hands on one thigh then raise head and shoulders towards the same thigh.

4. Hip adduction/abduction exercise.

Lie on side with bottom leg slightly bent. Lift, straighten other leg 4" and hold for 5 seconds then lower leg.

5. Pelvic tilting.

Lie on back with knees bent. Rock pelvis slowly forwards then backwards.

6. Lowback stretches.

Lie on back with pillow under one knee. Bring the other knee up towards the chest and hold with both hands for 10 secs, feeling only a tightness in lower back (not any pain) then relax leg to bed. Do the same stretch using other leg.

Overhead

PAIN SENSITIVE STRUCTURES

- BONE
- JOINT
- LIGAMENT
- MUSCLE
- NERVE

Why do I have back pain?

1. BONE
 - crush fracture
 - osteoporosis
 - tumour (very rare in spine)
2. JOINT
 - facet joint strain, irritation (inflammation), locking(stiff)
3. LIGAMENT
 - especially posterior longitudinal ligament, (also supraspinous in "sprung back" where these ligaments are ruptured)
 - chronic strain or stretch stimulates the pain-sensitive endings in the nerve inside the ligament
 - rupture (tear)
 - pressure on the ligament
4. MUSCLE
 - strain
 - tear
 - spasm
 - fatigue
5. NERVES

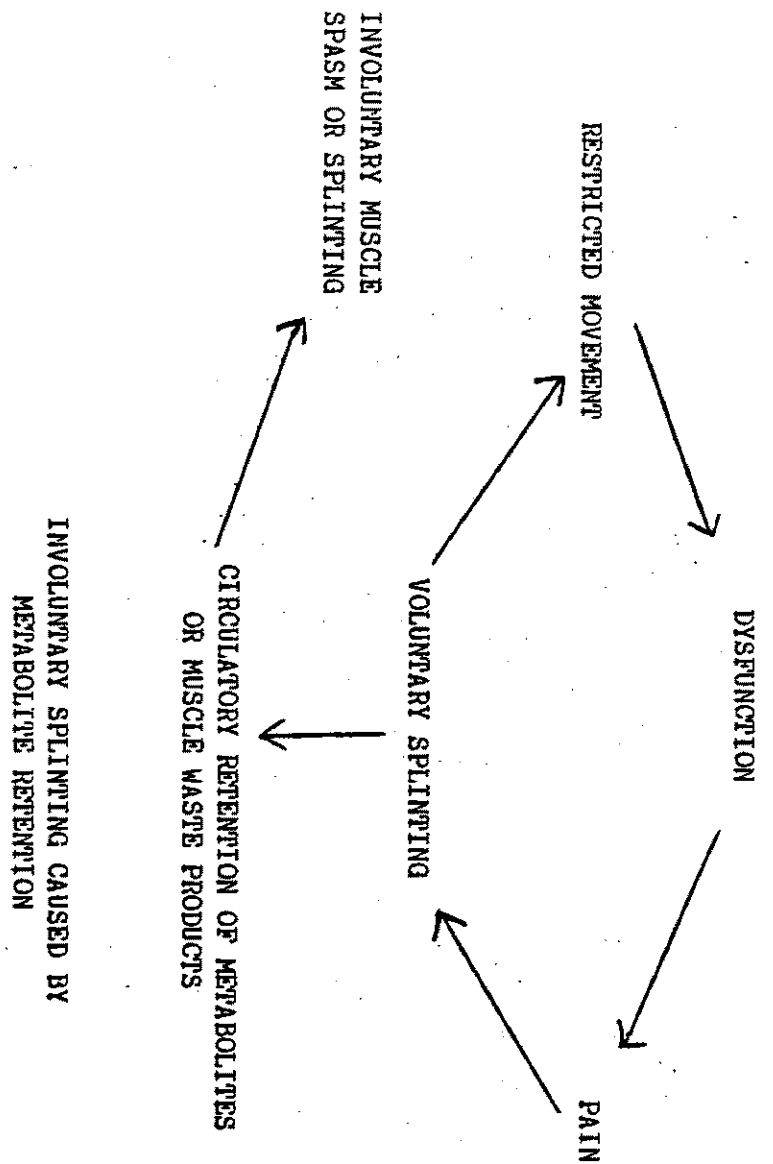
Apart from the stimulation of nerve endings already mentioned, the nerve roots can also produce pain as a result of damage to the DISC.

The disc itself does not have a nerve supply, but can produce pain in a number of ways:

1. Pressure or stretching of the nerve roots from the bulging or ruptured disc can cause pain.
2. Degenerating discs produce a chemical which can irritate the nerve roots even without a disc protrusion.
3. A ruptured disc releases substances which can cause severe pain for up to 48 hours after injury. (proteins in nucleus - not in contact with the rest of the body before).

Thus nerves can be irritated by pressure, stretch and chemicals.

Pressure can also be caused by narrowing of foramina, e.g. - by spurs, stenosis.



WEEK TWO

SESSION 2

POSTURE AND AGE

At birth, the spine only shows one curve which is convex but as the spine adjusts to the upright position these curves develop. The cervical lordosis and thoracic kyphosis develops as the child begins to hold up its head to enlarge its vision. The lumbar lordosis develops as the child begins to sit and stand. Thus as a result the centre of gravity (of the body) can be brought over the weight bearing surfaces of the feet.

Thus the spinal column has a variety of purposes:

1. supports thoracic (lungs and heart) and abdominal cavities
2. behaves as a flexible rod which maintains the body in an upright position
3. serves as an anchoring point for layers of powerful muscles which allow stability and mobility of the spine.

WEEK 3 session 2

EXERCISE AND BACK PAIN
10 GOOD REASONS

1. Help prevent further back injury.
2. Reduces stress.
3. Improves sleep.
4. Weight reduction.
5. Improves self-image.
6. Circulation.
7. Heart - lung capacity.
8. Help prevent osteoporosis.
9. Increase sexual interest.
10. Fun.

MYTHS!

1. 'NO PAIN, NO GAIN'
2. 'PUSH 'TIL IT BURNS'
3. COMPETITION
4. STEAM BATHS
5. RUBBER TRACK SUITS
6. VIBRATING BELTS
7. CELLULITE

MYTHS COMMONLY ASSOCIATED WITH EXERCISE

1. "No Pain, No Gain"

It is not necessary to subject the body to any degree of pain or overwork to derive the benefits that may be gained from exercise. In fact, inflicting pain on the muscles may do more harm than good, inflicting strains or sprains on the muscles or more permanent damage such as tendinitis (weaknesses at tendon sites, in the wrists or elbows for example, which may be chronic (recurring)).

2. "Push Till it Burns"

Again "pushing until it burns" may result in a visit to the hospital rather than a healthy body. Excessive workload or stress on the heart, especially in middle aged or elderly people who are not accustomed to strenuous exercise, or who are unfit, may be fatal.

That is not to say that good or even excellent levels of fitness in the older person are unobtainable. In fact the contrary is possible with gradually incremented, frequent periods of aerobic exercise.

Ageing is a progressive process that results in a decline in the ability of the heart to cope with strenuous work loads or activity. This means that in order to become fit, or increase the quality of your heart's functioning, you must exercise at first at a rate which is comfortable for you (and your heart), so that the heart muscle is not excessively strained. Fitness levels should be built up gradually, through small increases in the frequency and length of your exercise periods, so that your heart will have time to adapt to the increased workload you are putting on it and your muscles will be able to stretch and become more flexible without the risk of injury.

3. "Competition is Good Motivation"

A healthy, fit body should be motivation enough to embark on a programme of physical fitness. Competition may lead to over extension of your capacities when doing these exercises.

4. "Steam Baths/Saunas Are Good To Sweat Out The Bodies Impurities"

Steam Baths do not "purify" the body, nor do they aid in weight loss. They may in fact be harmful to your health causing low blood pressure through fluid loss in the body, or dehydration. These effects may be especially harmful if you are taking any kind of medication or if you have high blood pressure.

5. "Rubber Track Suits Make You Lose Weight Faster"

They do not. Rubber tracksuits simply make you sweat which does not in itself result in any significant weight loss. Towelling or cotton tracksuits, or any absorbant clothing will be best for you.

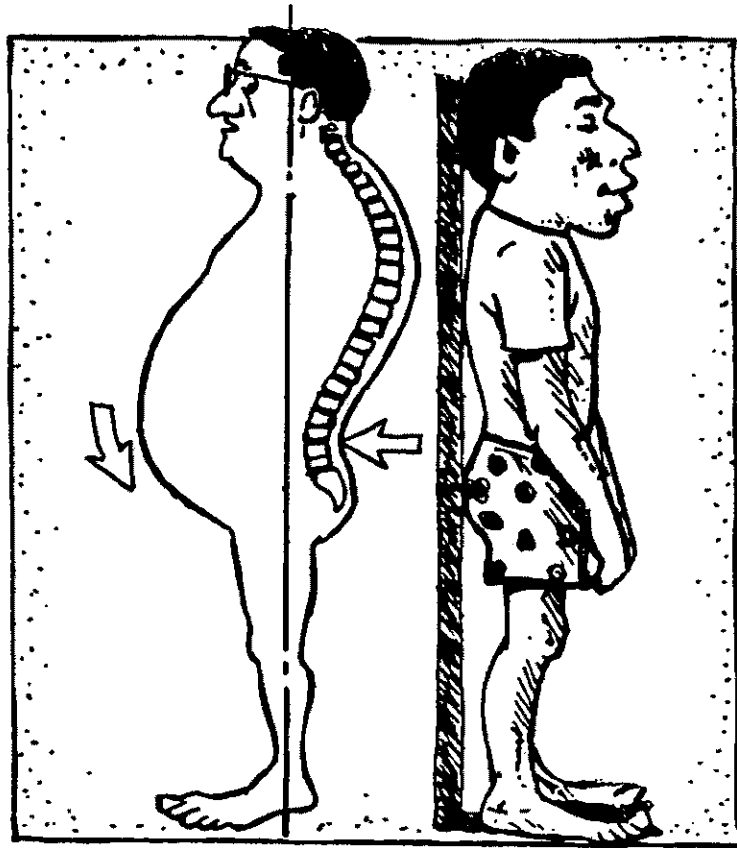
6. "Vibrating Belts and Massages Help Lose Weight"

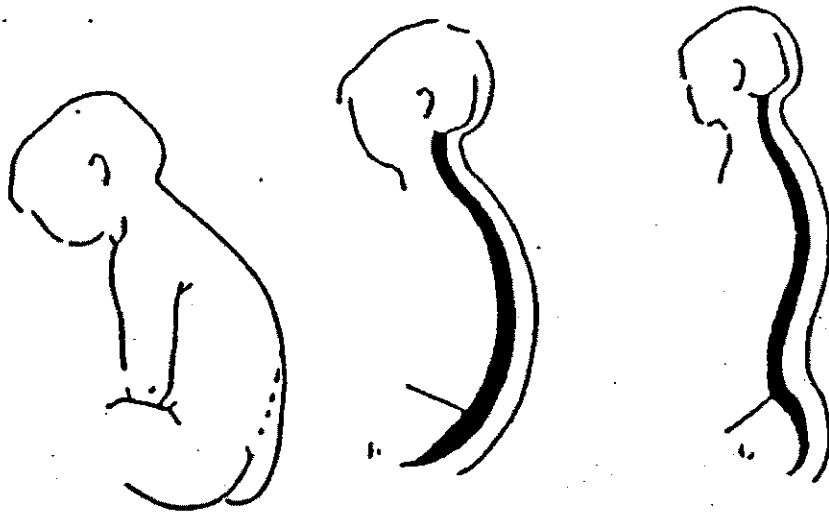
These types of things may be pleasant, however they are not classified as "useful" exercises, rather they are called 'passive exercises'. This means they have no beneficial effect on either the heart, lungs or muscle tone. If there is no exertion on these muscles, no energy will be used up, and hence no weight loss will occur. There may also be a risk of back problems if they are used too often. So there is no advantage in their use.

7. "Cellulite Is A Special Type of Fat"

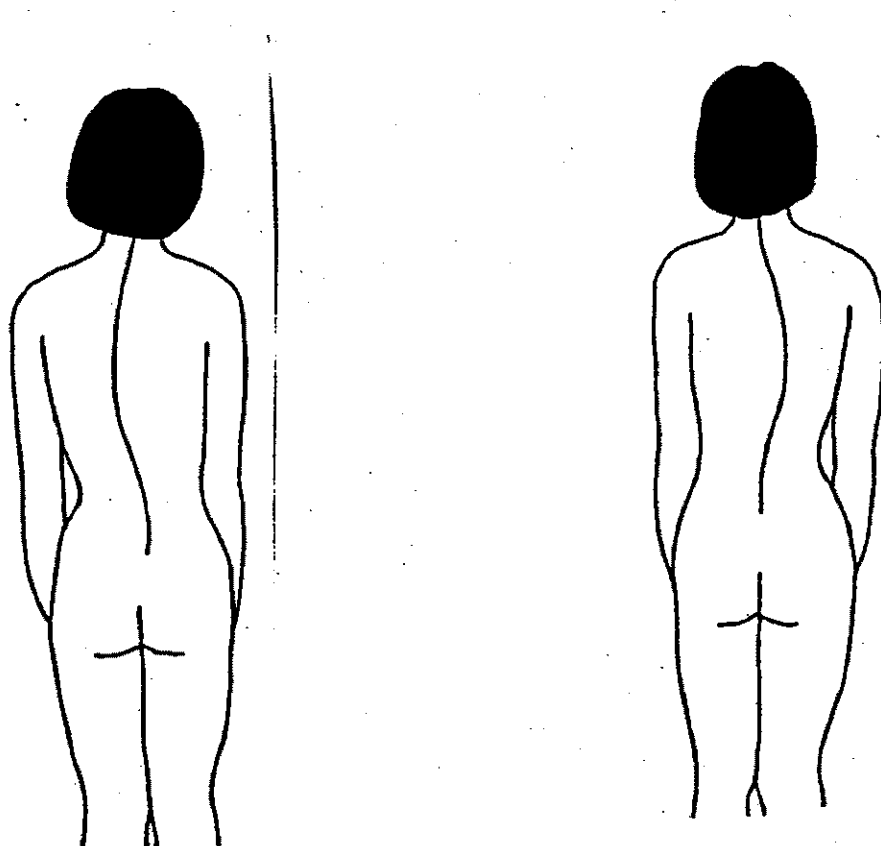
All fat is made up of the same type of cells. Cellulite is just more fat on one particular part of the body. A combination of a weight reduction program and a strict exercise regime will help reduce unwanted fat in these and other areas.

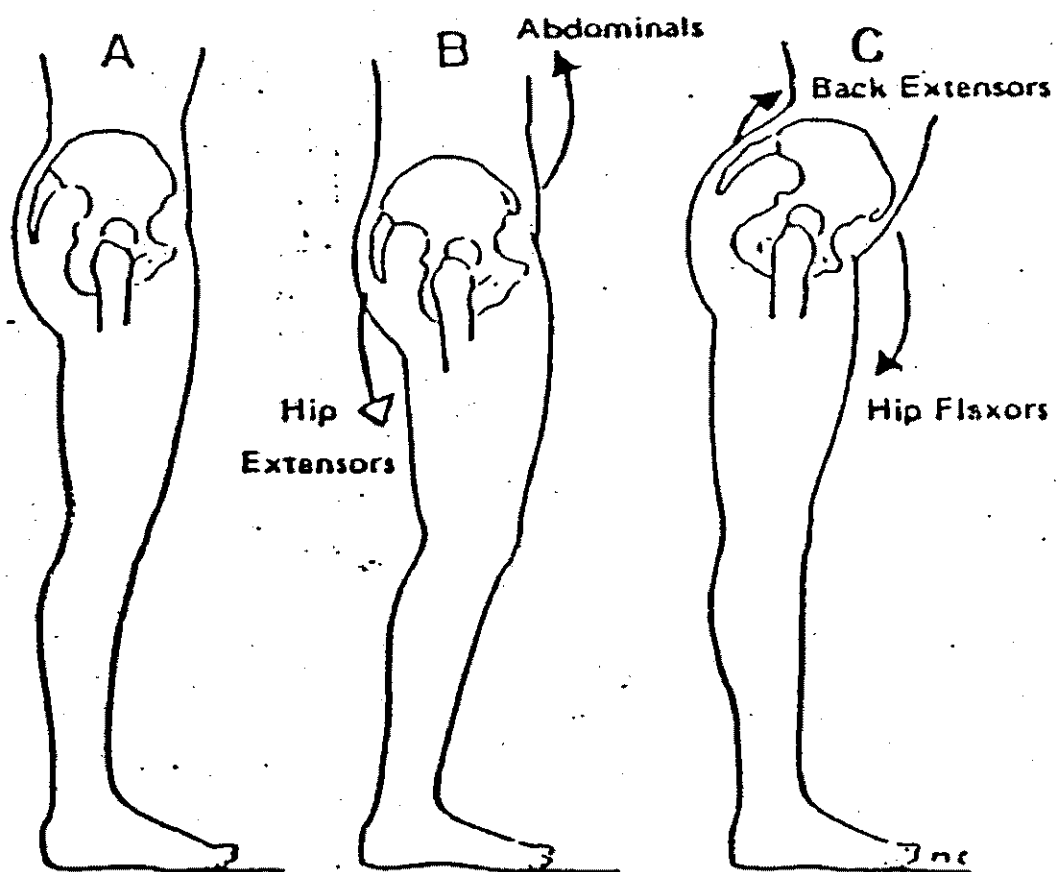
POSTURE





Single posterior curve of the newborn
Lordosis of cervical spine as child holds head up.
Lumbar lordosis added as child sits and stands.

