Adult Chronic Pain: The Development of an Assessment Model

by

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ABSTRACT

The effective measurement of chronic pain has become a focus of recent pain research. While studies have demonstrated that the pain experience is modified by many factors, assessing pain in the context of these factors is rarely undertaken. Thirty-six subjects volunteered to participate in the study, 18 persons with a chronic pain condition and 18 pain-free controls. Subjects completed a number of self-report questionnaires and were rated for their frequency of demonstrated pain behaviors. The results indicate that many subscales from the questionnaires, as well as several of the pain behaviors, are predictive of group membership. It is felt that the assessment methods utilized in this study hold promise as a diagnostic protocol for chronic pain.

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Adult Chronic Pain: The Development of an Assessment Model

Introduction

Chronic medical conditions affect thirteen percent of the population (Statistics Canada, 1986). These conditions alter the lifestyle of the affected person. Chronic pain is an example of such a condition. The resulting disability contributes to unemployment, depression, anxiety, heavy utilization of the health care system, and cost to the legal system. During the last two decades, interest in studying and treating chronic pain has moved from one-dimensional models (i.e., those that focus only on a stimulus and response paradigm), to the recognition of chronic pain as a multidimensional phenomenon (i.e., controlled and modified by numerous variables). Current thinking holds that pain is experienced in the context of diverse emotions and thoughts.

Awareness of the problems chronic pain can present results in increased demand for assessment measures that can distinguish between intractable chronic pain, chronic pain with psychological reaction, and psychogenic pain (primarily caused and controlled by psychological factors). While the individual's pain sensation is always real, understanding where it falls on the continuum between organic and psychogenic is important for intervention purposes. Some behavioral, emotional, and environmental factors have been recognized as important in maintaining chronic pain and as markers for the identification of patients not likely to benefit from medical interventions. Much of this literature, however, has focused on only one

dimension of the pain experience (e.g., verbal report or behavioral checklists) and has failed to take into account the discrepancy between what people say and what people do.

In order to study factors which may produce, maintain, or affect chronic pain conditions, it is important to have an assessment model that can effectively measure pain. This study proposes the development of a multi-measure assessment model which will examine the behavior of chronic pain patients in two ways: by self-report, and by behavioral observation. The use of this model in differentiating between a chronic pain group and normal controls (i.e., subjects without a chronic pain condition) will be examined in order to determine its effectiveness regarding the actual measurement of pain. This will be carried out through evaluation of the following three questions: Does performance on the self-report measures distinguish between chronic pain and normal subjects? Does the frequency of pain behaviors identify to which group a subject belongs? Are subjects' pain reports consistent with their performance on the pain measures? Factors within the chronic pain group that influence how a person may perceive and/or report their pain experience will also be examined.

Defining Chronic Pain

Current conceptions focus on two distinct types of pain: 1) organic and 2) psychogenic. Mersky and Spear (1967) define organic pain as that resulting from damage to nerve endings, or nerves, or else due to a lesion of the central nervous system; psychogenic pain is regarded as independent of peripheral stimulation or nervous system damage and due to emotionally-

induced peripheral changes (muscle tension, for example). More general definitions describe pain as an unpleasant sensation, occurring in varying degrees as a result of injury, disease, or emotional disorder. Chronic pain is defined as above with an additional criterion: duration of greater than six months.

Pain is a multidimensional experience. Although, as discussed by Elliot and Jay (1987), traditional approaches have defined pain in terms of the simplistic dichotomy between organic and psychogenic origins, the actual distinction separating the two is at best a vague one. It is for this reason that adequate definitions should take both of these factors into account.

Neural Basis of Pain

Pain receptors in humans, though primarily located just below the outer layer of skin, are also found in the cornea, internal organs, and membranes surrounding bones and muscles. Damage to these tissues activates the free nerve endings by the release of serotonin, one of the body's neuro-chemicals. Information from these nerve endings travels to the central nervous system via two fibre types: myelinated A delta fibres and unmyelinated C fibres. Sharp, localized pain reflects A delta fibre activity, often called "fast pain" due to the rapid speed at which the impulses travel along the myelinated fibres (which serve as highly effective insulators and allow for faster conduction of the nerve impulse). Dull, diffuse pain, also called "slow pain," reflects C fibre involvement and a slower conduction time (due to the lack of myelination).

Perception of pain is generally (but not entirely) mediated by the thalamus, with different regions of it responsible for coding distinct aspects of the pain. The posterior nuclei have been established as the structure which defines a stimulus as painful. It is also known that the ventral posterior thalamic nuclei localize a stimulus, while the intralaminar nuclei elaborate upon the aversiveness of a stimulus (Melzack, 1961).

Traditional concepts regarding the neural basis of pain have perceived it as a unitary and relatively fixed system of central pathways and nociceptive afferents. In light of new physiological, anatomical, and psychological information, however, pain is now seen as forming a complex, multi-level system of afferent input that can be modulated at many stages by ascending and descending neuronal impulses. The Gate-Control theory of pain (Melzack & Wall, 1988) stresses the interplay between slow and fast afferent impulses from the periphery and other potentiating feed-back impulses from the brain. The former represents sensory, while the latter reflect modulatory, including psychological mechanisms. In support of this theory, McGrath (1987) cites studies which have demonstrated that the neuronal responses evoked by a constant aversive stimulus can be altered by many environmental and internal factors. This suggests that distinguishing between "organic" and "psychogenic" pain is difficult to do. For example, known organic pain can be blocked by hypnosis, a purely "psychogenic" procedure (Hilgard, Hilgard, MacDonald, Morgan, & Johnson, 1978).

Literature Review

Literature published during the last two decades shows the assessment of pain to be based upon the three types of response systems recognized in individuals: cognitive-affective, behavioral, and physiological. To assess the cognitive-affective response system, researchers have employed self-reports such as self-monitored pain intensity, rating scales, questionnaires and diary cards (see Grabois & Blacker, 1987; Kerns, Finn & Haythornthwaite, 1988). Measurement of behavioral pain responses has been accomplished through behavioral observation scales and pain behavior and symptom checklists. Physiologic measures applied in the assessment of pain, based on the third class of responses, have typically focused on signs of autonomic arousal (e.g., heart rate, blood pressure, respiration, galvanic skin response, pupil dilation, and temperature).

Each mode of pain assessment has weaknesses. Self-report instruments can present a number of difficulties. To establish reliability with such a measure, multiple-item scales and parallel forms are necessary, a requirement often overlooked. Further, the validity of an individual's self-report is difficult to assess since clients display a tendency to either over- or under-report their pain. Use of the behavioral response system in assessment represents difficulties unique to this type of measure. Two major concerns regarding the validity of behavioral data in evaluating pain are: Is an individual not in pain when he/she fails to demonstrate pain behaviors? Are the behaviors researchers have labelled as indicators of pain solely a result of pain? Another limitation of the behavioral observation method is

that the conditions under which these observations occur may lack generalizability to other situations.

Physiological signs (e.g., heart rate, blood pressure) have rarely been demonstrated as valid pain indicators. Whaley and Wong (1983) have shown that fear, anxiety, pain, and anger all elicit the same physiological effects. Additionally, physiological changes may or may not imply the existence of pain; nor does the absence of these changes imply the nonexistence of pain. When pain persists for hours or days, adaptation occurs and physiological signs can return to normal levels. Thus, adults who experience chronic pain often do not manifest the physiological signs expected to be symptomatic of pain. As such, the assessment of pain through the cognitive-affective and behavioral response systems shows the most promise despite the weaknesses inherent in these methods.

Despite the limitations of self-report and behavioral observation discussed earlier, advantages can be found with these methods. Self-report information in pain assessment provides knowledge of pain from the individual suffering from it (the only "true" expert available). Support also exists for the behavioral observation of pain behaviors. Chronic pain patients with identifiable organic conditions, such as rheumatoid arthritis or cancer, show consistent pain related behaviors which can be reliably rated across time and varying conditions (see Anderson, Bradley, McDaniel, Young, Turner, Agudelo, Gaby, Keefe, Pisko, Snyder & Semble, 1987; Keefe, Brantley, Manual & Crisson, 1985; Keefe, Caldwell, Queen, Gil et al., 1987b; McDaniel, Anderson, Bradley, Young, Turner, Agudelo & Keefe, 1986).

Further, since the pain experience is controlled and modified by factors that may vary between individuals, a multi-faceted approach may more effectively address these variables. The goal of pain measurement is to understand the individual experience. This is best accomplished through interpretation of the self-report and non-verbal behavior of the individual. Therefore, the use of more than one technique is probably more useful in the measurement and assessment of chronic pain (Grabois & Blacker, 1987).

Environmental and Personality Influences on Pain

The role of psychological and environmental variables in chronic pain has been recognized (see Adler, Zlot, Hurny & Minder, 1989; Harkins, Price & Braith, 1989; Mechanic & Angel, 1987; Sternbach, 1986; Williams & Thorn, 1989). The individual's pain beliefs are one facet of an individual's psychological make-up. Pain beliefs represent the client's own conceptualization of what pain is and what it means for them (Williams & Thorn, 1989). People develop an understanding of conditions through personal beliefs associated with their ailments. These beliefs develop when the individual adds new information to currently existing meanings and behavior patterns. In a sample of industrially injured workers experiencing chronic pain, Williams and Thorn (1989) found the belief that pain will be long lasting was associated with reports of higher pain intensity by the subjects, regardless of age or actual pain duration. This supports an earlier study (in Williams & Thorn, 1989) which found that subjective reports of cold pressor pain were lower when subjects knew the duration of the pain than when this information was withheld.

This relates to the issue of control in pain conditions. Persons who perceive themselves as in control of their pain (or at least having the ability to modify it) tend to report lower levels of pain, effective coping skills, and less disruption to their daily lives.

A number of demographic and personal history factors have been identified as predisposing subjects to report chronic pain. Surveys conducted in Denmark, Canada, and the United States have identified age, gender, education, and socioeconomic status (SES) as demographic variables that influence the incidence of chronic pain. Williams (1988), in a review of the literature, found that disability claims and the occurrence of pain conditions are highest in the under forty age group and more likely on the part of men. The role of education has also been supported. The Nuprin Pain Report (Sternbach, 1986) found that 23% of Americans with less than a grade twelve education reported over thirty days of back pain a year. This compared with only 12% of high school and college graduates. Further, blue-collar workers will typically report one and a half to two times more back pain than white-collar workers, although this may be confounded by the physical activity these jobs typically require (see Nagi, Riley & Newby, 1973; Sternbach, 1986).

