THE UNIVERSITY OF SOUTHERN QUEENSLAND

A BIOPSYCHOSOCIAL INVESTIGATION INTO THE EXPERIENCE OF CHRONIC PAIN: THE MEDIATING ROLE OF DISPOSITIONAL COGNITIVE FACTORS

A Dissertation submitted by

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For the award of

DOCTOR OF PHILOSOPHY (PSYCHOLOGY)

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19 November 2009

Abstract

Survey data from an Australian chronic pain sample was used to investigate physical, cognitive and affective factors associated with pain experience. Research instruments included paper and web-based versions of Profile of Chronic Pain: Screen (Ruehlman, Karoly, Newton, & Aiken, 2005), Negative Problem Orientation Questionnaire (Robichaud & Dugas, 2005a), Pain Catastrophizing Scale (Sullivan, Bishop, & Pivik, 1995), Five-Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), and Depression, Anxiety and Positive Outlook Scale (Pincus, Williams, Vogel, & Field, 2004). Exploratory principal component analyses conducted on all scales, using parallel analysis for determining number of components for extraction, revealed differences in PCS dimensions (*N*=347), with rumination, magnification and helplessness not emerging as discrete components. DAPOS dimensions of depression and anxiety emerged as a single component called negative affect (*N*=345). PCP:S dimensions of severity and interference emerged as a single component called physical burden (*N*=337). NPOQ (*N*=326) and FFMQ (*N*=333) facets emerged as expected. All measures were internally reliable. Hierarchical regression analyses (*N*=269) revealed that, after accounting for previous emotional disorder diagnoses, pain-related distress could be appreciably understood and predicted in terms of physical burden of pain, negative problem orientation, catastrophizing, and non-judgement. Total variance accounted for in negative affect scores was 52%. Positive outlook scores were predicted by negative problem orientation, catastrophizing, observe, and non-reactivity. Total variance accounted for in positive outlook was 36%. Path analyses revealed that catastrophizing mediated the effect of emotional burden of pain on both negative

affect and positive outlook. Negative problem orientation, catastrophizing, and mindful awareness, each also explained the influence of physical burden of pain on positive outlook. A subset of participants (*N*=140) took part in a follow-up study using identical measures. Test-retest coefficients (4 weeks) suggested temporal stability of constructs. Path analyses (*n*=100) revealed that negative problem orientation mediated the influence of negative affect (Time 1) on emotional burden of pain (Time 2). Negative problem orientation also mediated the effect of positive outlook (Time 1) on emotional burden of pain (Time 2). Hierarchical regression analyses revealed that, after controlling for affect (negative and positive, from Time 1), predictors of negative affect in the follow-up study were previous negative affect scores and negative problem orientation. Total variance accounted for in negative affect was 72%. Significant predictors of positive outlook across time were previous positive outlook scores and the mindfulness facet: non-reactivity. Total variance accounted for in positive outlook was 62%. The most salient predictors of pain-related affect were previous affect scores. Replicating path analyses conducted at Time 1, the effect of physical burden of pain on positive outlook was mediated by three cognitive variables: negative problem orientation, catastrophizing, and describe (*N*=140). Findings for NPO and catastrophizing are consistent with results from Time 1. Results from all studies highlighted variously significant contributions, dysfunctional and adaptive, of cognitions to overall pain experience. An important mediating role of a range of dispositional cognitions was demonstrated in the relationship between pain and affect. Implications were addressed and suggestions made for future research.

STATEMENT OF ORIGINALITY

I certify that this report does not incorporate any material previously submitted for a degree at any university and that, to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where due reference is made in the text.

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Signature of candidate Date

ENDORSEMENT

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Signature of supervisor Date

Acknowledgements

Undertaking this research was an arduous but inspiring voyage of personal and professional discovery. The all-consuming process of focussed investigation, intensive learning, and scholarship, would not have been possible without the unconditional support of my amazing family. To my four beautiful children – thank you for being so understanding about my study commitments.
To Mr. Cuddles, Mr. Sporty, Little Miss Messy, and Mr. Music – I am very proud of you all, and so blessed to be your mother.

To my husband, Lindsey - for supporting my dreams, and encouraging me to fulfil them, an acknowledgement is not nearly sufficient. Without your love and acceptance, none of this would have been possible.

To Susie, Ross, and the team from USQ Psychology Technical Services – thanks for your expert advice and assistance in producing the surveys used in this research.

To my supervisor, colleague, and friend – Dr Murray Thompson – thank you for tolerating all the dramas along the way. Somehow you seemed to know exactly when to back off and pretend I didn't exist, and, precisely when to annoy me sufficiently into some serious cerebral action. I truly appreciate the time, patience, and ongoing commitment you so generously gave during this process. And, you make a great coffee. It's been a long time coming, but you now have my permission to retire, at last, officially, in peace!