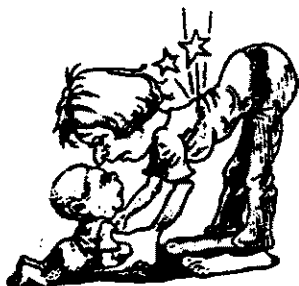
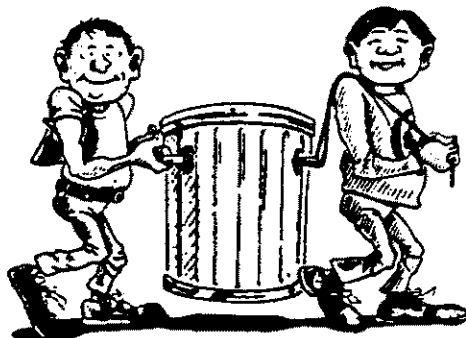




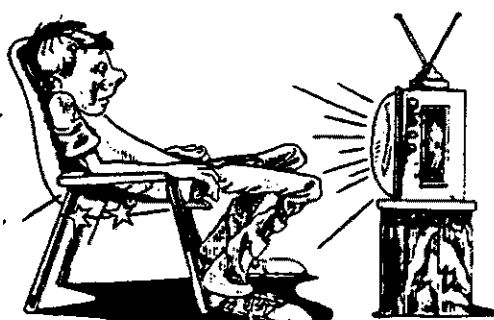
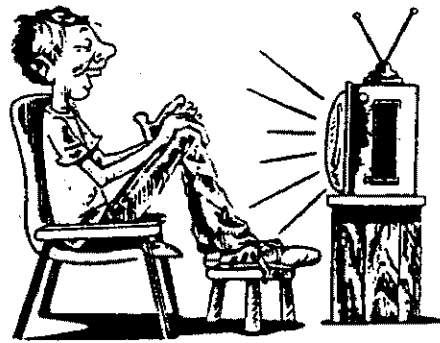
SLEEPING



LIFTING



SITTING



STANDING/WALKING



DRIVING



Treatments for low back pain

- write on white board and discuss as you go.

1. DRUGS

- Pain killers (Analgesics)
 - Aspirin
 - Paracetamol simple
 - Digesic
 - Codeine Phosphate
 - Nembudeine (contains Sodium Pentobarbitone - addictive)
 - Morphine - Pethidine ; Physeptone (Methodone)
- Non - Steroidal Anti-Inflammatory Drugs (NSAID's)
 - Butazolidin
 - Brufen
 - Indocid
 - Napeosyn
 - Dolobid
 - Clinoril
 - Voltaren

used for inflammation either chronic eg. Rheumatoid Arthritis or acute eg. Post - back injury.
- Anti-anxiety / muscle relaxants
 - Diazepam eg. Valium, Ducine
 - Serepax
- Anti-depressants
 - Tryptanol (amitryptaline)

2. CONSERVATIVE

- Bed rest
- ice
- heat - infrared, moist heat, SWD, u/s
- massage
- accupressure
- traction - hospital - pelvic, leg.
- physio - intermittent.

EXERCISES! (for pain directly and indirectly)

Interferential

TNS

Joint Mobilisation/manipulation - Physio

Chiropractic/osteopathy

Acupuncture

Herbalism/Naturopathy

Iridology

3. SURGERY etc. ie. INVASIVE TREATMENTS

- manipulation under Anaesthetic
- Epidural and cortisone
- Aneasthetic blocks
- Sympathectomy - cut sympathetic nerve supply.
- Rhysotomy - cut nerve to facet joint. (pain usually returns within 3 months)
- Laminectomy - R/O one or both laminae to relieve pressure.
- Disectomy - R/O disc or part of.
- Fusion - usually at facet joints.
 - R/O cartilage, new bone (eg. from hip) is inserted, and joint fuses.

Physio. Programme.

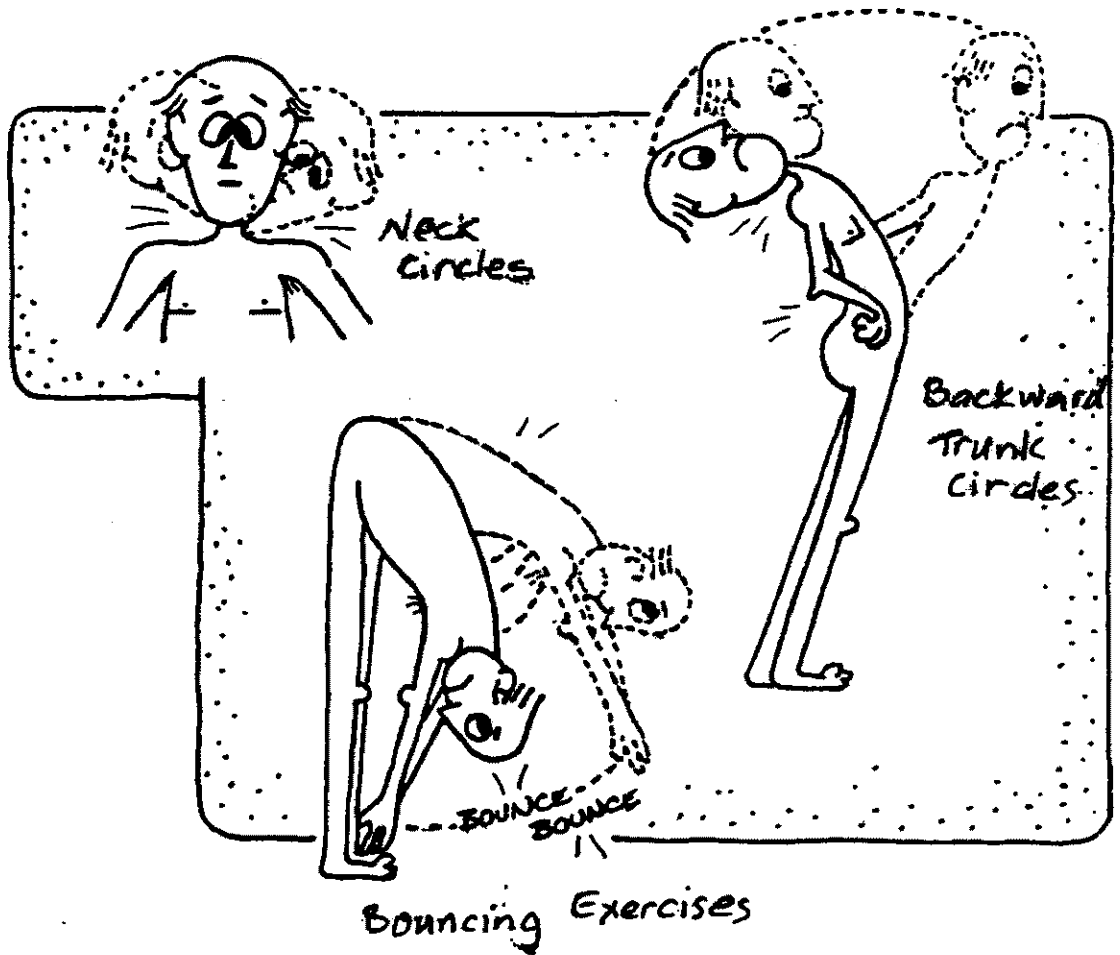
DON'TS

1. Don't hold one's breath while exercising or do isometric arm exercises as these increase blood pressure and could be especially dangerous for those with hypertension or cardiovascular problems.
2. Don't eat or drink (other than water) 2 hours or less before or after exercise. Avoid all alcohol also.
3. Don't exercise during an illness or infection, as the body temperature is usually raised to fight the infection and exercise will increase it further.
4. Don't have a hot shower immediately after the exercise as your body temperature is already increased.
5. Don't take salt tablets as our diets already supply us with excess amounts of salts.
6. Don't bounce when doing exercises or stretches as it can tear muscles.

SOME COMMON EXERCISES TO AVOID:

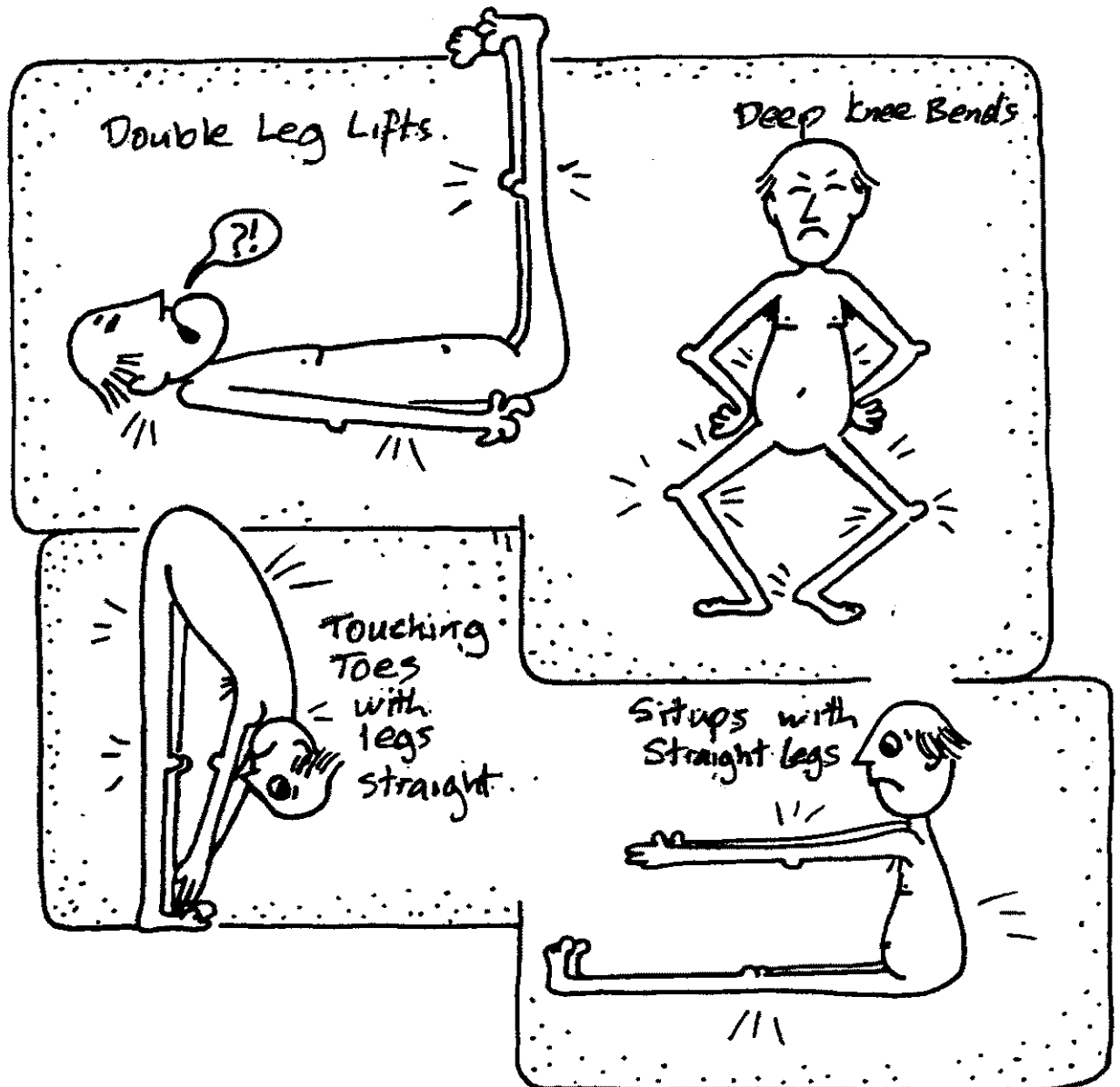
- Double leg lifts
- Standing toe touches with legs straight
- Sit ups with straight legs
- Keep knee beds
- Back bends and backward trunk circling
- Bouncing exercises
- Neck Circles

Exercises to Avoid!!



Exercises to Avoid!!

Physio. Programme -
Overhead.



HANDOUTS GIVEN TO PATIENTS BY PHYSIOTHERAPISTS.

ANATOMY

STRUCTURE OF THE SPINE

5 Sections:	Cervical	(neck)	-	7 vertebrae
	Thoracic	(chest)	-	12 vertebrae
	Lumbar	(low back)	-	5 vertebrae
	Sacrum		-	5 fused vertebrae
	Coccyx		-	3-4 small bones (fused).

Gentle Curves: Cervical and lumbar have a LORDOSIS
Thoracic has a KYPHOSIS.

Spine consists of vertebrae, separated by discs, attached by ligaments and moved by muscles.

A vertebrae has:

- Body
- Pedicles
- Laminae
- Transverse Processes
- Spinous Processes

In the centre is the spinal canal through which the spinal cord passes.

Facets-make up joints with the vertebrae above and below, which leave a hole, or FORAMEN, for the NERVE ROOTS.

Ligaments:

- made of thick fibrous tissue
- tough, but flexible - they give NO resistance to normal movements
- designed to prevent abnormal, or too much movement
- they are protected from excessive tension by reflex contraction of muscles.

Nerve Roots:

- branches from the spinal cord.

Nerves:

- Sensory - send messages to the brain about pain, heat, cold, texture etc.
- Motor - operate the muscles by signals from the brain (or spinal cord with reflexes)

DISC

The Disc is made up of 2 parts.

- 1) Annulus Fibrosis (outer containing wall)
- 2) Nucleus Pulposus (gel like centre: 80% water)

Disc pressure changes in different positions of the back.

Disc Prolapse (or herniation)

When the load on the disc is too great, some of the fibres of the annulus may rupture, and the nucleus may bulge out.

TERMS AND CONDITIONS

Spondylosis - degeneration and narrowing of the intervertebral disc.
(central joints)

Osteoarthritis - a degenerative process from wear-and-tear.
(facet joints)

Rheumatoid Arthritis - a chronic disease, of inflammation of the joint
destruction (facet joints)

Sciatica - referred leg pain

Osteoporosis - decreased mineralisation of the bones.
"egg-shell" vertebrae on x-ray.

Scoliosis - a lateral (sideways) curve of the spine.

Ankylosing Spondylitis - "bamboo" spine on x-ray.
whole spine becomes fused.

PAIN SENSITIVE STRUCTURES

- Bone
- Joint
- Ligament
- Muscle
- Nerves
 - stimulation of nerve endings
 - as a result of damage to the disc.

DISC

Between each vertebrae is a disc which acts as a shock absorber and as a type of joint. The annulus (fibrous outer casing) attaches firmly to the vertebral body above and below, with the nucleus pulposus (soft gelatinous capsule) found inside.

Because the posterior fibres (back) are relatively weak any disc protusions usually occur backwards or sideways, through the disc.

The highest incident of disc trouble occurs from 35 - 55 years of age. This is due to degeneration of the disc occurring.

There is no true 'slipped' disc problem.

HOW TO LIFT PROPERLY

1. Get a firm footing. Keep your feet apart for a stable base and point toes out.
2. Bend your knees. Don't bend at the waist. Don't lift more load at the one time than you have to.
3. Tighten stomach muscles. Abdominal muscles support your spine when you lift, offsetting the force of the load. Train muscle groups to work together ie. bracing.
4. Lift with your legs. Let your larger powerful leg muscles do the work of lifting, not the smaller weaker back muscles.
5. Keep the load close. Don't hold the load away from your body. The closer it is to your spine the less force it exerts on your back.
6. Keep your back upright. Whether lifting or putting down the load, don't add the weight of your body to the load. Avoid twisting as it can cause injury.

WEEK 4 - SESSION 2 - SUMMARY

Treatments for low back pain.