Personality factors, shaped by life experiences, which may contribute to chronic pain include: compulsiveness, lack of awareness regarding the effects of stress on the body, stress, lifestyle, family history of pain, family structure supporting pain behavior and encouraging dependency, and previous surgeries or hospitalizations (see Williams, 1989). Adler, Zlot,

Hurny and Minder (1989) tested the hypothesis that pain-prone patients have a certain blueprint of developmental experiences by comparing adults with psychogenic pain, organic pain, psychogenic bodily symptoms, and organic disease. Subjects in the psychogenic pain group had a higher incidence of abusive or aggressive home environments with an ill parent (often of the same gender) than the other groups. Research by Kremer, Block, and Atkinson (1983) supports the role of family structure in pain. The authors compared pain intensity reports from patients during two interview conditions: the perceived presence (by a pain patient) of a spouse solicitous toward pain complaints, and the presence of a neutral observer. Findings indicated that the presence of a spouse was related to increased pain intensity reports.

The importance of personality characteristics in chronic pain has also been a focus of study. Harkins, Price, and Braith (1989) examined the effects of extraversion and neuroticism (as measured by the Eysenck Personality Inventory) on behavior found in clinical pain and illness. While extraverts and introverts did not differ on any factor of the McGill Pain Questionnaire, extraverts were found to complain significantly more often about their pain. Chronic pain patients who obtained higher neuroticism scores perceived both experimental and their own clinical pain as more disturbing than patients who scored lower on this scale. This was obtained despite the lack of significant differences between these groups on the perceived magnitude of pain sensation intensity of either experimental or chronic pain.

Chronic Pain and the MMPI

The personality measure most extensively employed in investigations of chronic pain patients has been the Minnesota Multiphasic Personality Inventory (MMPI). While consensus has not been obtained regarding the utility of this instrument with pain populations, several MMPI profile configurations have been identified among chronic pain patients (see Bradley, Prokop, Margolis, & Gentry, 1978; Bradley & Van Der Heide, 1984; McGill, Lawlis, Selby, Mooney, & McCoy, 1983; Prokop, Bradley, Margolis, & Gentry, 1980). The most common of these is called a conversion V configuration and it is formed by elevations on scales 1, 2, and 3 (hypochondriasis, Hs; depression, D; and hysteria, Hy) with scale 2 less elevated than the others. The remaining profile clusters identified are elevations on the majority of scales, an absence of elevations, and elevations on one or two of the first three scales.

Costello, Hulsey, Schoenfeld, and Ramamurthy (1987) used a clustering method to arrive at four MMPI profile types labelled P-A-I-N. The "P" profile type represented the group manifesting clinical level elevations on nearly all scales. Analysis of demographic correlates in this group included low SES, high unemployment, and limited education. The "A" group, defined by a "conversion V" on scales 1-3 had no unique demographic correlates. The "I" group had elevations on scales 1-3 only, but without the conversion V configuration. Correlates of this profile type were an increased number of surgeries and hospitalizations. The fourth profile type, "N", demonstrated normal profile types (an absence of elevation on any

scale). This group was composed of subjects with higher education levels than the other groups, more reliable employment histories, and positive treatment responses.

Research conducted by Brennan, Barrett, and Garretson (1987) lends support to the utility of MMPI profiles in discriminating psychological disorder among chronic pain patients. Using the cluster-analytic findings of Bradley and Van Der Heide (1984), the MMPI profiles of each patient were classified as either Normal (no scales with scores >70), Left-Elevated (one or more of the first four scales, but none of the last five scales, with scores >70), or Fully-Elevated (at least one of the first four and at least one of the last five scales with scores >70). In a comparison of McGill Pain Questionnaire (MPQ) factor scores with MMPI profiles, their study found that MPQ scores were lower in subjects with normal MMPI profiles and were higher in those with fully elevated MMPI profiles. Consistent with the view that left-elevated profiles are questionable reflectors of psychopathology in chronic pain patients, no relationship was found between this profile type and the MPQ scores. This is further supported by the presence of Hs, Hy and D scale elevations in chronic pain patients as a whole. Elevations on the Hs and Hy depend in part on the endorsement of a substantial number of physical conditions, thus elevations in pain patients may indicate physical pain and disability rather than psychopathology (Brennan, Barrett & Garretson 1987; Merskey, Brown, Brown, Malhotra, Morrison & Ripley, 1985; Watson, 1982).

Additionally, the role of depression in psychopathology among chronic pain is not easily delineated. Elevated depression levels in chronic pain patients are consistently found (Ackerman & Stevens, 1989). A study by Brown (1990) found that Rheumatoid Arthritis (RA) patients experience higher levels of depressive symptomology than community samples. Further, the results of this study endorsed a "causal" model in which pain predicted depression.

Psychological Influences on Pain Reports

While the presence of psychological factors in chronic pain is no longer in dispute, assessing the magnitude of the effects of these factors has only recently been undertaken. Reesor and Craig (1988) divided a sample of chronic low back pain patients into two groups, based on their signs and symptoms. Subjects were classified as incongruent if they presented three or more non-organic symptoms (exaggerated behaviors not conforming to anatomy or disease), two or more non-organic signs (pain reports which deviate from anatomical principles), and exaggerated or non-anatomical pain drawings. All others were classified as chronic normals (chronic pain patients with an absence of incongruent pain behaviors). Incongruents reported greater levels of pain intensity and depression, evidenced more overt pain behavior, and reported more dysfunctional cognitions (e.g. catastrophizing) while in pain, on the measures employed.

The strongest predictor of incongruent pain behavior among the subjects was dysfunctional cognitions. These subjects felt they lacked self-efficacy and saw the pain experience as more distressing, thus directing

attention to the possible role of ineffective coping styles in chronic pain patients with incongruent behavior.

Performance differences (on pain measures) have also been studied between pain patients with and without psychological disturbance . Controlling for gender and severity of pain complaints, investigators have found that the complexity of pain complaints (the number of words and type of description, i.e., bizarre or unusual) is significantly greater for psychiatric than medical referrals. Leavitt (1983) reported that low back pain patients with psychological disturbance differ significantly from those without in several ways: they use a greater number of words in their descriptions of pain, they disperse these words over more pain factors, and they present significantly more pain of an affective nature (using the Back Pain Classification Scale; Leavitt & Garron, 1979).

Further support for this trend is found with use of the McGill Pain Questionnaire (Kremer & Atkinson, 1983; Leavitt & Garron, 1979; McCreary, 1983). Low back pain patients with psychological disturbance portray their pain in a more extreme fashion in terms of both sensory and affective pain descriptors than patients without psychological disturbance. The use of the MPQ to study the language of psychiatric and nonpsychiatric headache patients results in the finding of more extensive use of affective descriptors by persons who are psychologically disturbed.

Last, chronic benign pain patients (i.e. pain with no associated tissue damage) scoring high on the affective dimension of the MPQ were significantly more depressed, anxious, and somatically concerned on

measures of psychological disturbance than those who reported low affective scores. Preliminary evidence supports the evaluative and affective descriptors of the MPQ as reflecting the motivational and emotional processes of pain patients and the sensory descriptors as representative of factors more specifically related to disease processes (McCreary, 1983).

Leavitt (1987) compared the results of low back pain patients with organic disease alone and organic disease with psychological morbidity on a low back pain symptom checklist. After the items chosen by each group were evaluated for differences, it was found that the subjects differed on 43 words. When these words were statically weighted, prediction of organic disease was 99.2% while that of organic and psychological factors was 86%. These results were replicated with a further sample of subjects. Pain descriptions classifying low back pain not related to established organic disease has also been validated (see Leavitt & Garron, 1979). Subjects recognized as organic by a discriminant function (false negatives), in spite of a lack of physical evidence, resemble patients with identified organic disease. Subjects classified as functional (psychologically disturbed) resembled patients with documented psychological disturbance. Their pain was considerably more erratic, diffuse, and extreme.

Illness behavior has also been targeted as an indicator of psychological involvement in chronic pain patients. Scores on the Illness Behavior Questionnaire (IBQ) have been strongly correlated with measures of affective disturbance and psychological distress in chronic low back pain patients, and were successful in distinguishing between conscious

exaggerators, neurotics and normals (see Clayer, Bookless & Ross, 1984; Waddell, Pilowsky & Bond, 1989).

Comparison between medical clinic and pain clinic populations on the IBQ has supported the utility of illness behavior in screening patients. Pain clinic groups show a higher level of disease conviction and somatic preoccupation than medical clinic groups (see Pilowsky, Chapman & Bonica, 1977). In addition, the scores alone from these groups will correctly classify patients from other clinic populations 70% of the time (see Pilowsky, Murrel & Gordon, 1979). Pilowsky, Spence, Cobb and Katsikitis (1984) argue that illness behavior can complement other clinical data, and conclude that the IBQ provides information relevant to the management of chronic pain patients.

Pain and Coping Strategies

Coping strategies represent yet another facet of pain patients which has found support in the literature. Spinhoven, ter Kuile, Linssen and Gazendam (1989) found that subjects who feel helpless to do anything about their pain will report higher levels of pain, functional impairment, anxiety, depression and psychoneuroticism. Subjects with higher perceived control, on the other hand, reported lower levels of pain and functional impairment and higher levels of uptime (i.e., time not spent resting). Further evidence regarding the role of perceived control and positive thinking versus negative thinking and passivity exists with pain patients, and is described below.

Individuals who view their pain as catastrophic and beyond their control use more health care services, report more severe pain, and are less

active than individuals who demonstrate positive thinking and attitudes of control. This belief in self-efficacy (i.e. the ability to manage and cope with one's pain) is associated with lower pain levels, better health status, less psychological distress and higher activity levels (as measured by the Coping Strategy Questionnaire; Gil, Abrams, Phillips & Keefe, 1989; Keefe et al. 1987a). Coping styles have also predicted pain treatment and surgical outcome among chronic pain patients (Kleinke & Spangler, 1988; Smith & Duerksen, 1979; Villard, Imbeault & Duguay, 1986). Poor outcome from surgery for chronic pain was predicted by characteristics of passivity and dependency in an individual, as well as by difficulty in perceiving and expressing concerns. Positive treatment responses were associated more with refraining from the use of catastrophizing than the use of any particular coping strategy. This has been further supported with Rheumatoid Arthritis (RA) patients whose pain is of a known organic origin yet can be modified by psychological factors. Active coping among RA patients is associated with less pain, depression, and functional impairment and with higher self-efficacy. Passive coping was correlated with greater pain, depression, and functional impairment as well as lower self-efficacy (Brown & Nicassio, 1987).