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Cogito ergo sum

…René Descartes
1644

CHAPTER 1

Introduction

Rationale for the Project

The sensation and perception of pain is arguably one of the most important and adaptive of all human experience. Pain alerts us to injury, tissue damage or potential bodily harm, and motivates us to respond in adaptive ways so as to eliminate its source and symptoms. Unfortunately, when pain persists beyond a reasonable and expected time of healing, or is an ongoing symptom of disease, its chronicity has the potential to cause much distress, suffering, and impaired quality of life for the person concerned (Melzack, 2001).

The International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience associated with, or described in terms of, actual or potential tissue damage (Merskey & Bogduk, 1994). Chronic pain is defined as any ongoing pain experience persisting for more than three months. As shown in Figure 1, the transition from acute pain due to injury, to chronic pain condition, may be represented as phases extending over time (Brooks & Tracey, 2005).

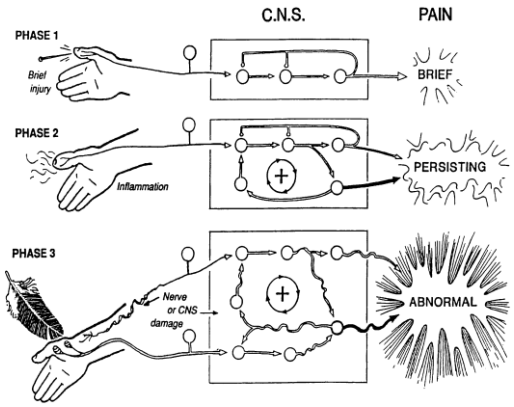


Figure 1: Schematic representation of transition from acute to chronic pain [Extracted from Brooks & Tracey, 2005 (p.21)]

The experience of pain is always subjective and unique to the individual (Merskey & Bogduk, 1994). Responses vary widely both across and within conditions attributed to injury, disease, or unknown origin. Therefore, irrespective of clinical findings regarding the presence or absence of underlying pathology, chronic pain may be considered an illness or disorder in its own right (European Federation of IASP Chapters, n.d.; Siddall & Cousins, 2004).

Prevalence and Costs of Chronic Pain in Australia

Chronic pain disorders are a global health concern (Dersh, Polatin, & Gatchel, 2002; European Federation of IASP Chapters, 2004; International Association for the Study of Pain, 2003, 2005). In a systematic review of empirical research conducted across several developed nations (International Association for the Study of Pain, 2003), the reported prevalence of chronic pain in the general population ranged from 10.1% to 55.2%. However, findings were excluded from all studies which focussed on specific medical conditions, or studies which were conducted in developing countries, so the estimated global prevalence rate is likely to be significantly higher than reported in the review (International Association for the Study of Pain, 2003). In 2001, the reported prevalence of chronic musculoskeletal conditions alone in the Australian population was 32% (6 million people), including arthritis (14%), back pain (21%), and osteoporosis (1.6%; (Australian Bureau of Statistics, 2004). Figures 2 and 3 show the prevalence of these conditions in Australia by age, and associated health system costs, respectively.