1. Drugs

- Pain killers (analgesics)
- Anti-inflammatory
- Anti-anxiety/muscle relaxants
- Anti-depressants

2. Conservative

- Bed rest	- T.N.S.
- Ice	- Joint mobilization/manipulation - Physio
- Heat	- Chiropractic/Osteopathy
- Massage	- Acupuncture
- Acupressure	- Herbalism/Naturopathy
- Traction	- Iridology
- EXERCISES	

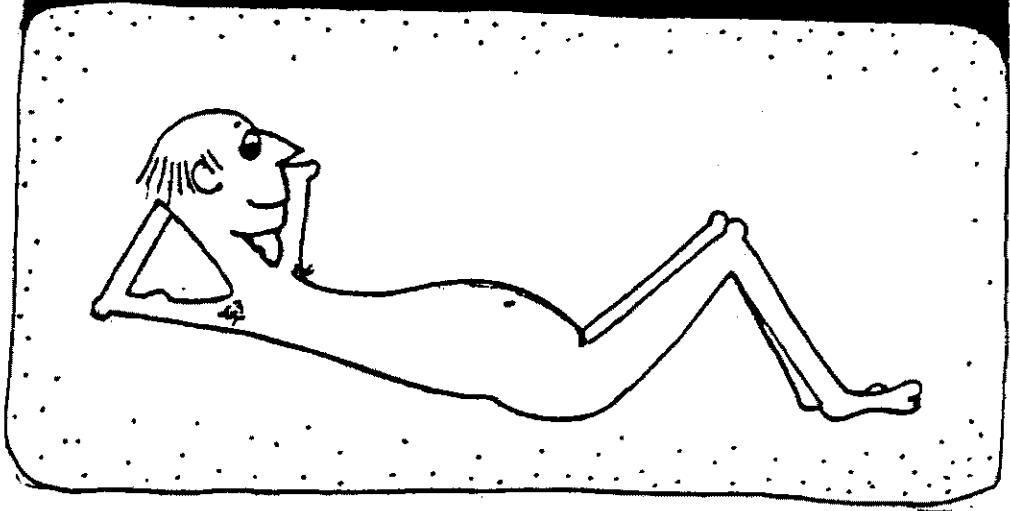
3. Surgery (i.e. invasive treatments)

- Laminectomy: removal of one or both laminae to relieve pressure
- Disectomy: removal of disc or part of the disc
- Fusion: usually of the facet joints by removing the cartilage of these joints then inserting new bone (e.g. from hip) to allow the joint to fuse

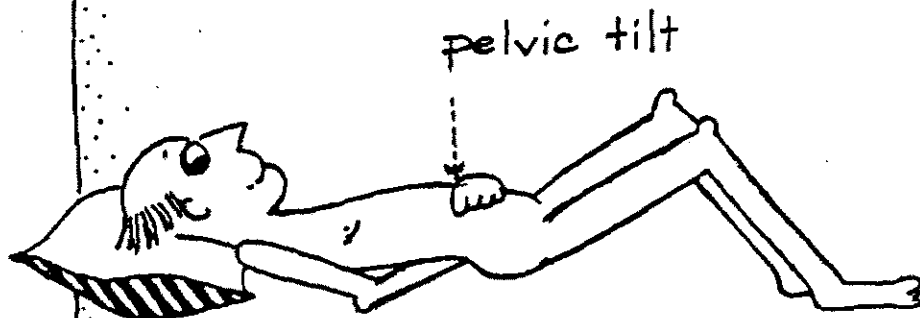
Other invasive treatment

- Epidural and cortisone injections
- Anaesthetic block
- Sympathectomy
- Rhysotomy

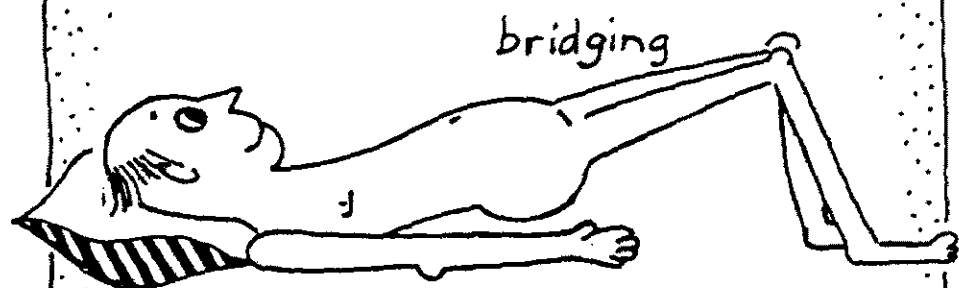
for the stomach



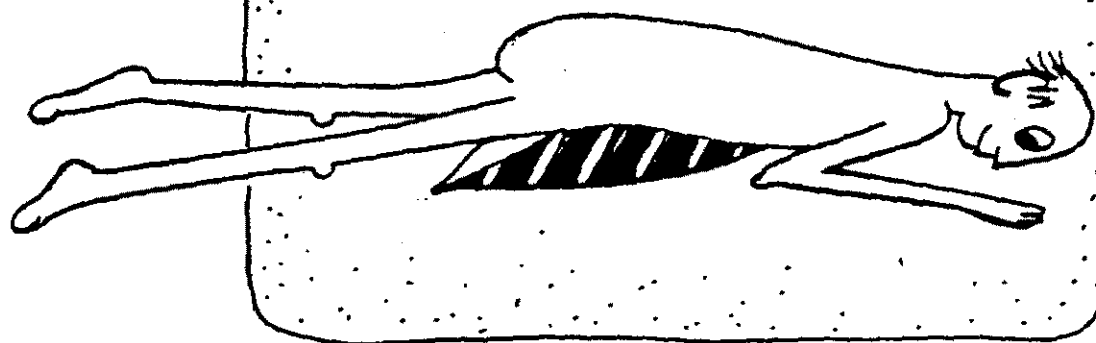
for the stomach



for back muscles

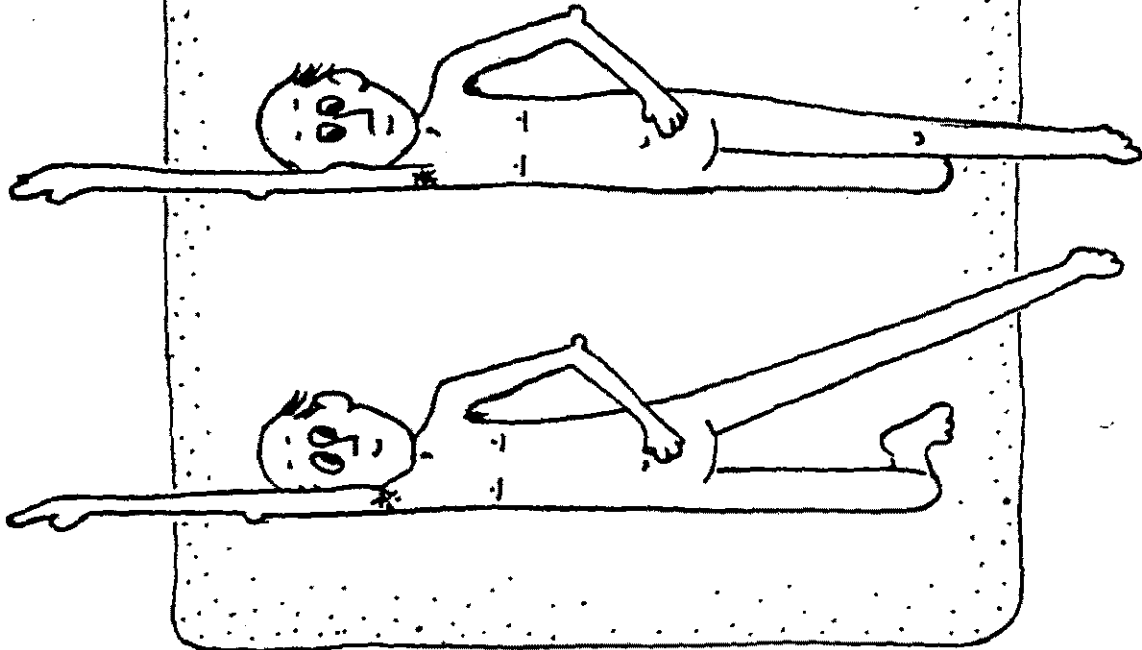


for strengthening back & buttocks



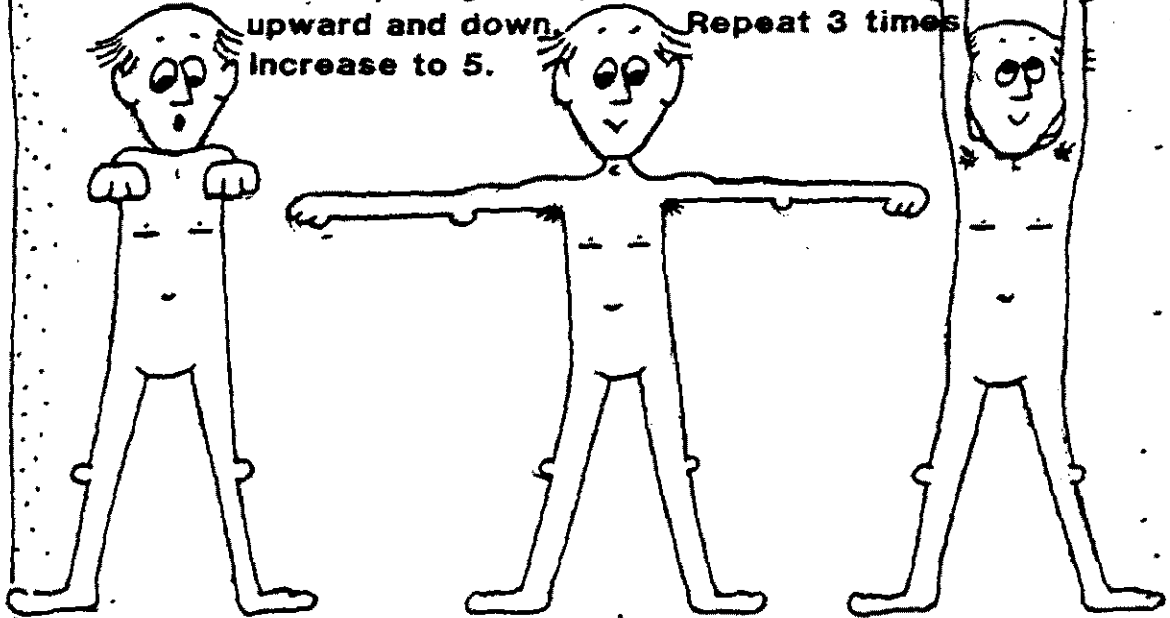
for hips & thighs

Lie on your side. Raise your straight leg sideways to 45°. Hold 10 seconds. Lower.

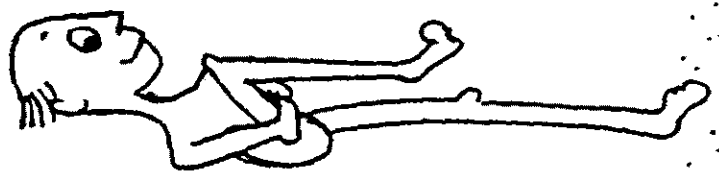


arm thrusts

With feet six inches (15cm) apart, make fists bend elbows, then thrust arms forward, bring back: thrust sideways, bring back, then thrust arms upward and down. Repeat 3 times. Increase to 5.

**single knee pull-for low back**

Lie on your back on the floor. Pull one leg up onto your chest by grasping it with both arms. Hold for the count of 5. Repeat with the opposite leg.



APPENDIX D

EXERCISE RECORD

NAME: _____

Week of Programme: _____

INSTRUCTIONS: Each exercise should be practised in sets of 5.
 Each time you complete a set of 5 make the following
 mark on the paper: / (e.g. if you complete ~~the~~ sets
 of 5 you would write: //).

D A Y

EXERCISE	1	2	3	4	5	6	7
BRACING							
STOMACH EXERCISE							
FLATTENING LOWER BACK (Pelvic Tilt)							
BRIDGING							
BACK AND BUTTOCK EXERCISE							
HIP AND THIGH EXERCISE							

APPENDIX E

Name: _____

IDENTIFYING YOUR REACTIONS TO PAIN

Make a record of your thoughts and feelings when your pain increases. Try to record your reactions as soon as possible after they happen (so they're easier to remember). And try to be as specific and honest as possible as it will help in our understanding of your pain problem.

Try to record your reactions at least 10 times before the next session.

Date	Pain Level (0-5)	Thoughts	Feelings
Examples:			
1/7/87	3	I can't stand this anymore	Angry
1/7/87	5	My pain feels terrible No one really understands	Upset Depressed

COGNITIVE SUMMARY SHEET

REMEMBER

1. Be alert to negative thoughts.
2. Use negative thoughts as signals that it is time to change.
3. Deliberately "say to yourself" helpful things, and use other coping strategies.

PREPARATION

1. Reject a helpless attitude. Work at coping; develop a plan.
For example:
 - . I can deal with this task. Let me actively prepare.
 - . I must just think about what I can do to deal with this. Think about a plan for future events.

Add here any others that you can think of that will help you to begin using coping techniques when you need them _____

2. Keep a positive attitude: Stop negative thoughts and redirect your attention to positive ideas. Some self-statements you could use:
 - . Stop worrying. Worrying won't help anything.
 - . What are some of the things I can do instead?
 - . I'm feeling anxious - that's natural. But that's no reason to give up. Let me just add examples here

CONFRONTATION

1. Make use of the general coping strategies. Switch strategies as necessary, and use self-statements to direct your attention to as many or as few coping strategies as you need.
 - . All right, I'm feeling tense. That lets me know that I should take some slow, deep breaths as I relax more, and switch from the strategy I was using to another one.
 - . I won't get overwhelmed. I'll just take one step at a time. Let me just use my skills to handle a bit at a time.
 - . STOP these negative thoughts. Let me just concentrate on one of the strategies to do something positive.Add examples here. _____

2. IRMA: Imagery, Relaxation, Mental Activity. Remind yourself of the possibilities in coping techniques.
 - . This pain is getting to me. Wait! Remember IRMA: Imagery, Relaxation, and mental Activity. OK; let me develop a good (or Relax, or use a Mental Activity).
 - . Relax. Just breathe deeply and relax.

- . Concentrate fully on breathing and relaxation
- . I won't think about my pain. I will focus my attention on remembering details of the movie I saw last night.

Take a few moments to review some of the strategies that were covered in both sessions. Then add here any other self-statements that you might use to call these to mind. Develop your own versions of images, relaxation, mental activities, and so on. Add examples here. _____

CRITICAL MOMENTS

1. Be realistic in expecting some intense stimulation, but don't magnify the sensations. Just keep them manageable.
 - . When I feel a lot of pain, I should just pause and then focus again on a strategy for dealing with it.
 - . I won't attempt to eliminate the pain totally. I just need to keep it manageable.
 - . I knew the sensations would rise. But I can keep them under control.

Add examples here _____

2. When you find yourself giving way to unpleasant thoughts or feelings, deliberately STOP them. Substitute coping self-statements to get you back on the right track. The following are some statements to use in this regard:
 - . Things are going pretty badly. I can't take any more - no, wait - just pause. I shouldn't make things worse. I'll review my planned strategies to see what I can switch to.
 - . My pain feels terrible. Things are falling apart. No. I'll stop that. Relax. I will focus my attention on something else. That's better, I'm regaining control. Just a slow, deep breath ... Good.
 - . I can't get my mind off the pain. I'll have to stop. NO! Wait a minute! I planned for this. Stop the negative thought. Let me use a strategy, and I'll get over this difficult time. OK, let me relax, breathe slowly and deeply.

Add examples here _____

Once again, remember that the key is to recognize negative thoughts and feelings, to interrupt them with positive self-statements, and to use these coping self-statements to guide you in the use of coping strategies.

REFLECTING ON HOW THINGS WENT (dealing with the feelings and thoughts you had about your ability to cope with, reduce, and eventually avoid the pain)

1. At first you may notice only a little change, but note how you are beginning to gain control. You deserve a pat on the back from yourself for having tried. If you've brought the pain under control even a very little bit, you deserve to feel proud.

Mental Coping Techniques

Reducing or challenging the negative or gloomy thoughts that often go through your mind when you feel your pain is getting worse or bothering you more can help you to cope with the pain.

It can also be helpful if you can shift your attention away from the pain (in other words, if you can try not to notice it).

Here are some techniques you can use to help you do this. Of course, they are not magical and will only be of use if you practice them often.

Try to get good at several of them so you can shift from one to another when you need to.

- (1) Imagine a pleasant, relaxing scene (e.g. imagine you are lying on a beach and it is a nice, warm day).

Think of your own examples: _____

- (2) Imagine an exciting or interesting scene (e.g. imagine you are at the Olympic Games and have just won the marathon)

Think of your own examples: _____

- (3) Focus your attention on the scene around you (e.g. if you are in the car, notice the other cars, their drivers, colours, etc.).