Overt Pain Behavior

The role of environmental factors in chronic pain and the observable manifestations of pain behavior were first discussed by Fordyce (1976). He saw the concept of pain behavior as one that encompasses a wide variety of verbal (spoken complaints and descriptions of pain) and nonverbal (motoric

correlates of the pain experience) responses which communicate to others that an individual is experiencing pain. He divided these pain behaviors into two types: respondent and operant. Respondent behaviors occur reflexively to antecedent stimuli arising from the site of tissue damage, while operant behaviors are directly controlled by environmental consequences. A basic postulate of the operant model is that pain behaviors are readily identifiable and can be observed and modified.

The development of an observational method for assessing pain behavior was described by Keefe and Block (1982). Five coding categories were used with chronic low back pain patients: guarding, bracing, rubbing, grimacing, and sighing. Prior to their observation period subjects rated the intensity of their pain on an eleven point scale (0=no pain, 10=pain as bad as it could be). Each session consisted of both a one and two minute sitting period, both a one and two minute standing period, 2 one minute reclining periods and 2 one minute walking periods. Order was varied across subjects. In a series of four experiments, the following results were obtained: Experiment I demonstrated that these behaviors could be reliably observed and that their frequency correlated with patients' ratings of pain (r=.71, p <.01). Experiment II found that the frequency of these behaviors diminished with treatment and that these changes corresponded to changes in pain ratings [t(14)=3.9, p <.002]. Experiment III indicated the level of pain behaviors was consistent with naive observer ratings of the subjects' pain (r=.68, p <.01). In experiment IV, the chronic pain subjects engaged in significantly higher levels of the pain behavior categories than normal

[$t(35) = 3.66, p < .01$] or depressed controls [$t(35) = 3.82, p < .01$). The reliability and validity of this procedure has since been extended successfully to other back pain subjects and other types of pain patients (i.e., head, neck, and Arthritis; Keefe, Brantley, Manual & Crisson, 1985; McDaniel, Anderson, Bradley, Young, Turner, Agudelo, & Keefe, 1986).

Follick, Ahern, and Aberger (1985) examined differences between chronic low back pain patients and normal subjects on an audiovisual taxonomy of 16 verbal and nonverbal pain behaviors. Subjects were videotaped during a standardized, structured sequence of movements and engaged in a brief interview component. The categories of partial movement, position shifts, sounds, and limitation statements accounted for 75% of the variance in group membership and correctly classified 94.4% of the patients and 95.2% of the controls. On cross-validation, the same four behaviors classified correctly 88.9% of a second subject sample. The significant pain behaviors in this study were similar to those standardized by Keefe and Block (1982; Guarding, Bracing, Rubbing, Grimacing & Sighing).

Support also exists for the application of both behavioral observation and self-report measures in the comprehensive examination of pain (Anderson, et. al., 1988; Reesor & Craig, 1988). Romano, Syrjala, Levy, Turner, Evans and Keefe (1988) examined the relationship of observed pain behaviors to self-report measures of patient functioning and treatment results. Pre-treatment frequency of overt pain behaviors was related to patient ratings of pain, pain behaviors, and physical impairment but not related to psychosocial functioning. Post-treatment decreases in observed

pain behaviors were significantly correlated with lower depression levels, but not with changes in self-reported pain or pain behaviors.

Keefe, Crisson, Maltbie, Bradley and Gil (1986) found scores on the Illness Behavior Questionnaire (IBQ) were strong predictors of several indices of pain and pain behavior, as measured by the MPQ and Keefe and Block (1982) protocol. Illness behaviors accounted for significant proportions of the variance in pain behaviors such as assistance/support behavior, limping, rubbing and sighing. The IBQ factors of Affective Disturbance, Affective Inhibition and Irritability were particularly strong predictors, while Denial and Disease Conviction were moderate. Further, while Affective Disturbance was significantly related to scores on the Affective dimensions of the MPQ, Irritability was strongly related to scores on the sensory dimension of the MPQ. Patients who reported elevated levels of affective disturbance were inclined to report pain experiences that were chiefly emotionally arousing. These findings were supported even after controlling for demographic (age and sex) and significant medical status variables (disability status and number of operations).

Hypotheses

Based on the findings of previous research, several results are predicted for the present study. It is felt that many of the subscales from the measures chosen should strongly differentiate between the two groups of subjects, such that a subject's performance will correctly classify him/her (i.e., chronic pain group vs. control group). Additionally, subject pain reports

are expected to correlate with the frequency of pain behaviors they demonstrate.

The goal for this research is to establish an assessment technique which can effectively discriminate between persons with and without chronic pain by looking at several aspects of the pain experience. These factors include: the sensation and intensity of a person's pain; the person's reaction to their health status and their method of coping with it; the behavioral correlates of pain; the degree to which pain is reflected on characterological measures such as the MMPI-2; and the role of demographic variables. This model may then serve as an indicator regarding the form of intervention which may be required.

Method

Subjects

The subjects in this study (N = 36) were placed in two groups. The first group (n = 18) consisted of persons who had been diagnosed with Arthritis at least one year previously. Arthritis is an auto-immune disease involving chronic inflammation and/or degeneration in the joints and surrounding tissues. Typical symptoms include stiff, sore, and swollen joints. Over a period of time, bony growths may occur within these joints causing decreased and painful movement. The second group (n = 18), a non-chronic pain control group, was included to assess the discriminant validity of the self-report instruments and behavioral observation method (i.e., the differences in pain reports and the extent to which the pain behaviors were not demonstrated). The control group was recruited from the University of

Victoria student population and the general community. Descriptive statistics for the two groups are presented in Table 1.

The age range of 25 to 57 years of age was imposed for two reasons. First, it was important to ensure that pain behaviors attributable to conditions experienced as a result of normal aging processes were not observed in the control group members. Second, Arthritis diagnosed prior to adulthood represents an entirely different form of disease process than that found in adulthood.

Fifty percent of the control group members and 22% of the chronic pain groups were employed at the time of their participation in the study.

Procedures

Subjects participated in the study on a volunteer basis. Each person first attended a two to three hour group session with between four to six subjects. During this session, participants completed the four self-report measures. These self-report measures were the McGill Pain Questionnaire (MPQ), the MMPI-2, the Illness Behavior Questionnaire (IBQ), and the Coping Strategies Questionnaire (CSQ).

The second session took place approximately seven to 14 days later. Subjects met with the researcher individually. For this session subjects were videotaped during the administration of interview questions (regarding demographic and personal history factors) and the WAIS-R, a period of approximately one and a quarter hours. These instruments were specifically chosen for inclusion in the videotaped portion of the session because of their completion time and the pain behaviors which can accompany sitting

TABLE 1

Descriptive Statistics by Group

	Control	Pain	F (1,34)
Age	38.9 (9.6)	40.3 (8.8)	0.21
Education	15.8 (4.1)	13.2 (1.9)	5.26
Gender			
Females	n=15	n=16	
Males	n= 3	n= 2	

Note: age and education were measured in years; standard deviations are reported in brackets.

while reading and writing, reaching and manipulating objects, and retrieving materials.

The length of the videotaped session for each subject was kept within a specific range of time (66-82 minutes) to ensure that the frequency of measured pain behaviors was not influenced by the duration of this session. No significant differences were obtained between the average length of the video sessions for the control and pain groups. The videotapes from these sessions were later rated for the frequency of nonverbal pain behaviors.

Control group subjects in the study were instructed to answer the questionnaire items on the basis of any present or recent pain. For example, they were prompted to think about any recent headaches or backaches they might have had, and asked to remember how they felt both physically and emotionally at that time. The chronic pain group members responded on the basis of any present or recent pain they had experienced as a result of their arthritis condition.

Measures

The MPQ (Melzack, 1975) contains 78 pain words which are classified into three major classes (sensory, affective, & evaluative) and 20 subclasses. Subjects complete the questionnaire by checking off the word in each subclass (if any) that best describes their pain (See Appendix B). The MPQ may be scored for the total number of words chosen (NWC), the pain rating index (PRI), and the present pain intensity (PPI). The PRI is derived from rank values of the words within each subclass. Summed, these values provide scores for the individual categories as well as an overall rating.

The reliability and validity of the MPQ has been established. Melzack (1975) and Graham, Bond, Gerkousch and Cook (1980) describe test-retest reliability investigations with average consistency indices of 70.3% and 75% respectively. Further, factor-analytic support for all three of the pain components has been found (see Byrne et al., 1982; Turk, Rudy & Salovey, 1985; and Brennan et al., 1987). The MPQ also distinguishes between pain groups, normals, and psychiatric patients (Dubuisson & Melzack, 1976; Leavitt, 1987; Reading, 1983).

The IBQ (Pilowsky and Spence, 1975, revised 1983) was developed to measure a person's psychological reactions to his/her health status. One completes this measure with a yes or no response to 62 items (See Appendix B). The IBQ provides seven subscale scores. These are: (1) General Hypochondriasis (GH) - high scores suggest the subject has a phobic, anxious concern regarding health; (2) Disease Conviction (DC) - high scores imply preoccupation with symptoms and a firm conviction that disease is present; (3) Psychologic vs Somatic perception of illness (PS) - high scores indicate that the individual perceives illness in psychologic terms and low scores that perception is in somatic terms; (4) Affective Inhibition (AI) - high scores reflect that the subject is unskilled in expressing personal or negative feelings to others; (5) Affective Disturbance (AD) - high scores convey excessive anxiety and depression; (6) Denial (D) - high scores indicate the patient tends to deny life stresses or attributes them to physical problems; (7) Irritability (I) - high scores indicate the client is distressed by feelings of anger, notably in interpersonal conditions.

Pilowsky and Spence (1983) describe test-retest correlations for the seven scales of the IBQ. After an interval of one to 12 weeks, correlations ranged from 0.67 to 0.87, with only three coefficients below 0.84. Factor analyses on the scored items with samples of chronic pain patients have identified the seven factors which are scored, and these scores have demonstrated success in discriminating between different medical and psychiatric patient populations (see McDowell & Newell, 1987; Pilowsky, Murrel & Gordon, 1979; Pilowsky & Spence, 1983).

The Coping Strategy Questionnaire (CSQ; Rosenstiel and Keefe, 1983) consists of seven scales representing pain coping activity: Diverting Attention (DA), Reinterpreting Pain Sensations (RS), Coping Self-Statements (CS), Ignoring Pain Sensations (IS), Increasing Activity Level (IA), Praying or Hoping (PH), and Catastrophizing (CS). In addition, the two pain control effectiveness scores of control over pain (CP) and ability to decrease pain (AD) are included (See Appendix B).

Rosenstiel and Keefe (1983) have demonstrated the internal reliability of the CSQ subscales. Turner and Clancy (1986) replicated the factor structure of the CSQ, and also found associations between the types of coping strategies used and measures of physical and psychosocial impairment. Further, it has been found that treatment-related changes in the use of certain coping strategies are related to changes in pain intensity and disability (Turner & Clancy, 1986; Keefe et al., 1987b)

The MMPI-2 is a widely used and well known characterological measure containing 567 items which are scored on 10 main clinical scales and

15 content scales. Three validity scales were also scored. The WAIS-R is a general adult intelligence test, also widely used and well known. Movements required with completion of some tasks may elicit pain behaviors.

The behavioral observation portion of this study used several of the pain behaviors researched by Keefe and Block (1982) with some additions. These include: 1) guarding: abnormally stiff, interrupted movement, or rigid movement while moving from one position to another; 2) bracing: a stationary position in which a fully extended limb supports and maintains an abnormal distribution of weight for more than three seconds; 3) rubbing: touching, rubbing, or holding the affected area of pain for more than three seconds; 4) grimacing: an obvious facial expression of pain which includes furrowed brow, narrowed eyes, tightened lips, corners of mouth pulled back, and clenched teeth; 5) position shifts: changes in body alignment or in distribution of body weight; and 6) pain relief behaviors (e.g., shoulder shrugs, neck rolls).

During the interview portion of the study, subjects were asked for information regarding their demographics and social history. Psychosocial stressors were evaluated using a checklist format (Holmes & Rahe, 1967). Each stressor from the checklist had a stress value attached to it. These values were summed to provide the stress number. Subjects were instructed to check off only those stressors which had occurred in their lives during the last twelve months. Subjects also indicated on a gender neutral body outline in what areas they were feeling pain (if any) at the time of the interview.

Analysis

The analysis of data has two aims: a) to examine those factors which influence chronic pain in pain-group individuals; b) to identify the variables differentiating between the two groups (normal controls vs. chronic pain patients).

A MANOVA (Tabachnick & Fidell, 1989) was run to determine which of the variables discriminated between the control and pain groups. The univariate F ratios yielded by this procedure indicated which variables would be retained for further analysis. All variables were evaluated using a conservatively adjusted alpha ($p < .001$) in order to maintain experiment-wise Type I error at less than five percent. Discriminant function analysis of the retained variables (Multivariate $F = 29.99$, $p < .0001$) was undertaken to order the strength of these discriminating variables and to predict group membership.

Results

Manova

The control and pain groups did not differ on the variables of age, gender, or education (See Table 1).

As seen in Table 2, the mean scores between the two groups on the McGill Pain Questionnaire were significantly different. The chronic pain subjects reported a higher index of pain descriptors in all categories, chose more words to describe their pain, and gave higher pain intensity ratings than did their control group counterparts.

Analysis of the IBQ revealed three subscales that were significant between groups: disease conviction, psychological versus somatic perceptions of illness and the Whitely Index of Hypochondriasis (see Table 3). As would be expected, the pain group perceived themselves as having the symptoms of a disease and felt these symptoms were of a somatic nature. The subject groups did not differ on the general hypochondriasis scale which measures phobic or anxious concern regarding health. Yet, they did differ on the Whitely index which examines hypochondriasis through the presence of physical symptoms and one's concern about them.

As shown in Table 4 only one of the cognitive coping strategies discriminated between the two groups (DA). Chronic pain subjects reported a higher use of strategies that involved diverting their attention away from the pain and onto something else (e.g., "I try to think of something pleasant") than the control group. The use of coping self statements (CS) when in pain (eg "I tell myself that I can overcome the pain") by the pain group approached significance ($p < .002$) but was unable to meet the required alpha level. These findings may be in part due to the possibility that the chronic pain group may have more of a need for these types of coping strategies given their chronic condition.

Regarding the behavioral strategy of increasing behavioral activities (IA) to cope with pain (e.g., reading, shopping), the pain group reported greater use of this strategy than the control group. Of note is the finding that both of the groups reported similar scores regarding their ability to control and decrease their pain. This is important given the fact that despite a chronic pain condition, the pain group subjects did not feel any differently than the controls regarding their ability to exert control over their condition.

TABLE 2

Subscale Scores on the McGill Pain Questionnaire (MPQ) by Group

	Control		Pain		
Subscale	M	SD	M	SD	F (1,34)
PRI-S	2.67	2.77	16.11	9.02	45.27*
PRI-A	0.39	0.78	4.67	3.97	20.12*
PRI-E	0.44	0.51	2.56	1.25	44.15*
TPRI	4.44	3.94	28.28	13.43	52.20*
PPI	0.72	0.83	2.61	0.61	61.03*
NWC	3.44	2.77	13.72	4.54	66.50*

* $p < .001$

TABLE 3

Subscale Scores on the Illness Behavior Questionnaire (IBQ) by Group

	Control		Pain		
Subscale	M	SD	M	SD	F (1,34)
General Hypochondriasis	0.17	0.23	0.24	0.25	0.78
Disease Conviction	0.16	0.13	0.69	0.19	95.31 *
Psychologic vs Somatic	0.46	0.14	0.12	0.12	61.66 *
Affective Inhibition	0.31	0.25	0.44	0.23	2.74
Affective Disturbance	0.23	0.25	0.39	0.41	1.86
Denial	0.60	0.25	0.53	0.20	0.77
Irritability	0.18	0.20	0.38	0.39	3.42
Whitely Index	0.14	0.11	0.52	0.23	38.06 *

* $p < .001$

TABLE 4

Subscale Scores on the Coping Strategy Questionnaire (CSQ) by Group

	Control		Pain		
Subscale	M	SD	M	SD	F (1,34)
DA	1.20	0.98	2.54	1.02	16.19 *
RS	1.02	1.32	1.31	1.14	0.52
CA	0.74	0.63	1.57	0.94	9.77
IS	2.41	1.55	2.43	1.04	0.00
PH	1.32	1.14	2.20	1.29	4.74
CS	2.67	1.53	4.11	0.89	11.89
IA	1.84	1.41	3.43	1.02	14.92 *
CP	3.61	0.98	3.39	1.54	0.27
AP	3.83	1.15	3.06	1.31	3.60

* $p < .001$

Analysis of the three MMPI-2 validity scales did not reveal any differences between the two groups. All subjects provided valid profiles.

Five of the MMPI-2 clinical subscales differentiated between control group and pain group profiles. These were: hypochondriasis, depression, hysteria, schizophrenia, and hypomania. Of these five scales, however, only two demonstrated mean t-scores that exceeded the normal range for the pain group (see Table 5). This same pattern of significance was found when using the raw scores (not k corrected) for each clinical scale (See Table 7).

Raw scores on the content scales were also evaluated, with health concerns emerging as significant between groups (See Table 8). The chronic pain group demonstrated more focus on bodily symptoms and health-related issues than the control group.

Subject profiles on the clinical scales of the MMPI-2 were evaluated to determine how many met the criteria for three profile types: normal, conversion V (or left-elevated), and fully elevated. Normal profile types were defined as an absence of any significant elevations (t-scores less than 65) on all ten scales. Conversion V was defined as a t-score of greater than 65 on scales one and three (hypochondriasis and conversion hysteria respectively) and a t-score on scale two (depression) at least five points lower than those on one and three. Profiles that demonstrated a conversion V, along with elevations on at least one of the last six scales were considered "fully elevated".

In the pain group, six subjects met the normal profile criteria, six showed the conversion V alone, and six were classified as fully elevated. In

the control group, all 18 subjects met the criteria for a normal profile. The classification system did not place any control group members in the conversion V or fully elevated categories. Sixty-six percent of the pain group, however, did meet the criteria for conversion V (See Table 6).

Post hoc analysis of the items loading on scales one and three (Hypochondriasis and Conversion Hysteria) suggested that the chronic pain group endorsed questions related to physical symptoms more often than the control group (See Figures 1-4; Table 13). The small sample size of this study, however, limits any further testing of this trend for significance.

The pain behavior categories of Guarding, Bracing and Position Shifts did not reach significance when compared between groups despite their low to zero frequency of occurrence in the control group. The categories of rubbing and pain relief behaviors, however, were effective at discrminating between the two groups (See Table 9).

The pain behavior of grimacing was not demonstrated by any of the subjects and eliminated from analysis. Pain behaviors were also consistent with where a subject indicated on a body outline they were experiencing discomfort.

TABLE 5

Clinical Scale t-Scores on the MMPI-2 by Group

	Control		Pain		
Scale	M	SD	M	SD	F(1,34)
L	49.94	9.84	55.11	13.46	1.73
F	47.11	5.27	55.89	8.80	13.18
K	55.83	8.48	52.44	10.84	0.30
Hs	48.17	7.11	76.00	10.15	90.88 *
D	49.39	7.30	61.67	9.71	18.39 *
Hy	49.61	7.62	75.50	13.21	51.86 *
Pd	47.83	9.45	52.83	14.47	1.51
Mf	48.89	6.41	46.50	6.86	1.17
Pa	49.11	9.70	53.67	10.23	1.88
Pt	49.17	9.02	60.28	11.24	10.78
Sc	48.17	5.59	63.67	12.94	21.77 *
Ma	45.17	5.27	57.39	11.09	17.82 *
Si	50.06	7.94	48.17	7.83	0.52

* $p < .001$

TABLE 6

MMPI-2 Profile Classifications by Group

		Profile Classification		
Group	n	Normal	Left Elevated	Fully Elevated
Control	18	18 a	0	0
Pain	18	6	6	6

Note N=36
a represents number of subjects

Figure Caption

Figure 1. Items Answered True Which Load on the Hypochondriasis Scale - Frequency By Group

Figure 2. Items Answered False Which Load on the Hypochondriasis Scale - Frequency By Group

Figure 3. Items Answered True Which Load on the Conversion Hysteria Scale - Frequency By Group

Figure 4. Items Answered False Which Load on the Conversion Hysteria Scale - Frequency By Group