Think of your own examples: _____

- (4) Focus on some part of your body which is not painful.

- (5) Think about or actively plan something you would like to do (e.g. going for a holiday, redecorating the house, walking in the Botanic gardens, etc.).

SUGGESTED ACTIVITIES(A) CREATIVE ACTIVITIES

1. Doing art work
2. Pottery, ceramics, etc.
3. Knitting, needlework, sewing, etc.
4. Taking a course in a creative skill (e.g. art, photography, cooking, pottery, etc.)
5. Cooking something special or new.
6. Redecorating a part of a room or house.
7. Restoring furniture, antiques, etc.
8. Woodwork, carpentry, etc.
9. Repairing things
10. Working with machines, engines, electrical equipment, etc.
11. Photography
12. Writing
13. Thinking up or arranging songs or music.
14. Singing.
15. Playing a musical instrument (alone or with others)
16. Learning to play a musical instrument.
17. Acting or taking acting lessons.
18. Participating in an organisation related to your creative interests.
19. Reading books, articles, magazines related to creative interests.

(B) ENTERTAINMENT ACTIVITIES

1. Watching T.V.
2. Listening to the radio
3. Listening to music, records, etc.
4. Going to a play or drama
5. Going to the movies
6. Going to concert, opera or ballet.

7. Going to art gallery, exhibition, museum.
8. Going to rock concert
9. Going to sports event
10. Going to races (car, boat, horse, etc.)
11. Reading the newspaper or a magazine

(C) EDUCATIONAL ACTIVITIES

1. Reading books, plays, poems, etc.
2. Reading about a subject which interests you.
3. Going to lecture courses or other classes which interest you.
4. Learning a foreign language
5. Learning to do something new (e.g. acquiring a new skill).
6. Going to the library

(D) PHYSICAL ACTIVITIES

1. Playing bowls or other lawn sports.
2. Swimming
3. Going for a walk.
4. Snorkling
5. Boating
6. Hunting, shooting, archery
7. Fishing
8. Bushwalking or exploring
9. Camping
10. Sitting in the sun
11. Being at the beach
12. Driving a car or riding a motorcycle.
13. Going for a trip on a bus, ferry or train (just for fun).
14. Participating in a club related to your own sporting interests.
15. Playing sport in competition.
16. Playing snooker, pool, etc.

(E) SOCIAL ACTIVITIES

1. Writing to or re-contacting an old friend.
2. Telephoning a friend.

(E) SOCIAL ACTIVITIES (cont'd)

3. Visiting a friend or neighbour.
4. Inviting a friend or neighbour to your place.
5. Having a friend or neighbour to lunch, dinner, or morning or afternoon tea.
6. Arranging or going on an outing with a friend or neighbour.
7. Arranging or having a meeting or outing with several mutual friends.
8. Having friends or relatives over for lunch or dinner/tea.
9. Organising or giving a party at your place.
10. Meeting someone new of the same sex.
11. Meeting someone new of the opposite sex.
12. Joining a club (social, recreational, academic, etc.)
13. Social drinking
14. Going to a wine bar, coffee bar, hotel, etc.
15. Going to a restaurant with friends.
16. Going to a party, picnic, barbecue, etc.
17. Being with people I like.
18. Talking about my interests, philosophy, politics, etc.
19. Going out on a date.
20. Going to a ball, dance, etc.
21. Complementing, praising or thanking someone.
22. Doing something positive for someone (e.g. offering assistance, giving a gift, etc.)
23. Having your preferred sexual activities.
6. Collecting things (e.g. stamps, coins, wine, etc.)
7. Gathering natural objects (flowers, rocks, driftwood, etc.)
8. Gardening, caring for houseplants, etc.
9. Visiting interesting outdoor places (e.g. zoo, reserves, parks, riverside, harbour, etc.)
10. Caring for or being with animals or pets.
11. Being in the country, mountains, etc.
12. Having or planning a holiday or trip.
13. Giving or receiving massages or backrubs.
14. Going to a sauna or doing health-related activities.
15. Having your hair done or cut.
16. Taking a hot shower or bath
17. Getting dressed up.
18. Having a hot drink in bed at night
19. Having a take-away meal.
20. Having a meal in a restaurant.
21. Buying something special for yourself (or someone else).

(F) MISCELLANEOUS ACTIVITIES

1. Active involvement in politics, community or social action groups, etc.
2. Being involved in religious or church activities, etc.
3. Speaking a foreign language.
4. Playing chess, draughts, etc.
5. Playing cards, bridge, board games, etc.

APPENDIX I

Setting Behavioural Goals

We would like you to work out at least one behavioural goal (preferably more) for each of the following categories. Focus especially on those activities that you used to do (and enjoy) before the onset of pain and which you are not doing now (or not very often now). Also, think of new activities - ones that you haven't done before but which you think you might enjoy and might be able to do. The attached list of activities might give you some ideas.

Try to be as specific as possible. For example, don't say you would like to see your friends "more"; say "how often" and "where" you would like to see them.

Use the following examples as a guide. Remember, we don't expect you to be able to do them right now - but rather, gradually, as your capabilities improve. But, they must still be possible (i.e. within your financial and physical means).

Examples:

<u>Category</u>	<u>Frequency (How Often)</u>		<u>Goal</u>
	<u>Before Pain</u>	<u>Now</u>	
(a) <u>Medication</u> - Pain killers	None	6 per day	None
(b) <u>Social</u> - Have friends over for tea	Once a month		Once a month
- Go to restaurant with friends	Once a month	Never	Once in 2 mos.
(c) <u>Recreation</u> - Go to football/rugby	Every Saturday	Never	Once every 2 wks
- Walk in mountains	Once in 2 months	Once in a year	Once in 2 months
(d) <u>Family</u> - Take spouse/kids for picnic	Once a month	Once in 6 months	Once a month
- Go to beach with kids	Once in 2 mos.	Never	Once in 2 months
(e) <u>Home Duties</u> - Wash dishes in evening	3 times a week	Once a week	Every night
- Look after garden	Every weekend	Once a month	Twice a week
(f) <u>Work</u> - Clerical - record clerk	5 days a week	Never	2-3 days a week (part-time)

APPENDIX 1a

THIS WEEK'S GOALS

Name: _____

Week: _____

Write down the goals you think you can achieve over the coming week. Be realistic, but try to think of a goal for each of the following categories as they apply to you.

<u>CATEGORY</u>	<u>HOW OFTEN/HOW MUCH</u>	<u>TICK IF YOU DID IT</u>
e.g. Wash dishes	2 nights	✓
Reduce pain killers	1 less each day	✓

(a) MEDICATION

(b) SOCIAL

(c) RECREATION

(d) FAMILY

(e) HOME DUTIES

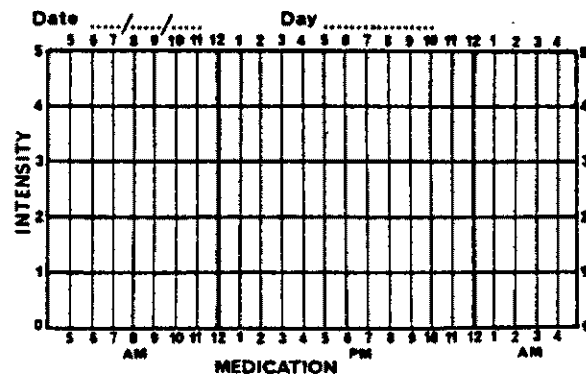
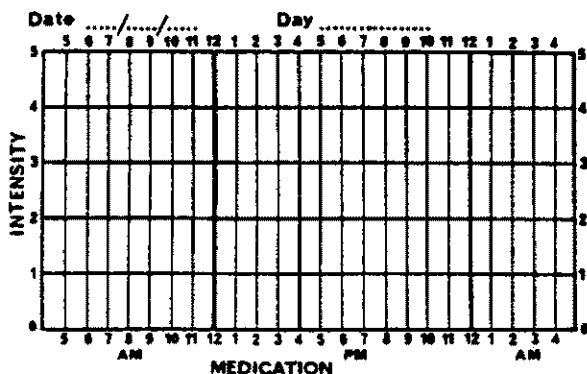
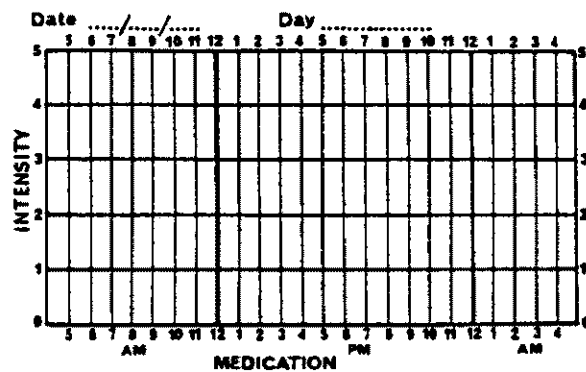
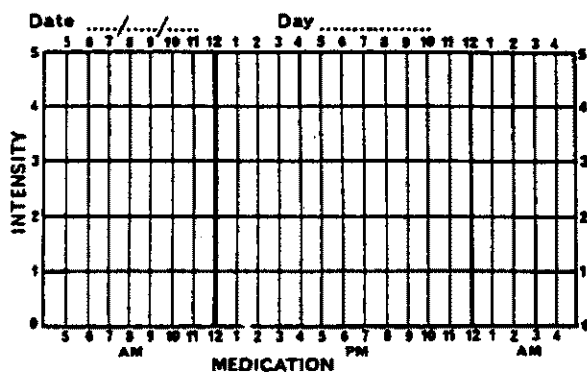
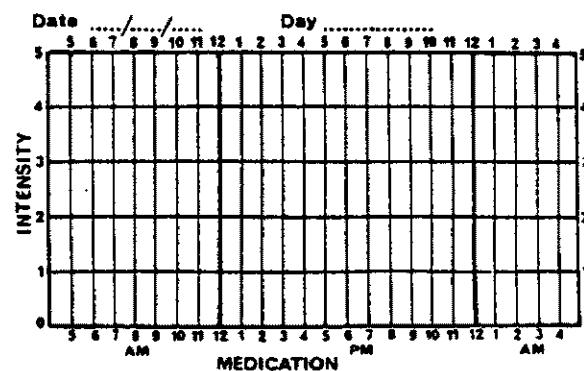
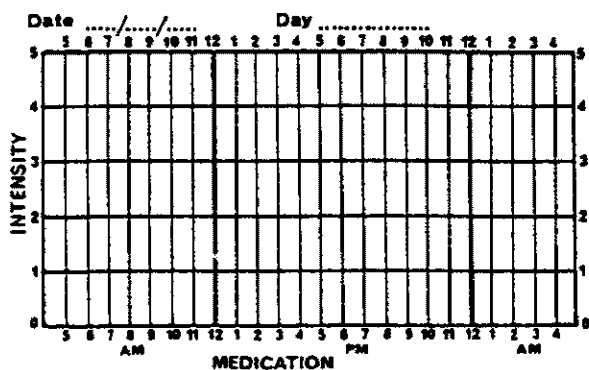
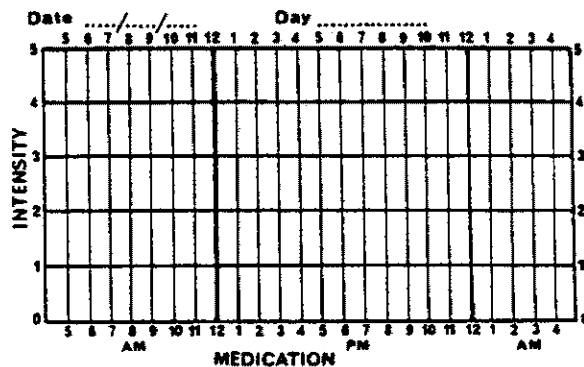
(f) WORK/STUDY

NAME

PAIN RATING CHART
(record only waking hours)

Intensity Levels:

0. No pain
1. Low level of pain (you are aware of pain only when you direct attention to it)
2. Pain can be ignored at times
3. Constant pain (still able to continue working)
4. Very severe pain (concentration is difficult but undemanding tasks can be coped with)
5. Intense incapacitating pain



OTHER TREATMENTS

Name: _____

Date: _____

What treatment(s) for your back-pain have you received since the last assessment?

Please tick those which apply.

- _____ Surgery
- _____ Injection into the spine
- _____ Hospitalization
- _____ Physiotherapy
- _____ Acupuncture
- _____ Chiropractic
- _____ Hypnosis
- _____ Traction
- _____ TENS
- _____ Medication
- _____ Psychotherapy (or seeing a psychiatrist regularly)
- _____ Other (specify)

APPENDIX L

B.P.P. FOLLOW-UP DATA

Name: _____

Date: _____

Are you still practising the techniques you learnt during the back-pain programme? (Please use a ✓ to indicate your answer).

Physiotherapy exercises

_____ Every day
_____ 3-6 days a week
_____ 1-2 days a week
_____ 1-2 days a month
_____ Not since the programme ended.

Mental Coping techniques

_____ Every day
_____ 3-6 days a week
_____ 1-2 days a week
_____ 1-2 days a month
_____ Not since the programme ended.

B.P.P. FOLLOW-UP DATA

Name _____

Date: _____

Are you still practising the techniques you learnt during the back-pain programme? (Please use a ✓ to indicate your answer).

Physiotherapy exercises

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

Mental Coping techniques

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

Relaxation exercises

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

B.P.P. FOLLOW-UP DATA

Name: _____

Date: _____

Are you still practicing the techniques you learnt during the back-pain programme? (Please use a ✓ to indicate your answer)

Physiotherapy exercises

- _____ every day
_____ 3-6 days a week
_____ 1-2 days a week
_____ 1-2 days a month
_____ Not since the programme ended.

Keeping up your
activity level

- _____ every day
_____ 3-6 days a week
_____ 1-2 days a week
_____ 1-2 days a month
_____ Not since the programme ended.

B.P.P. FOLLOW-UP DATA

Name: _____

Date: _____

Are you still practising the techniques you learnt during the back-pain programme? (Please use a ✓ to indicate your answer).

Physiotherapy exercises

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

Keeping up your activity level

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

Relaxation exercises

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

APPENDIX Ld

B.P.P. FOLLOW-UP DATA

Name: _____

Date: _____

Are you still practicing the techniques you learnt during the back-pain programme? (Please use a ✓ to indicate your answer).

Physiotherapy exercises?

_____ every day

_____ 3-6 days a week

_____ 1-2 days a week

_____ 1-2 days a month

_____ Not since the programme ended.

B.P.P. FOLLOW-UP DATA

Name: _____

Date: _____

Are you still practising the techniques you learnt during the back-pain programme? (Please use a _____ to indicate your answer).

Physiotherapy exercises

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

Keeping up your activity level

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

Relaxation exercises

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

Mental Coping Techniques

- _____ Every day
- _____ 3-6 days a week
- _____ 1-2 days a week
- _____ 1-2 days a month
- _____ Not since the programme ended.

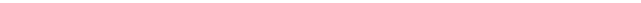
APPENDIX M

OPINION SURVEY

Name: _____

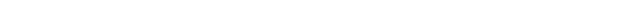
Date: _____

- (1) To what extent do you think this particular treatment will help you to reduce your pain?
(Place a mark on the line to indicate your answer).



No reduction at all
 Complete Reduction

- (2) To what extent do you think treatment of any sort would help you to reduce your pain?



No reduction at all Complete Reduction

- (3) To what extent do you think this particular treatment will help you to live with your pain?

|-----|

Not at all Extremely
helpful helpful

- (4) Would you recommend this treatment for a friend or relative who had a similar pain problem to you?

Yes _____

No _____ If not, why not?

APPENDIX N

Name: _____

Date: _____

PHYSIOTHERAPY EVALUATION

We would like you to evaluate the physiotherapist who ran the physiotherapy part of the programme. Please answer by making a mark on the lines below.

- 1) How helpful did you find the physiotherapist?

Not at all helpful _____ Extremely helpful

- 2) How understanding did you find the physiotherapist?

Not at all understanding _____ Extremely understanding

- 3) How friendly did you find the physiotherapist?