Note: 'true' and 'false' denote the direction for which pathology is scored

Figure 1

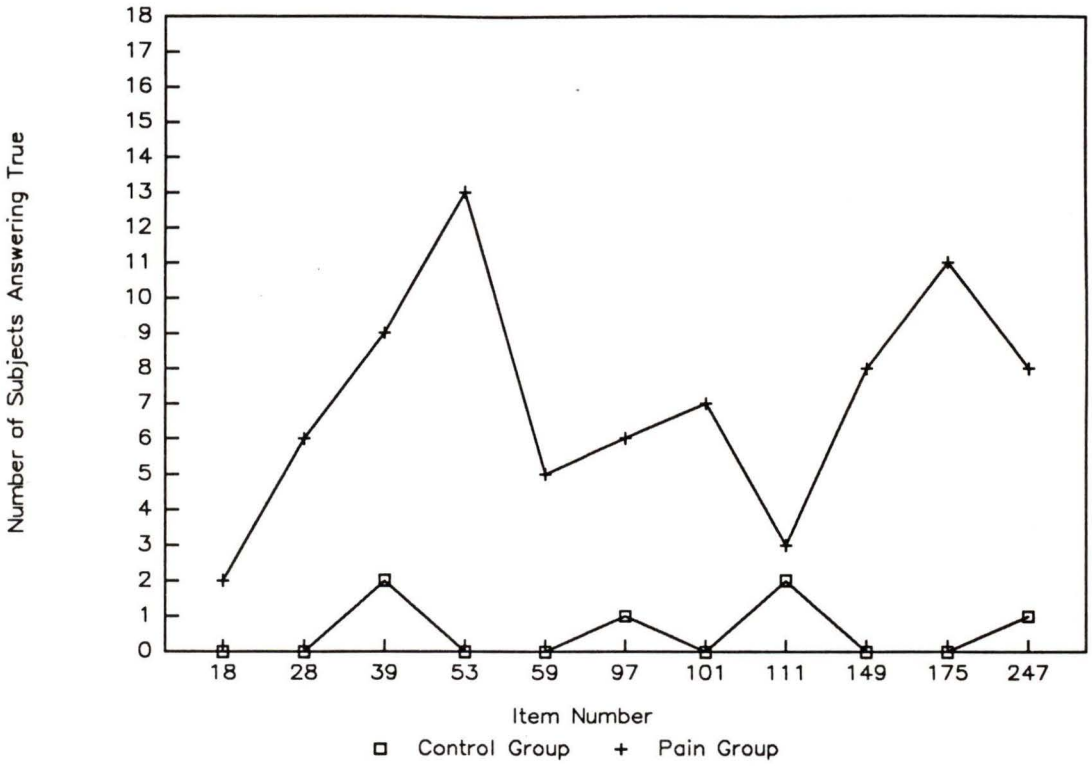
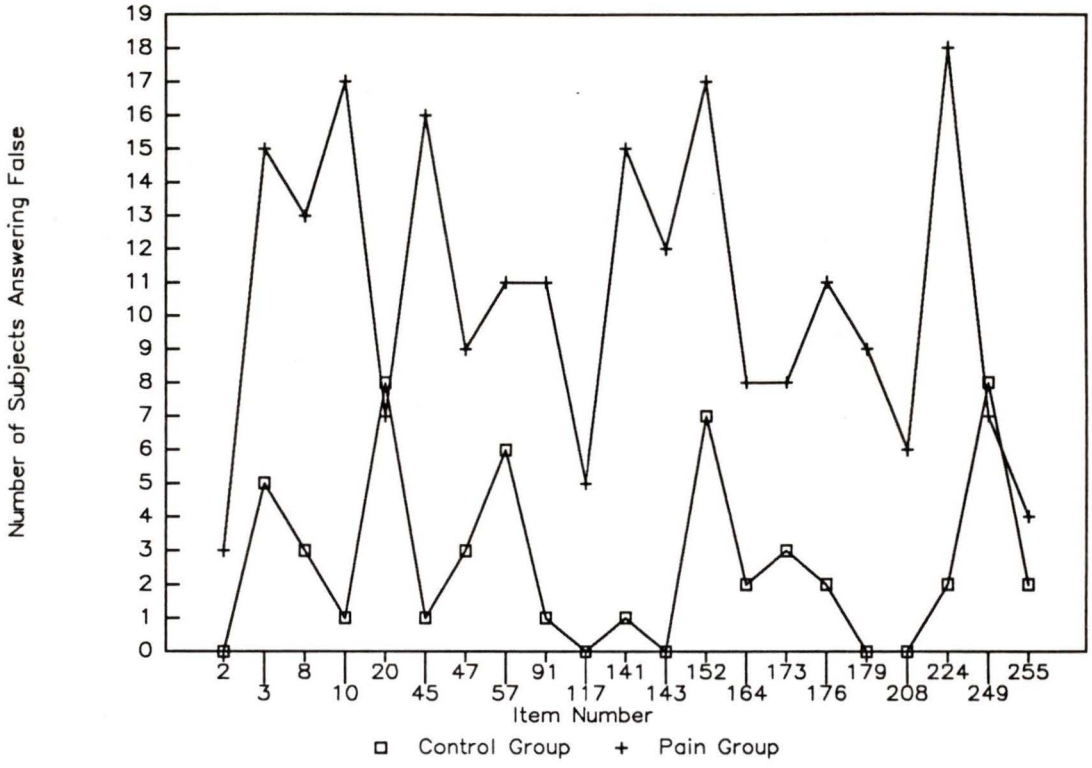

Number of Subjects Answering True
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
18
28
39
53
59
97
101
111
149
175
247
Item Number
Control Group
Pain Group

Figure 2


Number of Subjects Answering False
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1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
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18
19
2
3
8
10
20
45
47
57
91
117
141
143
152
164
173
176
179
208
224
249
255
Item Number
Control Group
Pain Group

Figure 3

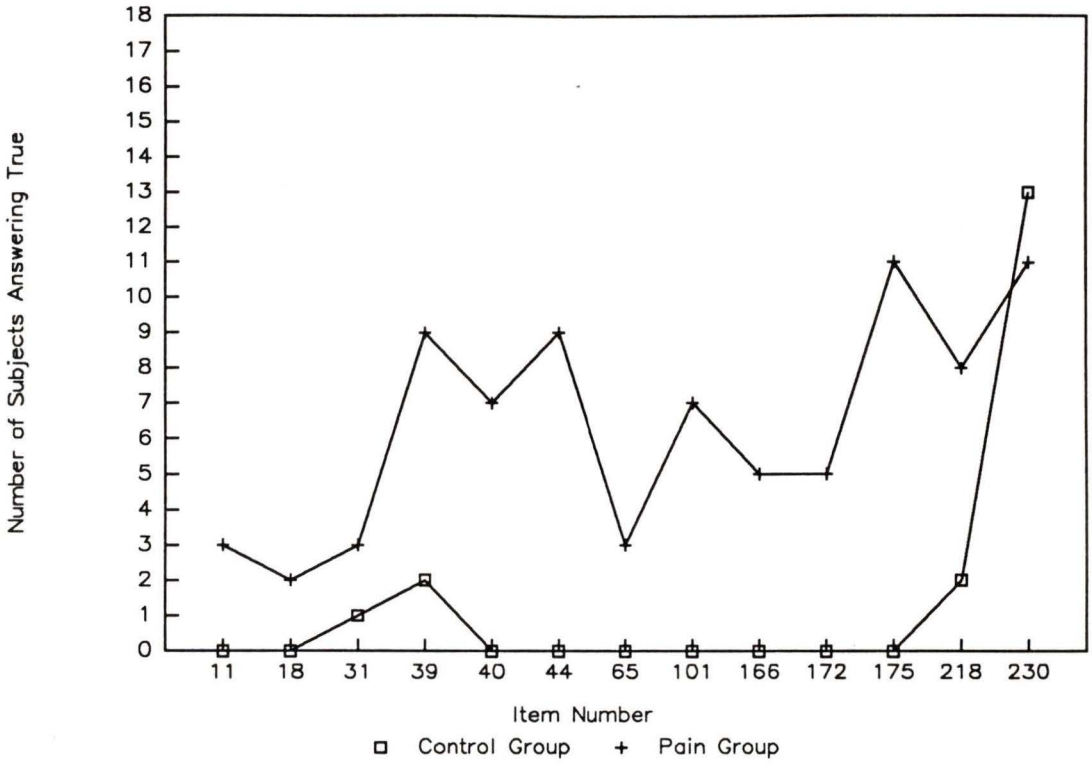
Number of Subjects Answering True
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
11
18
31
39
40
44
65
101
166
172
175
218
230
Item Number
Control Group
Pain Group

Figure 4

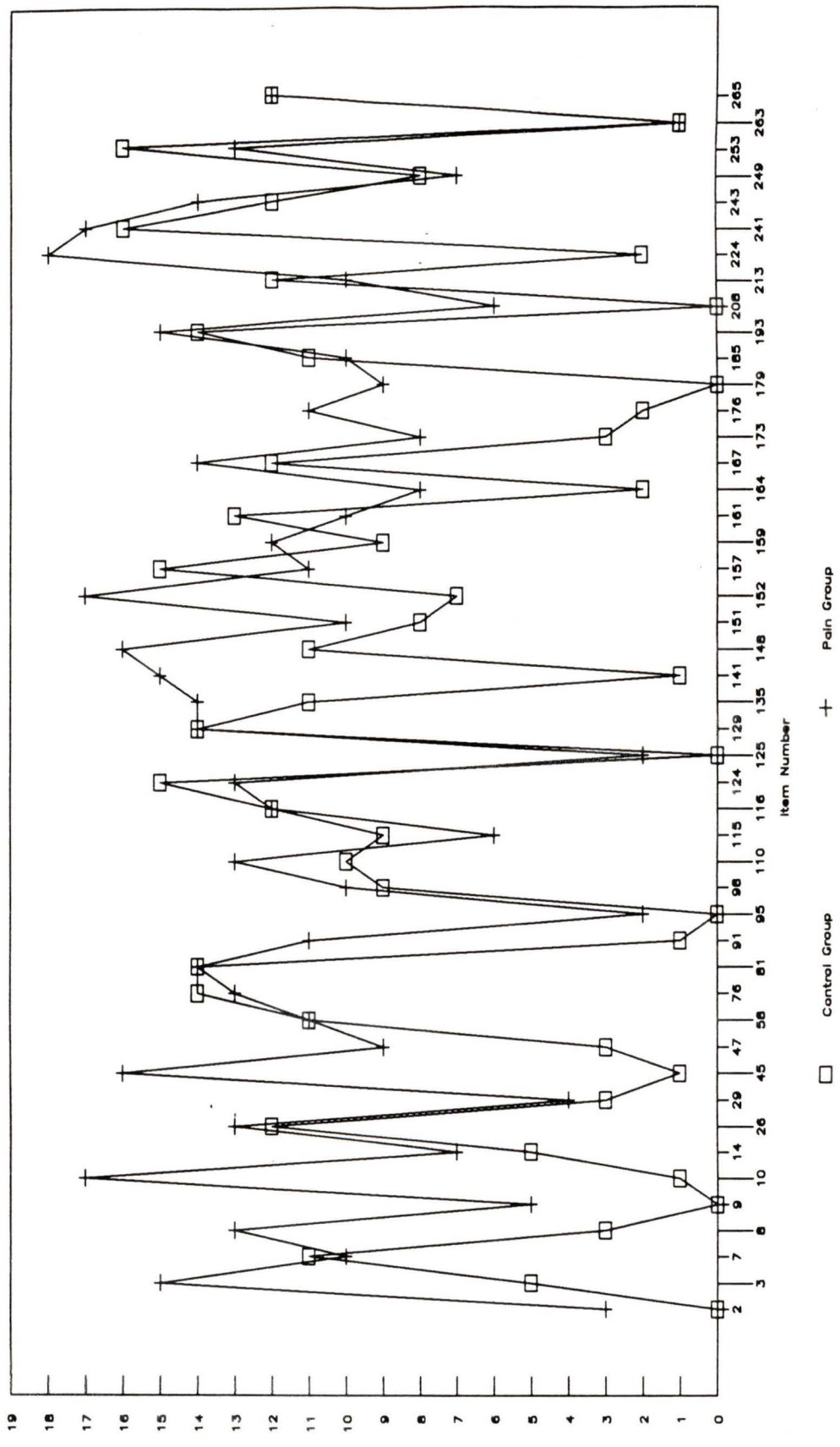
Number of Subjects Answering False
Item Number
Control Group
Pain Group

TABLE 7

MMPI-2 Raw Scores on the Clinical Scales by Group

	Control		Pain		
Scale	M	SD	M	SD	F (1,34)
L	3.56	2.09	4.61	2.85	1.60
F	2.94	1.39	5.50	2.66	13.02 *
K	17.78	3.84	16.17	4.99	1.18
Hs	3.61	1.72	16.67	5.38	96.18 *
D	20.11	3.07	25.72	4.59	18.62 *
Hy	21.72	3.80	33.00	5.51	51.10 *
Pd	14.06	3.51	16.83	6.08	2.82
Mf	35.17	4.29	35.89	5.18	0.21
Pa	9.94	2.96	11.28	2.95	1.83
Pt	9.28	5.75	16.67	8.81	8.88
Sc	7.44	3.43	18.56	10.16	19.32 *
Ma	13.00	3.05	18.94	4.44	21.94 *
Si	27.67	6.96	26.00	6.94	0.52

* $p < .001$

TABLE 8

MMPI-2 Raw Scores on the Content Scales by Group

	Control		Pain		
Scale	M	SD	M	SD	F (1,34)
ANX	4.18	3.86	8.00	5.50	5.60
FRS	5.59	3.08	5.94	2.82	0.13
OBS	3.71	2.71	4.83	3.54	1.11
DEP	2.82	2.72	7.50	5.82	9.08
HEA	4.53	1.94	16.68	6.04	62.48*
BIZ	0.88	1.22	3.83	3.45	11.10
ANG	3.06	1.85	6.00	2.97	12.18
CYN	5.35	3.26	8.17	4.19	4.88
ASP	4.94	3.03	6.39	3.27	1.84
TPA	5.71	1.93	6.33	3.34	0.46
LSE	4.12	2.93	5.33	3.63	1.17
SOD	8.71	4.58	7.89	4.66	0.27
FAM	4.24	2.84	6.83	5.18	3.33
WRK	6.12	3.84	9.94	5.04	6.34
TRT	2.65	2.57	5.44	4.31	5.35

* $p < .001$

TABLE 9

Frequency of Pain Behaviors by Group

	Control		Pain		
Behavior	M	SD	M	SD	F(1,34)
Gu	0.00	0.00	1.83	3.18	5.95
Br	0.00	0.00	0.61	1.60	4.13
Ru	0.00	0.00	2.67	3.33	38.55 *
Ps	5.89	4.25	5.50	4.87	0.30
PRB	0.28	0.45	2.89	2.85	37.22 *
Total	6.17	4.31	13.50	8.58	10.5
Duration of Video Session	72.8	4.2	75.1	3.6	1.77

Duration of video session is reported in minutes

* $p < .001$

Demographic Information

On the measure of psychosocial stressors, the chronic pain group did not demonstrate a higher amount of stress than the control group (control group mean = 158.61, SD 47.43; pain group = 213.56, SD 127.74; F (1,34) = 2.92 {p >.05}).

The length of time since diagnosis (in years) was also examined for the chronic pain group (mean = 9.69, SD 5.74). It was found that the longer an individual had been diagnosed, the more highly they scored on the MPQ and MMPI-2. As the duration of their condition increased, subjects reported higher pain intensity ratings (r = .7002, p <.001), and demonstrated elevated scores on the Hs, Hy, Sc scales of the MMPI-2 (Hs, r =.725; Hy, r =.697; Sc, r =.532; p <.001).

The second pain intensity measure (PPI2) was taken at the second session subjects attended. The PPI2 remained significantly different between the groups (PPI2: control group mean = 0.17, SD 0.38; pain group mean = 2.06, SD 0.64; F(1,34) = 115.6 {p<.001}) and was correlated with the original intensity measure (r = .775, p <.001). The pain intensity ratings given by subjects were also consistent with the frequency of pain behaviors they exhibited (r =.575, p <.001) and their total pain rating index on the MPQ (r =.722, p <.001).

The questions addressing medical usage demonstrated no significant differences between the two groups. The pain group subjects did not have a greater number of doctors, spend any more time in the hospital, or have a greater number of operations than the control group subjects.

greater number of doctors, spend any more time in the hospital, or have a greater number of operations than the control group subjects.

Discriminant Function Analysis

The fifteen most discriminative variables (i.e., those showing significant group differences) were entered into a direct discriminant function analysis to evaluate their utility in discriminating chronic pain subjects from control group members. The discriminant function significantly discriminated between chronic pain and control subjects, $R = .973$, $p < .0001$, and correctly classified the group membership of 100% of the subjects.

Interpretation of the matrix loadings produced by this method determined which of these variables were the strongest predictors (See Table 10).

TABLE 10

Variables Entered into Direct Discriminant Function Analysis

MPQ: PRI-S, PRI-A, PRI-E, NWC, PPI
IBQ: WH
CSQ: DA, IA
MMPI-2: Hs, D, Hy, Sc, Ma
Pain Behaviors: Ru, PRB

TABLE 11

Canonical Discriminant Function

Canonical Correlation	Chi-Square	df	Significance
.9763	81.110	15	$p < .0001$

Classification Results

		Predicted Group Membership	
Actual Group	n	Control	Pain
Control	18	18 a (100%)b	0 (0%)
Pain	18	0 (0%)	18 (100%)

Note N=36
a represents number of subjects
b represents percentage of sample for each condition

TABLE 12

Correlations Between Discriminant Variables and the Canonical Discriminant Function

Variable	Function 1
PPI2	0.4088
Hs	0.3625
NWC	0.3101
Hy	0.2738
PRI-S	0.2558
PRI-E	0.2527
WH	0.2346
Sc	0.1774
PRI-A	0.1706
D	0.1631
Ma	0.1605
DA	0.1530
IA	0.1469
PRB	0.1421
Ru	0.1254

Discussion

The results of this study represent the initial stages in the development of a reliable and valid multidimensional chronic pain assessment protocol. Subscales from the self-report instruments demonstrated utility in discriminating between persons with chronic pain and non chronic pain subjects in this sample. The frequency of an individual's rubbing and pain relief behaviors successfully contributed to the identification of the group to which a person belonged, and the subjects pain intensity reports were consistent with their scores on the pain measures.

Although the pain behavior categories of Guarding and Bracing did not reach a stringent significance level when compared between groups, it is useful to note that they were not demonstrated by any of the control group members. With the exception of position shifts, all of the pain behaviors rated in this study appeared nonexistent when observing persons without chronic pain conditions. In spite of the lack of significance found for three of the five behaviors, the pain behaviors described are still felt to be useful overt indicators of pain given their low to zero occurrence in normals.

The results of this study also lend support to the Brennan et al., (1987) profile types on the MMPI-2 for persons with a chronic pain condition. All subjects were classifiable into one of three categories: normal, left-elevated or fully elevated. None of the control group members met the inclusion criteria for any of the profile types except normal.

Although the MMPI-2 is useful when distinguishing between normals and chronic pain subjects, caution should be exercised since only the Hypochondriasis and Conversion Hysteria scales reached clinical significance with this pain sample. The difference between normals and chronic pain persons on scales such as Psychasthenia, Schizophrenia, and Hypomania may only reflect that the pain group are presenting themselves as more anxious than the control group by endorsing items concerning difficulties with attention and concentration. The impact of chronic pain conditions on an individual's cognition appears uncertain, but preliminary research supports the potential for memory and concentration difficulties (Almay, 1987; Jamison, Sbrocco & Parris, 1988; McArthur, Cohen, Gottlieb, Naliboff, & Schandler, 1987).

The Conversion V profile demonstrated by persons with a chronic pain condition is an artifact of endorsing physical symptom items. This has been discussed in the literature (see Brennan et al., 1987; Mersky et al., 1985; and Watson, 1982), and finds support in this study. Subjects in the chronic pain group more often endorsed items from the Hypochondriasis and Hysteria scales (e.g., I wake up fresh and rested most mornings, False; My hands and feet are usually warm enough, False; Parts of my body often have feelings like burning, tingling, crawling or like 'going to sleep', True; I have little or no trouble with my muscles twitching or jumping, False).

Analysis of the scores yielded by the McGill Pain Questionnaire found that none of the control group members obtained scores above the mean for

the pain group. The number of words chosen, and the sensory and evaluative components of the MPQ, were among the strongest predictors.

One question with the MPQ indices, however, is whether or not they do reflect different pain qualities. Strong correlations were found between the different subscales in this study. It may be that as the length of time since a person's diagnosis increases, he/she may find it more difficult to discriminate between the sensory, affective, and evaluative components of their pain experience. After a period of time, the pain experience becomes more influenced by emotional factors (Swanson, Maruta & Wolff, 1986). This was supported by the present study. As the duration of a subject's painful condition was related to scales 1, 3, and 8 (hypochondriasis, hysteria, and schizophrenia) on the MMPI-2. Garron and Leavitt (1983) have found that chronicity and pain intensity are related to increases in Hypochondriasis, Depression, Hysteria, Paranoia, and Hypomania on the MMPI. Thus, it is perhaps more useful to look at only the total MPQ score (which reflects the sum of the sensory, affective, and evaluative components) with long-standing chronic pain populations.

Post hoc comparison of the mean coping strategy scores for the pain group in this study to those in two other studies of persons with chronic low back pain (Rosenstiel & Keefe, 1983; Turner & Clancy, 1986) demonstrated little difference. Using the standard deviations from this study, it was found that all coping strategy scores from the three studies fell within the range of one standard deviation of each other. The only exception to this was the

praying/hoping subscale in Rosenstiel & Keefe (1983) which was greater than one standard deviation higher.

Though this finding has limited significance without further study, it suggests that the coping strategies used between different chronic pain populations (without psychological disturbance) may be similar.