Not at all friendly _____ Extremely friendly

APPENDIX O

Summary of F Values from Repeated Measures ANCOVAs for 8 Dependent Variables (Groups x Trials)

	AVE. PAIN	STAI	BDI	SIP-S	SIP-O	PBQ	CSQ	MED
<u>Pre/Post</u>								
1. CT+CT.RT vs BT+BT.RT	0.15	0.61	0.08	6.19	1.34	1.26	4.49	*4.17
2. CT.RT+BT.RT vs BT+CT	0.14	4.69*	2.89	0.28	1.31	1.38	0.07	0.11
3. TMT vs CNTRL	12.20***	0.11	0.44	8.63**	1.03	13.99***	5.34	*0.35
4. AC vs NAC	0.37	0.20	0.38	1.08	1.46	0.47	1.16	0.79
5. CT+BT.RT vs BT+CT.RT.	5.44*	0.30	0.13	0.35	0.60	2.77	2.43	0.10
<u>Pre/6-Months</u>								
1. CT+CT.RT vs BT+BT.RT	0.56	0.37	0.01	1.41	0.31	1.89	1.02	0.56
2. CT.RT+BT.RT vs BT+CT	0.01	11.59**	6.45*	1.21	0.24	4.81	0.61	0.01
3. TMT vs CNTRL	0.01	0.01	0.71	2.71	0.80	7.27**	3.97	0.02
4. AC vs NAC	0.39	4.69*	5.07*	4.71*	2.93	2.03	0.19	0.39
5. CT+BT.RT vs BT+CT.RT.	0.28	0.04	0.46	0.20	0.07	1.63	5.33*	0.28
<u>Pre/12-Months</u>								
1. CT+CT.RT vs BT+BT.RT	0.01	0.58	0.28	0.74	0.57	0.07	0.53	3.95
2. CT.RT+BT.RT vs BT+CT	0.65	0.35	1.84	1.62	0.06	0.92	0.29	2.99
3. TMT vs CNTRL	2.63	1.50	1.13	4.27	1.14	3.59	0.85	0.00
4. AC vs NAC	1.98	1.12*	2.96	2.54	0.75	0.56	0.69	0.20
5. CT+BT.RT vs BT+CT.RT.	0.34	0.29	4.74*	0.95	0.74	2.41	0.99	0.10

* p<0.01 (Univariate)

** p<0.05 (Bonferroni)

*** p<0.01 (Bonferroni)

Appendix P. Study One. Summary of Demographic Data
for each Condition of Pretreatment

	Condition					
	CT	CT.RT	AC	NAC	BT	BT.RT
N	10	8	10	11	10	9
Mean Age	42.0	40.8	39.3	42.8	38.3	39.7
Gender: M	6	3	5	5	5	2
F	4	5	5	6	5	7
Mean time						
Low back pain:	6.5	6.1	6.9	9.2	5.7	4.2
Compensation						
Insurance:	7	5	7	4	8	7
Working:	1	1	0	1	1	1
Married/						
Living with:	10	8	9	11	10	9
Occupation:						
Unskilled/Home D.	5	4	6	8	6	6
Skilled Man.	3	2	2	2	1	0
Clerical	2	1	0	1	2	1
Professional	0	1	1	-	1	1
English 1st Lang.	9	5	10	9	8	6
Education:						
1 ⁰ only	-	-	-	1	-	-
<3 yrs. 2 ⁰	8	6	9	10	10	9
>3 yrs. 2 ⁰	2	2	1	-	-	-
+ve Med. Find.	9	7	9	10	8	9
<u>Previous Tmts.</u>						
Surgery	5	3	4	3	3	4
Nerve blocks	4	3	3	2	3	4
Physiotherapy	10	7	10	10	10	9
TENS	6	3	2	2	6	4
Chiropractic	1	1	4	4	2	1
Medication	10	10	10	11	10	9
Psychotherapy	1	0	3	1	1	2
<u>Medication</u> <u>at Pretmt</u>						
Narcotic analg.	3	0	1	2	1	0
Non-Narc. analg.	5	8	8	7	7	6
NSAIDS	6	3	0	4	4	1
Anti-Depressants	1	1	3	3	6	4
Sedatives	4	1	7	1	5	3

APPENDIX Q

Summary of Trial Comparing Cognitive-Behavioural Treatment Plus Physiotherapy Information with Full Cognitive-Behavioural and Physiotherapy Treatment Programme

In Studies One and Two, it was found that the combined psychological and physiotherapy treatments were more effective at posttreatment than physiotherapy treatment alone. The results of Study Three concluded that any effect related to the physiotherapy treatment was likely to be associated with the information and back strengthening exercises, which were demonstrated to the patients but not practised by them under supervision during the sessions. The repeated practising of exercises under the supervision of the physiotherapists in the hydrotherapy pool was found to make no difference to the outcome. Consequently, it was decided to examine the effect of removing the instruction in and practice of the exercises completely from the physiotherapy treatment. A second aim of this trial was to examine the effect of doubling the amount of time for the cognitive-behavioural treatment, without altering the content.

Method

Subjects

Sixteen subjects, 8 males and 8 females who had been referred to the programme by the same sources as those in Studies 1, 2 and 3 were randomly assigned to one of two conditions. The selection criteria and procedure were the same as those employed in the earlier studies. The subjects ranged in age from 20 to 60 years (Mean=40.5 years, SD=9.9) and a history of chronic low back pain ranging from 1 to 17 years (Mean=6.5 years; SD=5.2). Four subjects had compensation claims pending and only 2 were employed at the start of the

programme. All subjects had previously had physiotherapy for their back problems, and 4 had had 1 or more operations, 5 had had spinal nerve blocks, 7 had tried TNS, and 15 were taking some type of pain-related medication at the pretreatment assessment.

Design and Procedure

The experiment comprised a two (Conditions) x two (Trials) design. Both conditions underwent repeated measurement on 2 occasions, pretreatment and posttreatment.

One condition was designated the Treatment condition and the other the Control condition. The Treatment condition received the same combination of psychological treatments and physiotherapy as used in the second study, namely: combined cognitive-behavioural treatment, relaxation training, physiotherapy education, demonstration of back strengthening exercises and four sessions of exercise practice in the hydrotherapy pool with the physiotherapists. The Control condition received the same combination of psychological treatments, relaxation training and the same information on back anatomy, function and back care as the Treatment condition, but no tuition in or practice of the back strengthening exercises. To compensate for the equivalent of 5 sessions on exercises given to the Treatment condition the psychological treatment sessions were spread over 10 sessions instead of 5 sessions, but no new material was provided. Thus, the Treatment condition received 5 sessions of psychological treatment and 10 sessions of full physiotherapy treatment, while the Control condition received 10 sessions of psychological treatment and 5 sessions of physiotherapy information.

Both conditions, with 8 subjects in each were run simultaneously. As in the previous studies, the treatment programme covered 5 weeks and involved 2 sessions each week. Each session lasted one hour. The Treatment condition's sessions were held according to the same timetable as the full psychological and physiotherapy treatments condition in Studies 2 and 3. The Control condition, however, attended the psychological sessions on both days each week and attended physiotherapy separately from the Treatment condition due to differences in physiotherapy input.

Six dependent measures were employed on the 2 assessment occasions. These included: the Pain Rating Chart, the Beck Depression Inventory, the self-rated SIP, the other-rated SIP, the Coping Strategies Questionnaire, and the Pain-related Self Efficacy Inventory. The State version of the STAI, the pain descriptors of the McGill Pain Questionnaire, the Modified Somatic Perception Questionnaire and the Pain Beliefs Questionnaire were also administered but only for correlational purposes and were not used as dependent measures. As in the previous studies, the expectations rating scale was completed at the end of the first session of the programme. In addition, the physiotherapist's evaluation rating scale was completed at the posttreatment assessment.

The experimenter conducted all the pretreatment assessments and the independent psychologist employed previously again acted as a blind assessor and conducted the posttreatment assessments.

As in the previous studies, the differences between the conditions at pretreatment on the dependent measures, as well as the Expectancy scores, were analyzed separately using a one-way ANOVA. The analysis of the 6 dependent variables was planned and they were

analyzed separately using repeated measures ANOVAs. In order to reduce the increased risk of Type I errors with the large number of dependent variables the Bonferroni adjustment to the critical value was employed again for the repeated measures ANOVAs. A family error rate was set at 0.05.

Results

Table 58 presents a summary of mean scores on the dependent measures.

Table 58 Mean Scores and Standard Deviations for Dependent Measures for Treatment and Control Conditions at Pretreatment and Posttreatment

MEASURE		CONDITION	
		Treatment	Control
Average Pain:	Pre	3.37	2.96
	SD	(0.99)	(0.65)
	Post	3.19	2.93
	SD	(1.23)	(0.62)
BDI	Pre	11.29	19.00
	SD	(13.74)	(9.86)
	Post	10.29	12.75
	SD	(11.82)	(7.10)
SIP-S	Pre	26.63	35.81
	SD	(13.42)	(10.83)
	Post	20.13	20.85
	SD	(15.84)	(5.52)
SIP-O	Pre	23.43	25.91
	SD	(19.29)	(11.79)
	Post	18.71	17.88
	SD	(21.19)	(7.56)
CSQ	Pre	33.29	29.13
	SD	(29.76)	(26.68)
	Post	61.29	69.38
	SD	(26.82)	(13.53)
PSEI	Pre	32.57	20.00
	SD	(18.62)	(8.08)
	Post	40.43	32.13
	SD	(16.43)	(5.93)

Only one subject dropped out of the programme and was unwilling to return. Consequently, the Treatment conditions data were analyzed

with $N=7$ while the Control condition's data were analyzed with $N=8$. One-way ANOVAs on the expectancies of improvement at the start of the programme, the pretreatment dependent variables, and the posttreatment ratings of the physiotherapists revealed no significant differences between the conditions on any measure. Bonferroni-adjusted repeated measures ANOVAs of pretreatment to posttreatment changes revealed significant within subjects improvements for both conditions on the self-rated SIP, $F(1,13)=18.36$, $p<0.01$, the other-rated SIP, $F(1, 13)=15.34$, $p<0.01$, the CSQ, $F(1, 13)=16.24$, $p<0.01$, and the PSEI, $F(1, 13)=17.65$, $p<0.01$, but not on Average pain intensity nor the BDI. No significant between conditions (conditions x trials) differences in improvements were revealed on any measure.

Discussion

Bonferroni-adjusted repeated measures ANOVAs revealed significant within subjects improvements for both conditions on measures of functional impairment, use of coping strategies and sense of pain-related self-efficacy. However, no significant pretreatment to posttreatment differences in improvement were revealed between conditions. Despite the small number of subjects in this study, the overall (i.e. within subjects results) are consistent with the findings obtained with the full psychological and physiotherapy treatment condition in Study 2 and with both conditions in Study 3. The results indicate that the exercise component of the physiotherapy treatment programme has no effect on treatment outcome. At the same time, the results also indicate that doubling the number of psychological treatment sessions has no greater effect than that obtained by the full psychological and physiotherapy treatment programme as used in Studies 2 and 3.

Appendix R. Pain-Related Self-Efficacy Inventory (PSEI)

SELF-RATING QUESTIONNAIRE (SRQ)

Name: _____

Date: _____

Please rate how confident you are that you can do the following things at present. To indicate your answer circle one of the numbers on the scale provided for each item.

For example

0 1 2 3 4 5 6
Not at all Completely
confident Confident

1. I can enjoy things, despite the pain.

0	1	2	3	4	5	6
Not at all confident						Completely Confident

2. I can do most of the household chores (e.g. tidying-up, washing dishes, etc.), despite the pain.

0	1	2	3	4	5	6
Not at all confident						Completely Confident

3. I can socialize with my friends or family members as often as I used to do, despite the pain.

0 1 2 3 4 5 6

Not at all Completely
confident Confident

4. I can cope with my pain in most situations.

0 1 2 3 4 5 6

Not at all Completely
confident Confident

5. I can do some form of work, despite the pain.

0 1 2 3 4 5 6

Not at all Completely
confident Confident

6. I can still do many of the things I enjoy doing, such as hobbies or leisure activities, despite the pain.

0	1	2	3	4	5	6
						Completely
Not at all						Confident
confident						

7. I can cope with my pain without medication.

0	1	2	3	4	5	6
						Completely
Not at all						Confident
confident						

8. I can still accomplish most of my goals in life, despite the pain.

0	1	2	3	4	5	6
						Completely
Not at all						Confident
confident.						

9. I can live a normal lifestyle, despite the pain.

0	1	2	3	4	5	6
						Completely
Not at all						Confident
confident						

10. I can gradually become more active, despite the pain.

0	1	2	3	4	5	6
						Completely
Not at all						Confident
confident						

Appendix S . Summary of F Values of Repeated Measures
ANCOVAs for Study Two

MEASURE	CONTRAST
	Treatment vs. Control
<u>Pre-Post</u>	
Ave. Pain	0.08
BDI	0.13
SIP-S	2.06
SIP-O	10.62**
PBQ	3.76
CSQ	12.67**
PSEI	8.01*
<u>Pre- 6 Months F/U</u>	
Ave. Pain	0.00
BDI	0.04
SIP-S	1.19
SIP-O	9.68*
PBQ	0.92
CSQ	18.05***
PSEI	4.81

* p<0.01 (Univariate)
 ** p<0.05 (Bonferroni)
 *** p<0.01 (Bonferroni)

APPENDIX T.

1) Modified Somatic Perception Questionnaire (MSPQ)

The MSPQ is a self-rating questionnaire consisting of 13 items describing somatic sensations, such as 'mouth becoming dry', which the subjects were asked to rate on a 4-point scale according to how much they had experienced each item over the past week - from 'not at all' (=0), to 'a little/slightly' (=1), to 'a great deal/quite a bit' (=2), to 'extremely/could not have been worse' (=3). Each item was scored according to the numbers given in brackets above and a total score for each subject calculated by summing the scores for each item. Thus, the maximum possible score is 39.

The MSPQ was developed by Main (1983) specifically for use with chronic backache patients and is intended to measure somatic and autonomic awareness as distinct from anxiety. As its use as an outcome measure has not been established, the MSPQ was used for correlational purposes in the present series of studies.

Evidence of the MSPQ's reliability and validity, based on studies of anxious patients, normal controls, and chronic backache patients was reported by Main (1983). Test-retest reliability was established using a 33 item version of the MSPQ on 40 consecutively referred patients with chronic backache. All items in the final 13 item version of the MSPQ had test-retest correlations of > 0.60 and Kappa values which reached significance at the $p < 0.01$ level. The construct validity of homogeneity of the 13 item scale was assessed using theta as the measure of internal consistency. Theta values of 0.79 and 0.77 on two cohorts of chronic backache patients were reported.

Construct validity was also demonstrated by comparison with the first three clinical scales of the MMPI and the Zung Depression Inventory on a small sample of 25 patients. Correlations of 0.61 with the HS scale of the MMPI, 0.36 with the D scale of the MMPI, 0.03 with the HY scale of the MMPI and 0.54 with the ZDI suggests a relationship between the MSPQ and emotional distress.

Significant Pearson product moment correlations were also established on a subset of 42 backache patients with the McGill Pain Questionnaire.

Clinical validity was demonstrated by comparisons between different clinical groups and normals. The mean for 100 normals of 1.79 (SD: 2.13) was significantly less than the mean for the total sample of back pain patients (4.91, SD: 4.46; $p < 0.001$), and the mean for problem back pain patients (5.53, SD: 4.53; $p < 0.001$).

2) McGill Pain Questionnaire (MPQ) - Adjective Checklist

The adjective checklist of the MPQ consists of 87 adjectives divided into 20 groups which comprise three dimensions of pain: Sensation, Affect, and Evaluation, plus a Miscellaneous group. To answer the checklist the subject was asked to nominate which word, if any, in each group best describes his/her pain over the last few days. If more than one word in a group was nominated the subject was asked to select the one which was the best descriptor. The checklist was completed by the subject nominating his/her pain descriptors to the interviewer who marked them on the list in front of the subject.

The checklist is scored by summing the values of each word selected within each of the four categories (Sensation, Affect,

Evaluation, Miscellaneous). The values for each word are determined by their position within the group, where the word at the top of each group is given a value of 1, the next 2, and so on. Thus, the maximum possible score for Sensation is 41, for Affect 14, for Evaluation 5, and for Miscellaneous 17.

The checklist is intended to provide a measure of the quality of pain, as opposed to its intensity. However, although its use is widely reported it has been criticized on the grounds that some of the words may be difficult to understand and the division of the groups into four dimensions has also been questioned (e.g. Crockett, Prkachin & Craig, 1977; Keefe, Brown, Scott & Ziesat, 1982). Others, such as Redding, Everitt & Sledmore (1982), however, have presented findings supportive of the construction of the MPQ's adjective checklist. On the other hand, Turk et al. (1985) found the 3 main dimensions (Sensation, Affect, Evaluation) were highly intercorrelated and concluded that only the total PRI score should be used and only as a measure of pain severity.

Evidence of the MPQ's reliability was reported by Melzack (1975) and its construct validity was supported by Reading et al.'s (1982) findings. Kremer and Atkinson (1981) reported evidence in support of the construct validity of the Affective subscale when they found positive correlations between it and scores on the depression and anxiety scales of the Brief Symptom Inventory.

In the present studies, the MPQ was not used as an outcome measure, but rather for correlational purposes with other measures.

AN EVALUATION OF COGNITIVE, BEHAVIOURAL AND RELAXATION
TREATMENTS FOR CHRONIC LOW BACK PAIN

VOLUME TWO

M.K. NICHOLAS

This thesis is submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Psychology at the University of Sydney, Australia.

April, 1988

AN EVALUATION OF TREATMENTS FOR CHRONIC LOW BACK PAIN

ADDITIONAL APPENDICES

Appendix U: Statistical Summaries and F-values for Pretreatment Dependent Variables.

Appendix V: Raw Data for Subjects in the Four Studies.

Appendix X: Copies of the Remaining Assessment Questionnaires Used.

- McGill Pain Questionnaire (MPQ)
- State-Trait Anxiety Inventory - State Version (STAI)
- Beck Depression Inventory (BDI)
- Modified Somatic Perception Questionnaire (MSPQ)
- Coping Strategy Questionnaire (CSQ)
- Pain Beliefs Questionnaire (PBQ)
- Sickness Impact Profile (SIP)

APPENDIX U.

Statistical Summaries and F-values for Pretreatment Dependent Variables

1. Study One.

(i) Average Pain Ratings

SOURCE	DF	SS	MS	F	
Between Groups	5	3.3168	0.6634	1.221	NS
Within Groups	42	22.8230	0.5434		
Total	47	26.1398			

Planned Contrast Summaries

CT+CT.RT vs BT+BT.RT	F(1,42) = 0.295	NS
CT+BT vs CT.RT+BT.RT	F(1,42) = 1.909	NS
TMT vs CNTRL	F(1,42) = 0.004	NS
AC vs NAC	F(1,42) = 0.039	NS
CT+BT.RT vs BT+BT.RT	F(1,42) = 4.212	p<0.05

(ii) STAI

SOURCE	DF	SS	MS	F	
Between Groups	5	916.1776	186.2355	1.085	NS
Within Groups	42	7094.8016	168.9238		
Total	47	8010.9792			

Planned Contrast Summaries

CT+CT.RT vs BT+BT.RT	F(1,42) = 1.115	NS
CT+BT vs CT.RT+BT.RT	F(1,42) = 2.709	NS
TMT vs CNTRL	F(1,42) = 0.662	NS
AC vs NAC	F(1,42) = 0.008	NS
CT+BT.RT vs BT+BT.RT	F(1,42) = 1.484	NS

(iii). BDI

SOURCE	DF	SS	MS	F	
Between Groups	5	631.7768	126.3554	1.781	NS
Within Groups	42	2979.0357	70.9294		
Total	47	3610.8125			

Planned Contrasts

CT+CT.RT vs BT+BT.RT	F(1,42) = 0.076	NS
CT+BT vs CT.RT+BT.RT	F(1,42) = 5.310	p<0.05
TMT vs CNTRL	F(1,42) = 2.287	NS
AC vs NAC	F(1,42) = 0.727	NS
CT+BT.RT vs BT+BT.RT	F(1,42) = 0.195	NS

(iv) PBQ

SOURCE	DF	SS	MS	F	
Between Groups	5	1814.7877	362.9575	1.020	NS
Within Groups	42	14949.1290	355.9316		
Total	47	16763.9167			

Planned Contrasts

CT+CT.RT vs BT+BT.RT	F(1,42) = 0.337	NS
CT+BT vs CT.RT+BT.RT	F(1,42) = 1.847	NS
TMT vs CNTRL	F(1,42) = 2.239	NS
AC vs NAC	F(1,42) = 0.396	NS
CT+BT.RT vs BT+BT.RT	F(1,42) = 0.005	NS

(v). CSQ

SOURCE	DF	SS	MS	F	
Between Groups	5	2282.5357	456.5071	0.545	NS
Within Groups	42	35149.4643	836.8920		
Total	47	37432.0000			

Planned Contrasts

CT+CT.RT vs BT+BT.RT	F(1,42) = 0.781	NS
CT+BT vs CT.RT+BT.RT	F(1,42) = 1.393	NS
TMT vs CNTRL	F(1,42) = 0.008	NS
AC vs NAC	F(1,42) = 0.033	NS
CT+BT.RT vs BT+BT.RT	F(1,42) = 0.739	NS

(vi) SIP-S

SOURCE	DF	SS	MS	F	
Between Groups	5	1384.5268	276.9054	2.719	NS
Within Groups	42	4277.6530	101.8489		
Total	47	5662.1798			

Planned Contrasts

CT+CT.RT vs BT+BT.RT	$F(1,42) = 5.918$ $p < 0.05$
CT+BT vs CT.RT+BT.RT	$F(1,42) = 4.842$ $p < 0.05$
TMT vs CNTRL	$F(1,42) = 1.444$ NS
AC vs NAC	$F(1,42) = 0.034$ NS
CT+BT.RT vs BT+BT.RT	$F(1,42) = 1.950$ NS

(vii). SIP-Q

SOURCE	DF	SS	MS	F	
Between Groups	5	907.3364	181.4673	1.576	NS
Within Groups	42	4835.3234	115.1267		
Total	47	5742.6598			

Planned Contrasts

CT+CT.RT vs BT+BT.RT	$F(1,42) = 1.920$ NS
CT+BT vs CT.RT+BT.RT	$F(1,42) = 1.404$ NS
TMT vs CNTRL	$F(1,42) = 3.266$ NS
AC vs NAC	$F(1,42) = 0.235$ NS
CT+BT.RT vs BT+BT.RT	$F(1,42) = 1.225$ NS

(viii). Expectancy Measure

SOURCE	DF	SS	MS	F	
Between Groups	5	76.8916	15.3783	3.226	NS
Within Groups	42	200.2065	4.7668		
Total	47	277.0981			

Planned Contrasts

CT+CT.RT vs BT+BT.RT	$F(1,42) = 1.201$ NS
CT+BT vs CT.RT+BT.RT	$F(1,42) = 0.032$ NS
TMT vs CNTRL	$F(1,42) = 14.022$ $p < 0.01$
AC vs NAC	$F(1,42) = 0.286$ NS
CT+BT.RT vs BT+BT.RT	$F(1,42) = 1.525$ NS

2. Study Two

(i) Average Pain Ratings

Treatment vs Control, $F(1,16) = 0.497$ NS

(ii) BDI

Treatment vs Control, $F(1,16) = 0.519$ NS

(iii) PBQ

Treatment vs Control, $F(1,16) = 0.000$ NS

(iv) CSQ

Treatment vs Control, $F(1,16) = 0.436$ NS

(v) SIP-S

Treatment vs Control, $F(1,16) = 0.042$ NS

(vi) SIP-O

Treatment vs Control, $F(1,16) = 0.010$ NS

(vii) PSEI

Treatment vs Control, $F(1,16) = 0.381$ NS

(viii) Expectancy Measure

Treatment vs Control, $F(1,16) = 0.516$ NS

3. Study Three

(i) Average Pain Ratings

Treatment vs Control, $F(1,21) = 0.862$ NS

(ii) BDI

Treatment vs Control, $F(1,21) = 1.596$ NS

(iii) PBQ

Treatment vs Control, $F(1,21) = 0.363$ NS

(iv) CSQ

Treatment vs Control, $F(1,21) = 0.493$ NS

(v) SIP-S

Treatment vs Control, $F(1,21) = 0.059$ NS

(vi) SIP-O

Treatment vs Control, $F(1,21) = 0.068$ NS

(vii) PSEI

Treatment vs Control, $F(1,21) = 1.298$ NS

(viii) Expectancy Measure

Treatment vs Control, $F(1,21) = 1.800$ NS

4. Study Four

(i) Average Pain Ratings

Treatment vs Control, $F(1,13) = 1.801$ NS

(ii) BDI

Treatment vs Control, $F(1,13) = 1.593$ NS

(iii) PBQ

Treatment vs Control, $F(1,13) = 0.623$ NS

(iv) CSQ

Treatment vs Control, $F(1,13) = 0.071$ NS

(v) SIP-S

Treatment vs Control, $F(1,13) = 1.861$ NS

(vi) SIP-O

Treatment vs Control, $F(1,13) = 0.081$ NS

(vii) PSEI

Treatment vs Control, $F(1,13) = 2.600$ NS

(viii) Expectancy Measure

Treatment vs Control, $F(1,13) = 0.557$ NS

APPENDIX V.

RAW DATA FOR ALL SUBJECTS FOR EACH STUDY.

1. STUDY ONE

Variables should be read as follows:

<u>Variable</u>	<u>Columns</u>

Row One

Code for condition	1-1
Subject Number	2-3
Age	4-5
Sex (M= 1; F= 0)	6-6
Marital status (Married= 1; Single= 0)	7-7
Living status (With another= 1; Alone= 0)	8-8
Occupation (Unskilled Manual= 1) (Skilled Manual= 2) (Clerical= 3) (Managerial= 4) (Professional= 5) (Home duties= 6)	9-9
Compensation (Yes= 1; No= 0)	10-10
English first language (Yes= 1; No= 0)	11-11
Education (Primary only= 1) (3 yrs or less Secondary= 2) (More than 3 yrs Secondary= 3) (Tertiary= 4)	12-12
Length of time with LBP	13-16
Cause (Accident= 1; Nonspecific= 0)	17-17
Positive medical findings (Yes=1; No=0)	18-18

Row Two

Code for condition and Subject No.	1-3
Test occasion (pretreatment)	4-4
Working at present (1= yes; 0= no)	5-5
Number of surgical treatments for LBP	6-6
Nerve blocks for LBP (1=yes; 0= no)	7-7
Physiotherapy for LBP (1=yes;0=no)	8-8
TENS for LBP (1=yes;0=no)	9-9
Acupuncture for LBP	10-10
Chiropractic for LBP (1=yes;0=no)	11-11
Manipulation under anaesthetic for LBP (1=yes;0=no)	12-12
Psychotherapy/counselling for LBP (1=yes;0=no)	13-13

Hypnotherapy/relaxation for LBP (1=yes;0=no)	14-14
Narcotic analgesics for LBP (1=yes;0=no)	15-15
Non-narcotic analgesics for LBP (1=yes;0=no)	16-16
NSAIDs for LBP (1=yes;0=no)	17-17
Antidepressants for LBP (1=yes;0=no)	18-18
Sedatives/hypnotics for LBP (1=yes;0=no)	19-19
Steroids for LBP (1=yes;0=no)	20-20
Present pain intensity (McGill Pain Quest. 0-5)	21-21
Maximum pain intensity (MPI)	22-22
Minimum pain intensity (MPI)	23-23
Average weekly pain rating	24-26
MPI Sensation score	27-28
MPI Affective score	29-30
MPI Evaluation score	31-31
MPI Miscellaneous score	32-33
MSPQ	34-35
STAI	36-37
BDI	38-39
PBQ	40-42
CSQ (Total)	43-46
CSQ - Divert att.	47-48
CSQ - Reinterpret.	49-50
CSQ - Catastroph.	51-52
CSQ - Ignore	53-54
CSQ - Pray	55-56
CSQ - Coping Statements	57-58
CSQ - Incr. Behav.	59-60
CSQ - Control pain	61-61
CSQ - Decr. pain	62-62
SIP-S	63-66
SIP-O	67-70

Rows 3,4 and 5 repeat the same order, with Row 3 being posttreatment, Row 4 being 6 months follow-up, and Row 5 being 12 months follow-up.

The only exceptions occur at the end of Rows 2,3,4, and 5, starting at column 71. In Row 2, columns 71-73 list the expectancy scores. In Row 3, columns 71-74 list the physiotherapy evaluation scores. In Rows 4 and 5, columns 71-74 list the follow-up practice frequencies for the techniques taught in the treatment conditions; column 71 = physio. exercises, 72 = maintenance of increased activities, 73 = relaxation practice, 74 = use of cognitive strategies.

Codes for different conditions:

- 1= Cognitive Treatment
- 2= Cognitive Treatment plus Relaxation
- 3= Attention Control
- 4= No-Attention Control
- 5= Behavioural Treatment
- 6= Behavioural Treatment plus Relaxation

2. Study Two

The data are presented in the same order in Study Two as for Study One. The only exception being in columns 78-79 where the scores for the PSEI are presented.

Codes for conditions:

- 7= Treatment
- 8= Control

3. Study Three

The data are presented in the same order as for the first two studies, with the important exception that the PSEI scores are presented in columns 40-41, the PBQ scores are presented in columns 42-44, and the CSQ scores in columns 45-47. The remaining ordering of variables is the same as before although they are displaced to the right by one.

Codes for conditions:

- 1= Treatment
- 2= Control

4. Study Four

The data are presented in the same order as for Study Two, with the PSEI scores on the end of Rows 2 and 3 (columns 78-79).

Codes for conditions:

- 7= Treatment
- 9= Control

RAW DATA- STUDY ONE

10135111200305.411	62209109173822084	063262122303130263241.533.69.4
1101101111000000001003423.	62209109173822084	063262122303130263241.533.69.4
1101200000000001000002403.	71007406223314050	100303115273030274331.131.609.77.4
11013000000000000104534.	41608309225620067	002312020232627272329.222.32 3
110140000000000000003523.	52107110175119057	08529272022303027428.114.72 4
10232111201210.011		
1102101110000001100103524.	32310511196224084	018270728011817123341.542.05.1
1102200000000001100102523.	6301341014424078	033171423081122062336.930.809.73.6
1102300011000001000102523.	72211412154321073	039211723071320103331.841.23 3
110240010000001100102523.	41909510104114057	039110812090517113231.631.93 3
10356011611208.011		
1103100010010000010102511.	52706207073607032	062220312191226165318.314.65.6
110321000000000010002511.	62607408143610032	103311107230525255412.605.310.00.0
110330000100000010101512.	12406408114311033	096300713241029295413.404.20 0
110340100000000011010251	160440410430703	7091230710210433215417.2 0 0
10439011101204.310		
110410011100000000003423.	01910305176226093	000030020000906170029.212.65.3
110421000000000100002212.	11201104146021059	01708021410105172213.107.308.06.3
11043000000000010001402.	12303104176419064	026100417120809161121.912.42 2
110440000000000000001412.	01702104094517059	018060418110606130019.513.13 3
10535101301204.011		
1105112011000100100102523.	22509208236329060	034150415121821150334.620.78.5
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10540100100000000100000	0000000022301029	086161313241595244305.8 2 0
10647111221206.411		
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1106410000000001101003534.	32809407148019061	061201124181622223322.404.72 4
10756001301204.411		
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10824101101300.811
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20242111300304.011
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204320000000000100100302.11201102073611034 077230113161030305508.802.00 34
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206100010000000110001411.81006104002502047 084311306232528203408.114.77.8
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207320000000000110102322.21602103054004026 043151206152416152220.521.32 12
20821001101203.510
208100001000000111002422.31305502277439094-006080329122008122145.1 2.3

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30120000000000100001511.81803101105311053		050190917151920233337.130.75.0
30130000000000100004431.01707305064102052		059192118182221204328.117.109.06.2
3014000000000010005522.91000108075114056		049181512141816163311.718.13
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30240000000000100103523.32910408145210047		102262602211119233318.119.33
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305100010000000000002422.10400201114512041		025170310123021113333.618.72.0
305210000000000000002512.31501201124314053		029170211142615183336.017.308.42.6
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30630000000000101002333.12003305123708057		015100517101313073319.712.92
3064000000000000101002523.11203305113890958		001140421031607081325.816.40
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307300000100001000101503.80702403122204052		
30740011110000110010151 1405503176509054		
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308200000000000000002423.63107411135618077		
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30838011621215.011
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40145011611212.011
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401420010000100100002312.81302303112918084 05015151010252520337.629.33
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402200000000000110002513.11106304045309059 027080305000710183121.224.408.61.9
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402400101000000110003432.21106505107318041 040180603043023244230.418.54
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STUDY ONE

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END OF FILE

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[illegible]

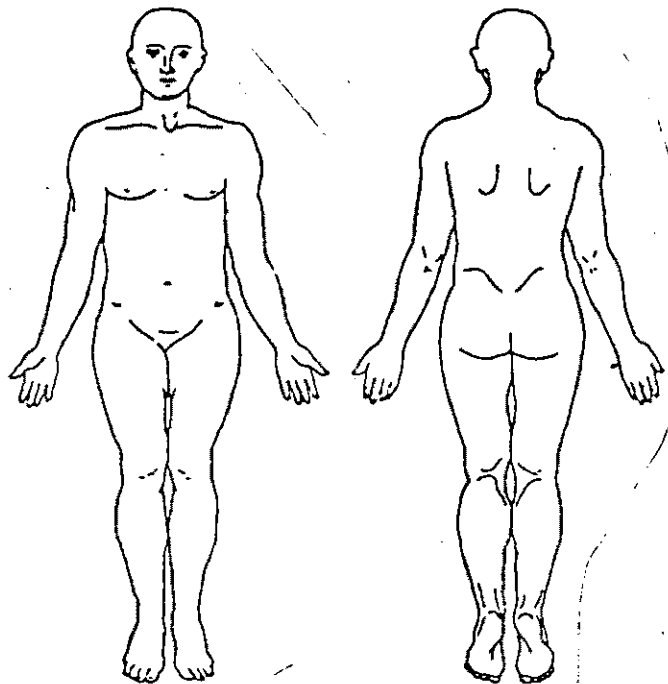
PAIN QUESTIONNAIRE

Name: _____
 File No.: _____
 Age: _____
 Date: _____
 Presenting Problem: _____

Onset: _____
 Diagnosis (if any): _____
 Referring Doctor: _____
 On Compensation, Pension, or employed?: _____

Where is your Pain?