Some of the variables in the study had little discriminant power between the two groups. While this may seem to support a lack of utility on their part, it is felt that this finding in itself is important. It is useful to have an understanding of how persons with chronic pain are not different from normals, particularly in the context of assessment. The subjects in this study did not present with any maladaptive coping skills and, on the contrary, believed that they had the ability to exert some control over their pain experience. Further, the pain group and control group manifested similar reactions and attitudes towards pain.

The high proportion of females in the study is consistent with the ratio of females to males seen clinically with diagnoses of arthritis. Arthritic conditions (apart from those of normal aging) are up to six times more common in females than males.

Limitations of This Study

Despite the promise this study holds for the development of a diagnostic pain protocol, some limitations are present. The chronic pain subjects in this study had all received previous diagnoses of arthritis. Since chronic pain conditions can vary in terms of cause and symptoms, applying these findings to persons without arthritis should be approached with

caution. The gender imbalance of females to males also makes it difficult to generalize the findings to males with chronic pain conditions.

An issue relevant to the measurement of any pain is the medication a person may be taking for their condition. While this is going to affect a subject's pain reports, it cannot be ethically controlled. A correction formula for length of time since last intake still does not control for the different types of pain medications the subjects were using, as well as the differences in dose or frequency of intake and thus, was not included in this study.

Finally, the small sample size limits confidence in the one-hundred percent classification results produced by the discriminant function, as this procedure may produce results that 'overfit' the data when the number of cases does not significantly exceed the number of predictor variables.

Directions for Future Research

The findings of this study offer several suggestions for future research. Cross-validation of the assessment tools with another "organic" chronic pain group is needed to ensure that the classification results are not merely an artifact of this sample. Further, a larger sample size may increase the discriminative ability of those scales that only approached significance by allowing for a less conservative alpha level. Future samples should also incorporate a larger proportion of male subjects to provide for generalizability to both genders.

Last, one could to take this assessment protocol and apply it to a population of persons with psychogenic pain to further assess its ability to discriminate among different pain groups. Since many of the subscales were

not different between the two groups in this study, it is important to see how this might differ with psychogenic pain conditions.

The way pain is reported is affected by numerous factors. These reports represent the combined impact of the pain stimulus, the environment, and the nature of the person experiencing it. The individual measures used in this study have been established as reliable and valid by previous research. As an assessment model in this investigation, they indicate that chronic pain has a multidimensional facet to it that can be reliably evaluated and classified.

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Appendix A

TABLE 13

Items From the Hypochondriasis and Conversion Hysteria Scales of the MMPI-2 Frequently Endorsed by the Chronic Pain Subjects

Item#	Direction of Pathology	Scales	Item
3	False	1,3	I wake up fresh and rested most mornings
8	False	1,3	My hands and feet are usually warm enough
10	False	1,3	I am about as able to work as I ever was
44	True	3	Once a week or oftener I suddenly feel hot all over, for no real reason
45	False	1,3	I am in just as good physical health as most of my friends
53	True	1	Parts of my body often have feelings like burning, tingling, crawling or 'like going to sleep'
91	False	1,3	I have little or no trouble with my muscles twitching or jumping
141	False	1,3	During the past few years I have been well most of the time
143	False	1	I am neither gaining nor losing weight
149	True	1	The top of my head sometimes feels tender
152	False	1,3	I do not tire quickly
175	True	1,3	I feel weak all over much of the time
179	False	1,3	I have had no difficulty in keeping my balance in walking
224	False	1,3	I have few or no pains

TABLE 14

Frequency of Control Group Members Exceeding Mean Score for the Pain Group on the Variables

Variable	Mean	Frequency
PRI-S	16.11	0
PRI-A	4.67	0
PRI-E	2.56	0
NWC	13.72	0
GH	0.24	4
DC	0.67	0
PS	0.12	0
AI	0.44	5
AD	0.39	5
DE	0.53	14
I	0.38	2
WH	0.52	0
DA	2.54	1
RS	1.31	5
CA	1.57	1
IS	2.43	7
PH	2.12	3
CS	4.11	2
IA	3.43	1
CP	3.38	9
AP	3.05	10
L	55.11	3
F	55.89	0
K	52.44	10
Hs	76.00	0
D	61.67	0
Hy	75.50	0
Pd	52.83	5
Mf	46.50	10
Pa	53.67	7
Pt	60.28	2
Sc	63.67	0
Ma	57.39	0
Si	48.17	10
Gu	1.80	0
Br	0.61	0
Ru	2.67	0
Ps	5.50	7
PRB	2.89	0
PPI2	2.06	0

N of pain group = 18

TABLE 15

List of Variables Included in the Analysis

McGill Pain Questionnaire (MPQ)
- Pain Rating Index-Sensory (PRI-S)
- Pain Rating Index-Affective (PRI-A)
- Pain Rating Index-Evaluative (PRI-E)
- Total Pain Rating Index (TPRI)
- Present Pain Intensity (PPI)
- Number of Words Chosen (NWC)

Illness Behavior Questionnaire (IBQ)
- General Hypochondriasis (GH)
- Disease Conviction (DC)
- Psychological vs Somatic (PS)
- Affective Inhibition (AI)
- Affective Disturbance (AD)
- Denial (DE)
- Irritability (I)
- Whitely Index of Hypochondriasis (WH)

Coping Strategy Questionnaire (CSQ)
- Diverting Attention (DA)
- Reinterpreting Pain Sensation (RS)
- Catastrophizing (CA)
- Ignoring Pain Sensation (IS)
- Praying or Hoping (PH)
- Coping Self-Statements (CS)
- Increased Behavioral Activities (IA)
- Control Over Pain (CP)
- Ability to Decrease Pain (AP)

Minnesota Multi-Phasic Personality Inventory, Second Edition (MMPI-2)

Validity Scales
- Lie (L) Scale
- Infrequency (F) Scale
- Defensiveness (K) Scale

Clinical Scales
- Hypochondriasis (Hs)
- Depression (D)
- Conversion Hysteria (Hy)
- Psychopathic Deviate (Pd)
- Masculinity-Femininity (Mf)
- Paranoia (Pa)
- Psychasthenia (Pt)

- Schizophrenia (Sc)
- Hypomania (Ma)
- Social Introversion (Si)

Content Scales

- Anxiety (ANX)
- Fears (FRS)
- Obsessiveness (OBS)
- Depression (DEP)
- Health Concerns (HEA)
- Bizarre Mentation (BIZ)
- Anger (ANG)
- Cynicism (CYN)
- Antisocial Practices (ASP)
- Type A (TPA)
- Low Self Esteem (LSE)
- Social Discomfort (SOD)
- Family Problems (FAM)
- Work Interference (WRK)
- Negative Treatment Indicators (TRT)

Behavioral Observation

- Guarding (Gu)
- Bracing (Br)
- Rubbing (Ru)
- Grimacing (Gr)
- Position Shifts (Ps)
- Pain Relief Behaviors (PRB)
- Total Pain Behaviors (TPB)

Interview Questions

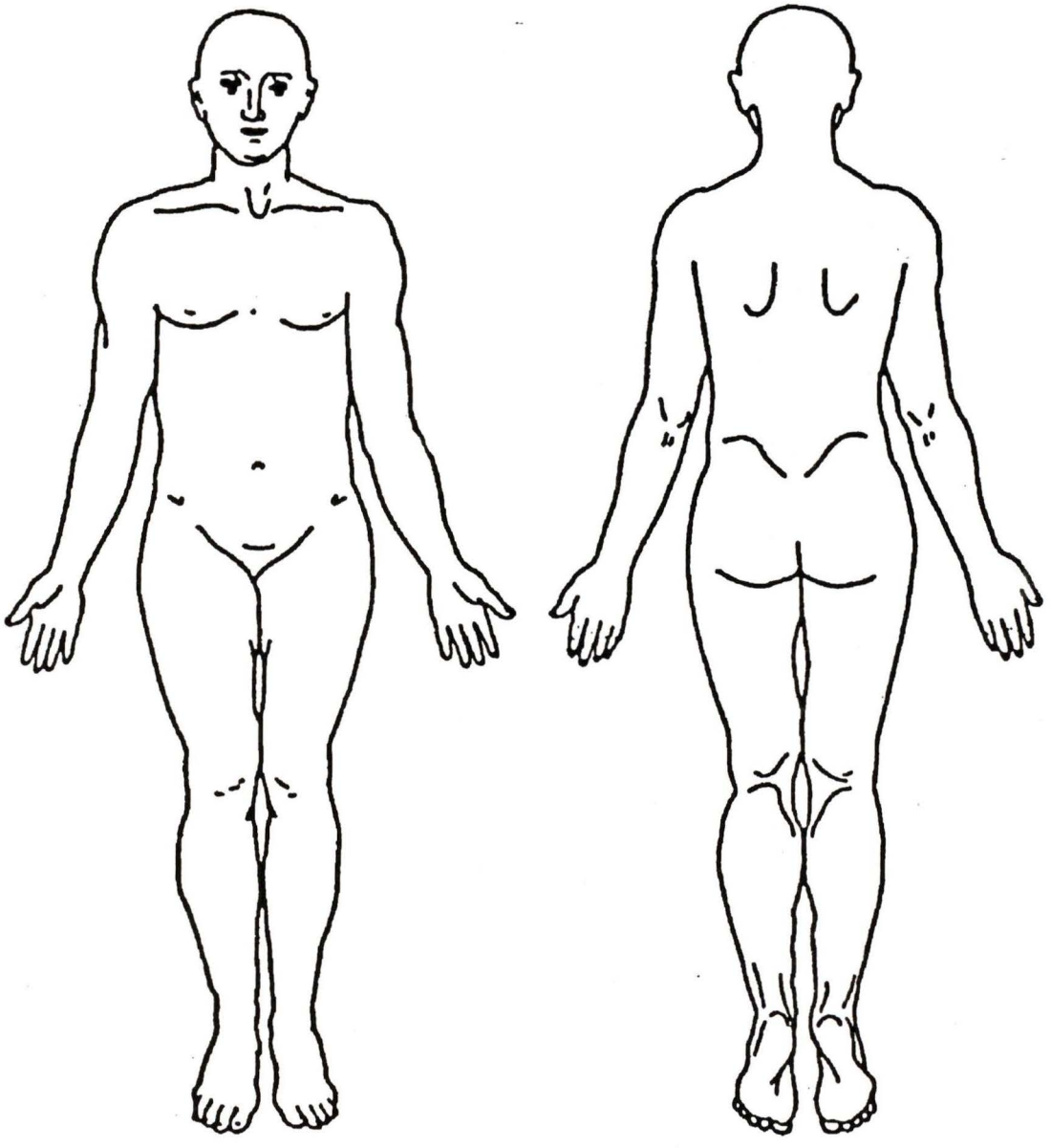
- Age
- Gender
- Years of Education/Occupational Status
- Number of Doctors
- Amount of Time in Hospital
- Number of Operations
- Length of Time Since Diagnosis
- Present Pain Intensity (second report)
- Psychosocial Stressor Scale
- Gender Neutral Body Outline

Appendix B

Instruments

Part 1. Where is your Pain?

Please mark, on the drawings below, the areas where you feel pain. Put E if external, or I if internal, near the areas which you mark. Put EI if both external and internal.



COPING STRATEGY QUESTIONNAIRE ID#_____

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 people 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. 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 that you always do it when you are experiencing pain. Remember, you can use any point along the scale.

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 somebody 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 awhile.
___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 gotten 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 cure for my pain.
___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.

When I feel pain . . .

___33. I feel I can't stand it any more.
___34. I 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. I do something I enjoy, such as watching TV or listening to music.
___41. I pretend it is not a 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
No control			Some control			Complete control

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
Can't decrease it at all			Can decrease it somewhat			Can decrease completely

McGILL PAIN QUESTIONNAIRE ID#_____

Part 1: 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
Stinging

9 Dull
Sore
Hurting
Aching
Heavy

10 Tender
Taut
Rasping
Splitting

11 Tiring
Exhausting

12 Sickening
Suffocating

13 Fearful
Frightening
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

Part 2: How Does Your Pain Change With Time?

Which word or words would you use to describe the pattern of your pain?

1 Continuous	2 Rhythmic	3 Brief
Steady	Periodic	Momentary
Constant	Intermittent	Transient

Part 3: How Strong Is Your Pain?

People agree that the following five words represent pain of increasing intensity. Circle the word which best describes your pain right now.

0	1	2	3
no pain	Mild	Discomforting	Distressing

4	5
Horrible	Excruciating

Part 4

If you are currently taking any medications for your pain please note here the amount of time since your last dose.

Illness Behavior Questionnaire (IBQ) ID#_____

1. Do you worry a lot about your health?	YES	NO
2. Do you think there is something seriously wrong with your body?	YES	NO
3. Does (your) illness interfere with your life a great deal?	YES	NO
4. Are you easy to get on with when you are ill?	YES	NO
5. Does your family have a history of illness?	YES	NO
6. Do you think you are more liable to illness than other people?	YES	NO
7. If the doctor told you that he could find nothing wrong with you would you believe him?	YES	NO
8. Is it easy for you to forget about yourself and think about all sorts of other things?	YES	NO
9. If you feel ill and someone tells you that you are looking better, do you become annoyed?	YES	NO
10. Do you find that you are often aware of various things happening in your body?	YES	NO
11. Do you ever think of (your) illness as a punishment for something you have done wrong in the past?	YES	NO
12. Do you have trouble with your nerves?	YES	NO
13. If you feel ill or worried, can you be cheered up by the doctor?	YES	NO
14. Do you think that other people realize what it's like to be sick?	YES	NO
15. Does it upset you to talk to the doctor about (your) illness?	YES	NO
16. Are you bothered by many pains and aches?	YES	NO
17. Does (your) illness affect the way you get on with your family or friends a great deal?	YES	NO
18. Do you find that you get anxious easily?	YES	NO
19. Do you know anybody who has had the same illness as you?	YES	NO
20. Are you more sensitive to pain than other people?	YES	NO
21. Are you afraid of illness?	YES	NO
22. Can you express your personal feelings easily to other people?	YES	NO
23. Do people feel sorry for you when you are ill?	YES	NO
24. Do you think that you worry about your health more than most people?	YES	NO
25. Do you find that (your) illness affects your sexual relations?	YES	NO
26. Do you experience a lot of pain with (your) illness?	YES	NO
27. Aside from (your) illness, do you have any problems in your life?	YES	NO
28. Do you care whether or not people realize that you are sick?	YES	NO
29. Do you find that you get jealous of other people's good health?	YES	NO
30. Do you ever have silly thoughts about your health which you can't get out of your mind, no matter how hard you try?	YES	NO
31. Do you have any financial problems?	YES	NO
32. Are you upset by the way people take (your) illness?	YES	NO
33. Is it hard for you to believe the doctor when he tells you there is nothing for you to worry about?	YES	NO
34. Do you often worry about the possibility that you have got a serious illness?	YES	NO
35. Do you sleep well?	YES	NO
36. When you are angry, do you tend to bottle up your feelings?	YES	NO
37. Do you often think that you might suddenly fall ill?	YES	NO
38. If a disease is brought to your attention (through the radio, television, newspapers or someone you know) do you worry about getting it yourself?	YES	NO
39. Do you get the feeling that people are not taking (your) illness seriously enough?	YES	NO
40. Are you upset by the appearance of your face or body?	YES	NO
41. Do you find that you are bothered by many different symptoms?	YES	NO
42. Do you frequently try to explain to others how you are feeling?	YES	NO
43. Do you have any family problems?	YES	NO
44. Do you think there is something the matter with your mind?	YES	NO
45. Are you eating well?	YES	NO
46. Is (your) bad health the biggest difficulty in your life?	YES	NO
47. Do you find that you get sad easily?	YES	NO
48. Do you worry or fuss over small details that seem unimportant to others?	YES	NO

49. Are you always a cooperative patient?	YES	NO
50. Do you often have the symptoms of a very serious disease?	YES	NO
51. Do you find that you get angry easily?	YES	NO
52. Do you have any work problems?	YES	NO
53. Do you prefer to keep your feelings to yourself?	YES	NO
54. Do you often find that you get depressed?	YES	NO
55. Would all your worries be over if you were physically healthy?	YES	NO
56. Are you more irritable towards others people?	YES	NO
57. Do you think that your symptoms may be caused by worry?	YES	NO
58. Is it easy for you to let people know when you are cross with them?	YES	NO
59. Is it hard for you to relax?	YES	NO
60. Do you have personal worries which are not caused by physical illness?	YES	NO
61. Do you often find that you lose patience with other people?	YES	NO
62. Is it hard for you to show people your personal feelings?	YES	NO

Which occurred during the 12 months prior to this evaluation?

	Stress value
[] Death of spouse	100
[] Divorce	73
[] Marital separation	65
[] Jail term	63
[] Death of close family member	63
[] Personal injury or illness	53
[] Marriage	50
[] Fired at work	47
[] Marital reconciliation	45
[] Retirement	45
[] Change in health of family member	44
[] Pregnancy	40
[] Sex difficulties	39
[] Gain of new family member	39
[] Business readjustment	38
[] Change in financial state	37
[] Death of a close friend	36
[] Change to a different line of work	35
[] Change in number of arguments with spouse	31
[] Mortgage over $100,000	30
[] Foreclosure of mortgage or loan	29
[] Son or daughter leaving home	29
[] Trouble with in-laws	29
[] Outstanding personal achievement	28
[] Spouse began or stopped work	26
[] Began or ended school	25
[] Change in living conditions	24
[] Revision of personal habits	23
[] Trouble with boss	20
[] Change in work hours or conditions	20
[] Change in residence	20
[] Change in schools	19
[] Change in recreation	19
[] Change in church activities	18
[] Change in social activities	18
[] Mortgage or loan less than $100,000	17
[] Change in sleeping habits	16
[] Change in number of family get-togethers	15
[] Change in eating habits	15
[] Vacation	13
[] Christmas	12
[] Minor violations of the law	11

Comments or explanations concerning changes coded above:

_____

_____

_____

_____

_____

Appendix C: Instrument Scoring

Illness Behavior Questionnaire

Item Scoring For Each Scale:

Assign one point to each of the following items "correctly" endorsed:

1) GH: 9 yes, 20 yes, 21 yes, 24 yes, 29 yes, 30 yes, 32 yes, 37 yes, 38 yes (max=9)
2) DC: 2 yes, 3 yes, 7 no, 10 yes, 35 no, 41 yes (max=6)
3) PS: 11 yes, 16 no, 44 yes, 46 no, 57 yes (max=5)
4) AI: 22 no, 36 yes, 53 yes, 58 no, 62 yes (max=5)
5) AD: 12 yes, 18 yes, 47 yes, 54 yes, 59 yes (max=5)
6) DE: 27 no, 31 no, 43 no, 55 yes, 60 no (max=5)
7) I: 4 no, 17 yes, 51 yes, 56 yes, 61 yes (max=5)

The Whitely Index of Hypochondriasis can also be scored. Score one point for a "yes" response to items 1, 2, 9, 10, 16, 21, 24, 33, 34, 38, 39 and 41, and a "no" answer to item 8.

- divide number endorsed by total number possible to obtain score for each subscale

McGill Pain Questionnaire

To score for the individual PRI categories: the sum of subclasses 1-10 is the sensory index score; 11-15 is affective; 16 is evaluative; and 17-20 is miscellaneous (used in the sum for Total PRI).
The PRI scores are based on rank values of the words within each subclass (i.e. the first word in a subclass is given a score of 1, the next a score of 2 etc.). Summed, these values provide scores for the individual categories as well as an overall rating.

Coping Strategies Questionnaire

To score the coping strategies, take the sum of each item rating and divide by six to give a mean for that scale.

Cognitive Coping Strategies

1. Diverting Attention: 3, 9, 12, 26, 27, 38
2. Reinterpreting the Pain Sensations: 1, 4, 10, 16, 29, 41

3. Catastrophizing: 5, 11, 13, 25, 33, 37
4. Ignoring Sensations: 17, 19, 21, 24, 30, 35
5. Praying or Hoping: 14, 15, 18, 22, 28, 36
6. Coping Self-Statements: 6, 8, 20, 23, 31, 32

Behavioral Coping Strategy

1. Increased Behavioral Activities: 2, 7, 34, 39, 40, 42

Effectiveness Ratings

1. Control Over Pain
2. Ability to Decrease Pain

Vita

Surname: Townsend Given Names: Laurel Ann

Place of Birth: Chilliwack, BC
Date of Birth: October 19, 1966

Educational Institutions Attended

University of Victoria	1985 to 1992

Degrees Awarded

B.Sc. (Honours)	University of Victoria	1989

Honours and Awards

University of Victoria Fellowship	1991-92
John MacNeal Scholarship	1990-92
Terry Fox Humanitarian Award	1986-89
The L. and G. Butler Award for the Disabled	1988-89
Province of British Columbia, Post-Secondary Education Scholarship	1986-88
Central Saanich Lions Club Scholarship	1984-85

Membership in Professional Associations

Student affiliate membership with American Psychological Association

Trainee member of International Association for the Study of Pain

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