Please mark on the drawing below the areas where you feel pain.

Pain Intensity

People agree that the following five words represent pain of increasing intensity.

1	2	3	4	5
Mild	Discomforting	Distressing	Horrible	Excruciating

To answer each question below, write the number of the most appropriate word in the space beside the question.

1. Which word describes your pain right now? _____
2. Which word describes it at its worst? _____
3. Which word describes it at its least? _____

What Does Your Pain Feel Like?

Some of the words below describe your present pain. Circle ONLY those words that best describe it. Leave out any category that is not suitable. Use only a single word in each appropriate category - the one that applies best.

1 Flickering Quivering Pulsing Throbbing Beating Pounding	2 Jumping Flashing Shooting	3 Pricking Boring Drilling Stabbing Lancinating	4 Sharp Cutting Lacerating
5 Pinching Pressing Gnawing Cramping Crushing	6 Tugging Pulling Wrenching	7 Hot Burning Scalding Searing	8 Tingling Itchy Smarting
9 Dull Sore Hurting Aching Heavy	10 Tender Taut Rasping Splitting	11 Tiring Exhausting	12 Sickening Suffocating
13 Fearful Frightful Terrifying	14 Punishing Gruelling Cruel Vicious Killing	15 Wretched Blinding	16 Annoying Troublesome Miserable Intense Unbearable
17 Spreading Radiating Penetrating Piercing	18 Tight Numb Drawing Squeezing Tearing	19 Cool Cold Freezing	20 Nagging Nauseating Agonizing Dreadful Torturing

How Does Your Pain Change with Time?

1. Which word or words would you use to describe the pattern of your pain?

1 Continuous Steady Constant	2 Rhythmic Periodic Intermittent	3 Brief Momentary Transient

2. What kind of things relieve your pain?

3. What kind of things increase your pain?

SELF-EVALUATION QUESTIONNAIRE

Developed by C. D. Spielberger, R. L. Gorsuch and R. Lushene

STAI FORM X-1

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *feel* right now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	①	②	③	④
2. I feel secure	①	②	③	④
3. I am tense	①	②	③	④
4. I am regretful	①	②	③	④
5. I feel at ease	①	②	③	④
6. I feel upset	①	②	③	④
7. I am presently worrying over possible misfortunes	①	②	③	④
8. I feel rested	①	②	③	④
9. I feel anxious	①	②	③	④
10. I feel comfortable	①	②	③	④
11. I feel self-confident	①	②	③	④
12. I feel nervous	①	②	③	④
13. I am jittery	①	②	③	④
14. I feel "high strung"	①	②	③	④
15. I am relaxed	①	②	③	④
16. I feel content	①	②	③	④
17. I am worried	①	②	③	④
18. I feel over-excited and "rattled"	①	②	③	④
19. I feel joyful	①	②	③	④
20. I feel pleasant	①	②	③	④



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577 College Avenue, Palo Alto, California 94306

BECK DEPRESSION INVENTORY (BDI).

NAME: _____

DATE: _____

This is a brief mood inventory

Place a tick in the space provided beside the statements which best describe how you have felt over the past week, including today.

There are 21 groups of statements (indicated by letters A to U). Please tick only one statement in each group - that is, the statement which best describes how you have felt over the past week. If no statements in a group describe exactly how you have felt, just tick the one that is closest.

Make sure you read all the statements in each group before answering.

A.

- _____ I do not feel sad.
- _____ I feel blue or sad.
- _____ I am blue or sad all the time and can't snap out of it.
- _____ I am so sad or unhappy that it is quite painful.
- _____ I am so sad or unhappy that I can't stand it.

B.

- _____ I am not particularly pessimistic or discouraged about the future.
- _____ I feel discouraged about the future.
- _____ I feel that I have nothing to look forward to.
- _____ I feel that I won't ever get over my troubles.
- _____ I feel that the future is hopeless and that things cannot improve.

C.

- _____ I do not feel like a failure.
- _____ I feel I have failed more than the average person.
- _____ I feel I have accomplished very little that is worthwhile or that means anything.
- _____ As I look back on my life all I can see is a lot of failure.
- _____ I feel I am a complete failure as a person (parent, husband, wife).

D.

- _____ I am not particularly dissatisfied.
- _____ I feel bored most of the time.
- _____ I don't enjoy things the way I used to.
- _____ I don't get satisfaction out of anything any more.
- _____ I am dissatisfied with everything.

E.

- ☐ I don't feel particularly guilty.
- ☐ I feel bad or unworthy a good part of the time.
- ☐ I feel quite guilty.
- ☐ I feel bad or unworthy practically all the time now.
- ☐ I feel as though I am very bad or worthless.

F.

- ☐ I don't feel I am being punished.
- ☐ I have a feeling that something bad may happen to me.
- ☐ I feel I am being punished or will be punished.
- ☐ I feel I deserve to be punished.
- ☐ I want to be punished.

G.

- ☐ I don't feel disappointed in myself.
- ☐ I don't like myself.
- ☐ I am disgusted with myself.
- ☐ I hate myself.

H.

- ☐ I don't feel I am any worse than anybody else.
- ☐ I am critical of myself for my weaknesses or mistakes.
- ☐ I blame myself for my faults.
- ☐ I blame myself for everything bad that happens.

I.

- ☐ I don't have any thoughts of harming myself.
- ☐ I have thoughts of harming myself but I would not carry them out.
- ☐ I feel I would be better off dead.
- ☐ I feel my family would be better off if I were dead.
- ☐ I have definite plans about committing suicide.
- ☐ I would kill myself if I could.

J.

- ☐ I don't cry any more than usual.
- ☐ I cry more than I used to.
- ☐ I cry all the time now. I can't stop it.
- ☐ I used to be able to cry but now I can't cry at all even though I want to.

- _____ I am no more irritable now than I ever am.
- _____ I get annoyed or irritated more easily than I used to.
- _____ I feel irritated all the time.
- _____ I don't get irritated at all at the things that used to irritate me.

L.

- _____ I have not lost interest in other people.
- _____ I am less interested in other people than I used to be.
- _____ I have lost most of my interest in other people and have little feeling for them.
- _____ I have lost all my interest in other people and don't care about them at all.

M.

- _____ I make decisions about as well as ever.
- _____ I try to put off making decisions.
- _____ I have great difficulty in making decisions.
- _____ I can't make decisions at all any more.

N.

- _____ I don't feel I look worse than I used to.
- _____ I am worried that I am looking old or unattractive.
- _____ I feel that there are permanent changes in my appearance and they make me look unattractive.
- _____ I feel that I am ugly or repulsive looking.

O.

- _____ I can work about as well as before.
- _____ It takes extra effort to get started at doing something.
- _____ I don't work as well as I used to.
- _____ I have to push myself very hard to do anything.
- _____ I can't do any work at all.

P.

- _____ I can sleep as well as usual.
- _____ I wake up more tired in the morning than I used to.
- _____ I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
- _____ I wake up early every day and can't get more than 5 hours sleep.

Q.

- _____ I don't get any more tired than usual.
- _____ I get tired more easily than I used to.
- _____ I get tired from doing anything.
- _____ I get too tired to do anything.

R.

- ☐ My appetite is no worse than usual.
- ☐ My appetite is not as good as it used to be.
- ☐ My appetite is much worse now.
- ☐ I have no appetite at all any more.

S.

- ☐ I haven't lost much weight, if any, lately.
- ☐ I have lost more than 5 pounds (2 kilos).
- ☐ I have lost more than 10 pounds (4 kilos).
- ☐ I have lost more than 15 pounds (7 kilos).

T.

- ☐ I am no more concerned about my health than usual.
- ☐ I am more concerned about aches and pains or upset stomach or constipation.
- ☐ I am so concerned with how I feel or what I feel that it's hard to think of much else.
- ☐ I am completely absorbed in what I feel.

U.

- ☐ I have not noticed any recent changes in my interest in sex.
- ☐ I am less interested in sex than I used to be.
- ☐ I am much less interested in sex now.
- ☐ I have lost interest in sex completely.

MSPQ

Name: _____

Score: _____

Date: _____

Please describe how you have felt during the PAST WEEK by making a check mark (✓) in the appropriate box. Please answer ALL questions. Do not think too long before answering.

	Not at all	A Little/ slightly	A great deal/quite a bit	Extremely/ could not have been worse
Mouth Becoming Dry				
Blurring of Vision				
Sweating All Over				
Stomach Churning				
Muscles Twitching or Jumping				
Feeling Hot all Over				
Feeling Faint				
Muscles in Neck Aching				
Dizziness				
Tense Feeling Across Forehead				
Legs Feel Weak				
Nausea				
Pain or Ache in Stomach				

COPING STRATEGY QUESTIONNAIRE

Individuals who experience pain have developed a number of ways to cope, or deal with, their pain. These include saying things to themselves when they experience pain, or engaging in different activities. Below are a list of things that patients have reported doing when they feel pain.

For each activity, I want you to indicate, using the scale below, how much you engage in that activity when you feel pain, where a 0 indicates you never do that when you are experiencing pain, a 3 indicates you sometimes do that when you are experiencing pain, and a 6 indicates you always do it when you are experiencing pain.

0	1	2	3	4	5	6
never do			sometimes do that			always do that

When I feel pain ...

1	I try to feel distant from the pain, almost as if the pain was in someone else's body.....	
2	I leave the house and do something, such as going to the movies or shopping.	
3	I try to think of something pleasant.	
4	I don't think of it as pain but rather as a dull or warm feeling.	
5	It is terrible and I feel it is never going to get any better.	
6	I tell myself to be brave and carry on despite the pain.	
7	I read.	
8	I tell myself that I can overcome the pain.	
9	I count numbers in my head or run a song through my mind.	
10	I just think of it as some other sensation, such as numbness.	
11	It is awful and I feel that it overwhelms me.	
12	I play mental games with myself to keep my mind off the pain.	
13	I feel my life isn't worth living.	
14	I know someday someone will be here to help me and it will go away for a while	
15	I pray to God it won't last long.	
16	I try not to think of it as my body, but rather as something separate from me.	
17	I don't think about the pain.	
18	I try to think years ahead, what everything will be like after I've got rid of the pain	
19	I tell myself it doesn't hurt.	
20	I tell myself I can't let the pain stand in the way of what I have to do.	
21	I don't pay any attention to it.	
22	I have faith in doctors that someday there will be a cure for my pain.	

0	1	2	3	4	5	6
never do			sometimes do that			always do that

please turn over

0 1 2 3 4 5 6
 never do sometimes do that always do that

- 23 No matter how bad it gets, I know I can handle it.
- 24 I pretend it is not there.
- 25 I worry all the time about whether it will end.
- 26 I replay in my mind pleasant experiences in the past.
- 27 I think of people I enjoy doing things with.
- 28 I pray for the pain to stop.
- 29 I imagine that the pain is outside of my body.
- 30 I just go on as if nothing happened.
- 31 I see it as a challenge and don't let it bother me.
- 32 Although it hurts, I just keep on going.
- 33 I feel I can't stand it any more.
- 34 try to be around other people.
- 35 I ignore it.
- 36 I rely on my faith in God.
- 37 I feel like I can't go on.
- 38 I think of things I enjoy doing.
- 39 I do anything to get my mind off the pain.
- 40 do something I enjoy, such as watching TV or listening to music.
- 41 I pretend it is not part of me.
- 42 I do something active, like household chores or projects.

Based on all the things you do to cope or deal with your pain, on an average day, how much control do you feel you have over it? Please circle the appropriate number. Remember, you can circle any number along the scale.

0 1 2 3 4 5 6
 never do sometimes do that always do that

Based on all the things you do to cope or deal with your pain, on an average day, how much are you able to decrease it? Please circle the appropriate number. Remember, you can circle any number along the scale.

0 1 2 3 4 5 6
 never do sometimes do that always do that

Name _____
Date _____

Sex _____ Age _____

PRE POST FU

Other _____

Pain Beliefs Questionnaire

The purpose of this questionnaire is to determine how individuals react to the experience of having chronic pain. Information you provide in this questionnaire will allow us to better understand what your pain problem is like for you. For each of the statements below, please indicate how much you agree with what is being stated. For each item, you should circle the number beside the statement that indicates how much agree. For example, if you agree "somewhat" with the statement, you will circle #1, if you agree, you will circle #2, etc. Keep in mind that we would like you to indicate how much you agree, and not simply whether you agree or disagree.

For example, if you do not agree with the statement, "Surgery can cure all problems", then you would circle the zero, indicating that you do not agree at all. If you agree somewhat with the statement "medication is helpful for me", you would circle #1 to indicate this.

The information that you provide in this questionnaire will be very valuable for helping us to treat individuals like you more effectively. Please complete the questionnaire carefully. Be sure to circle one number following each statement on the questionnaire.

Thank you very much for your cooperation.

Agree strongly
Agree
Agree somewhat
Do not agree at all .

PLEASE CIRCLE ONE NUMBER FOR EACH STATEMENT.

1. I have to lie down when I am in pain.....	0	1	2	3
2. It is impossible to enjoy things when you have pain.....	0	1	2	3
3. People should try to be helpful and understanding when I have pain.....	0	1	2	3
4. I can live a normal lifestyle even though I have pain.....	0	1	2	3
5. It is not worth it to try to do things when I am in pain..	0	1	2	3
6. Doctors should be able to cure my pain problem.....	0	1	2	3
7. Friends and family should help out if I am in pain.....	0	1	2	3
8. Pain can get so bad that I will lose control.....	0	1	2	3
9. No one understands how I feel.....	0	1	2	3
10. People think that my pain is imaginary.....	0	1	2	3
11. I cannot enjoy myself when I am in pain.....	0	1	2	3
12. I will never be able to get my life back to normal.....	0	1	2	3
13. My pain problem can get so bad that I want to kill myself.	0	1	2	3
14. I am not going to get better.....	0	1	2	3
15. I will always have to do something to relieve my pain....	0	1	2	3
16. My pain will always interfere with my life.....	0	1	2	3
17. I won't be able to play sports again.....	0	1	2	3
18. I can't stand a lot of pain.....	0	1	2	3
19. I doubt if I will ever be able to do any kind of work.....	0	1	2	3
20. I will never be able to do the things I used to enjoy.....	0	1	2	3
21. I am unhappy all of the time.....	0	1	2	3
22. I feel I have nothing to look forward to.....	0	1	2	3
23. I blame myself for my pain problem.....	0	1	2	3

Agree strongly.....
 Agree.....
 Agree somewhat.....
 Do not agree at all.

PLEASE CIRCLE ONE NUMBER FOR EACH STATEMENT.

14. I get irritated at many things.....	0	1	2	3
15. I think that I am harming my body when I have pain.....	0	1	2	3
16. There must be some way to cure my pain.....	0	1	2	3
17. My doctors may have made my pain problem worse.....	0	1	2	3
18. I can improve my lifestyle despite pain.....	0	1	2	3
19. For the most part, I live a normal life.....	0	1	2	3
20. I feel I can accomplish most of my goals.....	0	1	2	3
21. I think a lot about my pain problem and how it interferes with my life.....	0	1	2	3
22. It is too much of an effort to try to change my lifestyle....	0	1	2	3
23. I require assistance from others with many activities.....	0	1	2	3
24. I fear that my pain will spread to more areas of my body:....	0	1	2	3
25. If my pain increases, it means I'm getting worse.....	0	1	2	3
26. I should stop what I'm doing if I feel more pain.....	0	1	2	3
27. I can get much done even though I have pain.....	0	1	2	3
28. Most chores are too difficult for me to do.....	0	1	2	3
29. I can get things done around the house even when I have pain.	0	1	2	3
30. Another surgery might help my pain problems.....	0	1	2	3
31. I can gradually resume some of my activities.....	0	1	2	3
32. I will never be able to resume doing my hobbies.....	0	1	2	3
33. I shouldn't try to do new things which are difficult to do...	0	1	2	3

Please review the questionnaire and make certain that you have circled one number for each statement.

SICKNESS IMPACT PROFILE.

CALCULATION OF CATEGORY SCORE, DIMENSION SCORES, AND OVERALL SIP SCORE*

The score for each category is calculated by adding the scale values for each item checked within the category and dividing by the maximum possible dysfunction score for that category. This figure is then multiplied by 100 to obtain the category score.

Two dimension scores may be calculated. The physical dimension score is obtained by adding the scale values for each item checked within categories BCM, M, and A, dividing by the maximum possible dysfunction score for these categories, and then multiplying by 100; the psychosocial dimension score is obtained by adding the scale values for each item checked within categories EB, SI, AB, and C, dividing by the maximum possible dysfunction score for these categories, and then multiplying by 100. The scores for the remaining categories are always calculated individually.

The overall score for the SIP is calculated by adding the scale values for each item checked across all categories and dividing by the maximum possible dysfunction score for the SIP. This figure is then multiplied by 100 to obtain the SIP overall score.

In the attached SIP booklet the scale values are coded to one decimal as follows:

1. Following the checking line for each item, the item number and scale value are shown, e.g., 070-083 indicates item 70 has a scale value of 8.3.
2. Following each category code in the upper right-hand corner of the page, the total possible scale value for that category is shown, e.g., SR-0499 indicates a total possible scale value of 49.9 for category SR.
3. On the title page of the booklet in the lower right-hand corner appears SD I-03564 and SD II-03657. These indicate a total possible scale value of 356.4 for the physical scoring dimension, and a total scale value of 365.7 for the psychosocial scoring dimension. These are the denominators for calculating the respective dimension scores.
4. Also on the title page of the booklet in the lower right-hand corner appears SIP-10030 indicating a total possible scale value of 1003.0 for the entire SIP. This is the denominator for calculating the overall SIP score.

*A computerized scoring program (FORTRAN IV) is available through the Department of Health Services, University of Washington, Seattle, Washington 98195.

Please note that there are two special considerations in scoring Category W - Work:

- (1) When a subject answers YES to either,

"If you are retired, was your retirement related to your health?" or

"If you are not retired, but are not working, is this related to your health?",

he is instructed to skip Category W - Work. However, in editing the questionnaire prior to coding or scoring, for subjects who answered YES to either of these questions, item 100 should be checked.

- (2) Item 100, the first item, has been coded 100-361, indicating an unusually high scale value. The scale value for this item has been statistically adjusted to take into account the fact that when item 100 is checked no other item in category W can be checked.

THE FOLLOWING INSTRUCTIONS ARE FOR THE INTERVIEWER-ADMINISTERED QUESTIONNAIRE.

INSTRUCTIONS TO THE RESPONDENT

Before beginning the questionnaire, I am going to read you the instructions.

You have certain activities that you do in carrying on your life. Sometimes you do all of these activities. Other times, because of your state of *pain*, you don't do these activities in the usual way: you may cut some out; you may do some for shorter lengths of time; you may do some in different ways. These changes in your activities might be recent or longstanding. We are interested in learning about any changes that describe you today and are related to your state of *pain*.

I will be reading statements that people have told us describe them when they are not completely well. Whether or not you consider yourself sick, there may be some statements that will stand out because they describe you today and are related to your state of *pain*. As I read the questionnaire, think of yourself today. I will pause briefly after each statement. When you hear one that does describe you and is related to *pain* please tell me and I will check it.

Let me give you an example. I might read the statement "I am not driving my car." If this statement is related to your *pain* and describes you today, you should tell me. Also, if you have not been driving for some time because of your *pain*, and are still not driving today, you should respond to this statement.

If you are in the hospital today, you are here because of your state of *pain*, and you are not doing a number of the things you usually do. For instance, if driving is usual for you, then you are not driving today because you are in the hospital, and you should respond to this statement.

On the other hand, if you never drive or are not driving today because your car is being repaired, the statement, "I am not driving my car" is not related to your *pain* and you should not respond to it. If you simply are driving less, or are driving shorter distances, and feel that the statement only partially describes you, please do not respond to it.

I am now going to begin the questionnaire. Please tell me if you want me to slow down, repeat a statement, or stop so that you can think about one. Also let me know any time you would like to review the instructions. Remember we are interested in the recent or longstanding changes in your activities that are related to your *pain*.

(SR-0499)

PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE
DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

1. I spend much of the day lying down in order to rest _____ (070-083)
2. I sit during much of the day _____ (062-049)
3. I am sleeping or dozing most of the time - day and night _____ (063-104)
4. I lie down more often during the day in order to rest _____ (066-058)
5. I sit around half-asleep _____ (065-084)
6. I sleep less at night, for example, wake up too early,
don't fall asleep for a long time, awaken frequently _____ (069-061)
7. I sleep or nap more during the day _____ (071-060)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

☐

(EB-0705)

PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE
DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

-
1. I say how bad or useless I am, for example, that I am
a burden on others _____ (274-087)
 2. I laugh or cry suddenly _____ (272-068)
 3. I often moan and groan in pain or discomfort _____ (269-069)
 4. I have attempted suicide _____ (281-132)
 5. I act nervous or restless _____ (284-046)
 6. I keep rubbing or holding areas of my body that hurt or
are uncomfortable _____ (262-062)
 7. I act irritable and impatient with myself, for example,
talk badly about myself, swear at myself, blame myself
for things that happen _____ (273-078)
 8. I talk about the future in a hopeless way _____ (283-089)
 9. I get sudden frights _____ (278-074)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

☐

(BCM-2003)

PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE
DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

-
1. I make difficult moves with help, for example, getting into or out of cars, bathtubs	_____ (168-084)
2. I do not move into or out of bed or chair by myself but am moved by a person or mechanical aid	_____ (170-121)
3. I stand only for short periods of time	_____ (155-072)
4. I do not maintain balance	_____ (146-098)
5. I move my hands or fingers with some limitation or difficulty	_____ (152-064)
6. I stand up only with someone's help	_____ (165-100)
7. I kneel, stoop, or bend down only by holding on to something	_____ (171-064)
8. I am in a restricted position all the time	_____ (158-125)
9. I am very clumsy in body movements	_____ (148-058)
10. I get in and out of bed or chairs by grasping something for support or using a cane or walker	_____ (169-082)
11. I stay lying down most of the time	_____ (162-113)
12. I change position frequently	_____ (147-030)
13. I hold on to something to move myself around in bed	_____ (143-086)
14. I do not bathe myself completely, for example, require assistance with bathing	_____ (310-089)
15. I do not bathe myself at all, but am bathed by someone else	_____ (312-115)
16. I use bedpan with assistance	_____ (292-114)
17. I have trouble getting shoes, socks, or stockings on	_____ (305-057)
18. I do not have control of my bladder	_____ (290-124)

(CONTINUED FROM PAGE 7)

19. I do not fasten my clothing, for example, require assistance with buttons, zippers, shoelaces	_____ (298-074)
20. I spend most of the time partly undressed or in pajamas	_____ (302-074)
21. I do not have control of my bowels	_____ (295-128)
22. I dress myself, but do so very slowly	_____ (300-043)
23. I get dressed only with someone's help	_____ (297-088)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

☐

(HM-0668)



THIS GROUP OF STATEMENTS HAS TO DO WITH ANY WORK YOU USUALLY DO IN CARING FOR YOUR HOME OR YARD. CONSIDERING JUST THOSE THINGS THAT YOU DO, PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

-
1. I do work around the house only for short periods of time or rest often _____ (117-054)
 2. I am doing less of the regular daily work around the house than I would usually do _____ (119-044)
 3. I am not doing any of the regular daily work around the house that I would usually do _____ (120-086)
 4. I am not doing any of the maintenance or repair work that I would usually do in my home or yard _____ (001-062)
 5. I am not doing any of the shopping that I would usually do _____ (106-071)
 6. I am not doing any of the house cleaning that I would usually do _____ (116-077)
 7. I have difficulty doing handwork, for example, turning faucets, using kitchen gadgets, sewing, carpentry _____ (107-069)
 8. I am not doing any of the clothes washing that I would usually do _____ (111-077)
 9. I am not doing heavy work around the house _____ (115-044)
 10. I have given up taking care of personal or household business affairs, for example, paying bills, banking, working on budget _____ (105-084)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

☐

(M-0719)

PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE
DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

-
1. I am getting around only within one building	_____ (134-086)
2. I stay within one room	_____ (128-106)
3. I am staying in bed more	_____ (130-081)
4. I am staying in bed most of the time	_____ (131-109)
5. I am not now using public transportation	_____ (140-041)
6. I stay home most of the time	_____ (133-066)
7. I am only going to places with restrooms nearby	_____ (125-056)
8. I am not going into town	_____ (124-048)
9. I stay away from home only for brief periods of time	_____ (139-054)
10. I do not get around in the dark or in unlit places without someone's help	_____ (121-072)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

☐

(SI-1450)

PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE
DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

-
1. I am going out less to visit people	_____ (028-044)
2. I am not going out to visit people at all	_____ (029-101)
3. I show less interest in other people's problems, for example, don't listen when they tell me about their problems, don't offer to help	_____ (003-067)
4. I often act irritable toward those around me, for example, snap at people, give sharp answers, criticize easily	_____ (015-084)
5. I show less affection	_____ (007-052)
6. I am doing fewer social activities with groups of people	_____ (012-036)
7. I am cutting down the length of visits with friends	_____ (027-043)
8. I am avoiding social visits from others	_____ (034-080)
9. My sexual activity is decreased	_____ (039-051)
10. I often express concern over what might be happening to my health	_____ (018-052)
11. I talk less with those around me	_____ (002-056)
12. I make many demands, for example, insist that people do things for me, tell them how to do things	_____ (038-088)
13. I stay alone much of the time	_____ (023-086)
14. I act disagreeable to family members, for example, I act spiteful, I am stubborn	_____ (249-088)
15. I have frequent outbursts of anger at family members, for example, strike at them, scream, throw things at them	_____ (240-119)
16. I isolate myself as much as I can from the rest of the family	_____ (237-102)

(CONTINUED FROM PAGE 11)

17. I am paying less attention to the children _____ (238-064)
18. I refuse contact with family members, for example, turn
away from them _____ (256-115)
19. I am not doing the things I usually do to take care of
my children or family _____ (242-079)
20. I am not joking with family members as I usually do _____ (255-043)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

☐

(A-0842)

PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE
DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

-
1. I walk shorter distances or stop to rest often	_____ (050-048)
2. I do not walk up or down hills	_____ (046-056)
3. I use stairs only with mechanical support, for example, handrail, cane, crutches	_____ (042-067)
4. I walk up or down stairs only with assistance from someone else	_____ (044-076)
5. I get around in a wheelchair	_____ (057-096)
6. I do not walk at all	_____ (052-105)
7. I walk by myself but with some difficulty, for example, limp, wobble, stumble, have stiff leg	_____ (049-055)
8. I walk only with help from someone	_____ (053-088)
9. I go up and down stairs more slowly, for example, one step at a time, stop often	_____ (040-054)
10. I do not use stairs at all	_____ (041-083)
11. I get around only by using a walker, crutches, cane, walls, or furniture	_____ (047-079)
12. I walk more slowly	_____ (051-035)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

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PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE
DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

-
1. I am confused and start several actions at a time _____ (223-090)
 2. I have more minor accidents, for example, drop things,
trip and fall, bump into things _____ (234-075)
 3. I react slowly to things that are said or done _____ (228-059)
 4. I do not finish things I start _____ (227-067)
 5. I have difficulty reasoning and solving problems, for
example, making plans, making decisions, learning new
things _____ (224-084)
 6. I sometimes behave as if I were confused or disoriented
in place or time, for example, where I am, who is around,
directions, what day it is _____ (231-113)
 7. I forget a lot, for example, things that happened
recently, where I put things, appointments _____ (222-078)
 8. I do not keep my attention on any activity for long _____ (220-067)
 9. I make more mistakes than usual _____ (225-064)
 10. I have difficulty doing activities involving concen-
tration and thinking _____ (217-080)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

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(C-0725)

PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE
DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

-
1. I am having trouble writing or typing _____ (191-070)
 2. I communicate mostly by gestures, for example,
moving head, pointing, sign language _____ (177-102)
 3. My speech is understood only by a few people
who know me well _____ (179-093)
 4. I often lose control of my voice when I talk,
for example, my voice gets louder or softer,
trembles, changes unexpectedly _____ (197-083)
 5. I don't write except to sign my name _____ (188-083)
 6. I carry on a conversation only when very close
to the other person or looking at him _____ (178-067)
 7. I have difficulty speaking, for example, get
stuck, stutter, stammer, slur my words _____ (176-076)
 8. I am understood with difficulty _____ (200-087)
 9. I do not speak clearly when I am under stress _____ (201-064)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

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THE NEXT GROUP OF STATEMENTS HAS TO DO WITH ANY WORK YOU USUALLY DO OTHER THAN MANAGING YOUR HOME. BY THIS WE MEAN ANYTHING THAT YOU REGARD AS WORK THAT YOU DO ON A REGULAR BASIS.

DO YOU USUALLY DO WORK OTHER THAN
MANAGING YOUR HOME?

YES

NO

 IF YOU ANSWERED YES, GO ON TO THE NEXT PAGE.

 IF YOU ANSWERED NO:

ARE YOU RETIRED?

YES

NO

IF YOU ARE RETIRED, WAS YOUR
RETIREMENT RELATED TO YOUR HEALTH?

YES

NO

IF YOU ARE NOT RETIRED, BUT ARE
NOT WORKING, IS THIS RELATED TO
YOUR HEALTH?

YES

NO

 NOW SKIP THE NEXT PAGE.

IF YOU ARE NOT WORKING AND IT IS NOT BECAUSE OF
YOUR PAIN , PLEASE SKIP THIS PAGE.

NOW CONSIDER THE WORK YOU DO AND RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN. (IF TODAY IS A SATURDAY OR SUNDAY OR SOME OTHER DAY THAT YOU WOULD USUALLY HAVE OFF, PLEASE RESPOND AS IF TODAY WERE A WORKING DAY.)

-
1. I am not working at all	_____	(100-361)
<u>(IF YOU CHECKED THIS STATEMENT, SKIP TO THE NEXT PAGE.)</u>		
2. I am doing part of my job at home	_____	(094-037)
3. I am not accomplishing as much as usual at work	_____	(096-055)
4. I often act irritable toward my work associates, for example, snap at them, give sharp answers, criticize easily	_____	(088-080)
5. I am working shorter hours	_____	(095-043)
6. I am doing only light work	_____	(086-050)
7. I work only for short periods of time or take frequent rests	_____	(090-061)
8. I am working at my usual job but with some changes, for example, using different tools or special aids, trading some tasks with other workers	_____	(092-034)
9. I do not do my job as carefully and accurately as usual	_____	(097-062)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE



THIS GROUP OF STATEMENTS HAS TO DO WITH ACTIVITIES YOU USUALLY DO IN YOUR FREE TIME. THESE ACTIVITIES ARE THINGS THAT YOU MIGHT DO FOR RELAXATION, TO PASS THE TIME, OR FOR ENTERTAINMENT. PLEASE RESPOND TO (CHECK) ONLY THOSE STATEMENTS THAT YOU ARE SURE DESCRIBE YOU TODAY AND ARE RELATED TO YOUR STATE OF HEALTH.

-
1. I do my hobbies and recreation for shorter periods of time _____ (215-039)
 2. I am going out for entertainment less often _____ (214-036)
 3. I am cutting down on some of my usual inactive recreation and pastimes, for example, watching TV, playing cards, reading _____ (207-059)
 4. I am not doing any of my usual inactive recreation and pastimes, for example, watching TV, playing cards, reading _____ (208-084)
 5. I am doing more inactive pastimes in place of my other usual activities _____ (211-051)
 6. I am doing fewer community activities _____ (216-033)
 7. I am cutting down on some of my usual physical recreation or activities _____ (210-043)
 8. I am not doing any of my usual physical recreation or activities _____ (209-077)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

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(E-0705)

PLEASE RESPOND TO (TICK) ONLY THOSE STATEMENTS THAT YOU ARE SURE
DESCRIBE YOU TODAY AND ARE RELATED TO YOUR PAIN.

-
1. I am eating much less than usual	_____ (085-037)
2. I feed myself but only by using specially prepared food or utensils	_____ (073-077)
3. I am eating special or different food, for example, soft food, bland diet, low-salt, low-fat, low-sugar	_____ (081-043)
4. I eat no food at all but am taking fluids	_____ (077-104)
5. I just pick or nibble at my food	_____ (083-059)
6. I am drinking less fluids	_____ (080-036)
7. I feed myself with help from someone else	_____ (074-099)
8. I do not feed myself at all, but must be fed	_____ (075-117)
9. I am eating no food at all, nutrition is taken through tubes or intravenous fluids	_____ (076-133)

TICK HERE WHEN YOU HAVE READ ALL STATEMENTS ON THIS PAGE

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