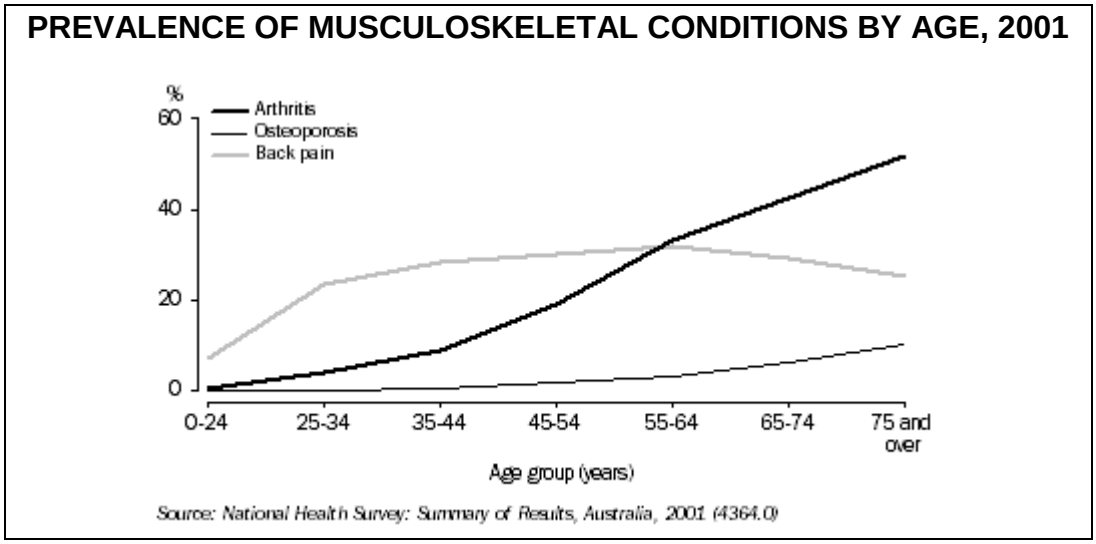


Figure 2: Extracted from "Musculoskeletal conditions in Australia: a snapshot" (Australian Bureau of Statistics, 2004)

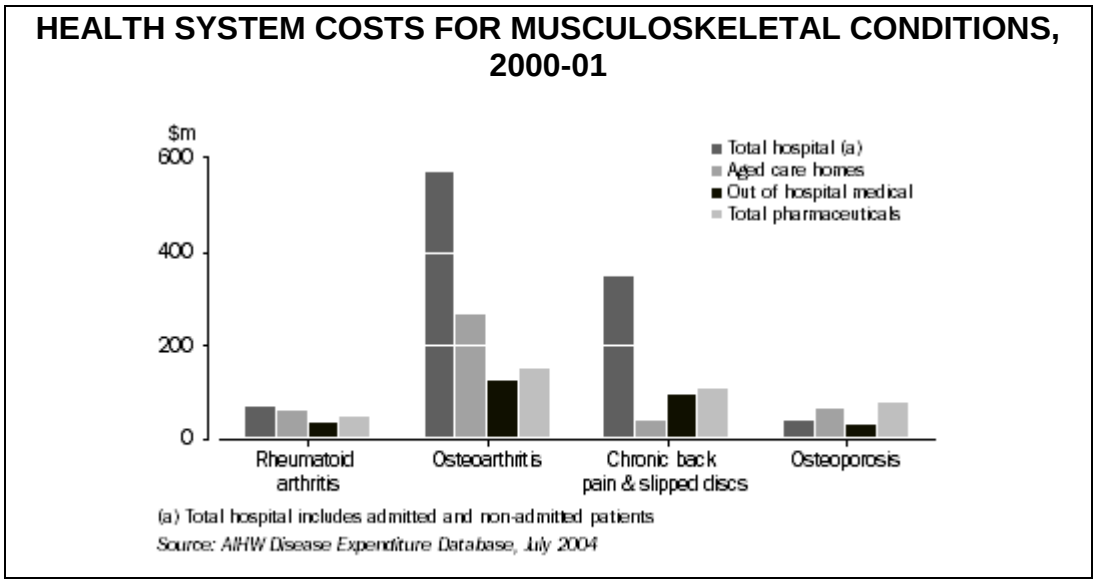


Figure 3: Extracted from "Year book Australia: Health status" (Australian Bureau of Statistics, 2005)

In addition to prevalence and high costs incurred by healthcare systems, a recent Australian study investigated annual lost productivity costs in employment, arising from chronic pain-related days absent, and, reduced-effectiveness workdays (van Leeuwen, Blyth, March, Nicholas, & Cousins, 2005). It was estimated that Australian workers are absent due to chronic pain for 9.9 million workdays, annually. In monetary terms, this equated to about $1.4 billion AUD per year (van Leeuwen et al., 2005). Moreover, under the assumption that reduced-effectiveness workdays affect productivity costs in much the same way as lost work days, the total number of lost workday equivalents was reported to be 36.5 million, with the total annual cost of lost productivity due to chronic pain estimated as $5.1 billion AUD per year (van Leeuwen et al., 2005).

In terms of economic indicators, chronic pain is clearly an extensive drain on resources. However, the human costs and consequences of pain that continue to impact on society, with significant distress and reductions in quality of life experienced by many pain sufferers and their families, are also notable. For example, it has been reported that in addition to experiencing varying degrees of anger, frustration, depression, and anxiety, the majority of people with chronic pain are less able (or unable) to exercise, enjoy normal sleep, and engage in everyday activities such as household chores, some types of employment, or driving a car, and many personal relationships become strained or broken (European Federation of IASP Chapters, n.d.).

Purpose of the Project

This research sought to establish the nature of relationships between physical, cognitive, and affective factors associated with the experience of chronic pain. Specifically, the research assessed the extent to which cognitive tendencies (negative problem orientation, catastrophizing, and mindfulness) influenced the level of affective response (distress, and positive outlook) to chronic pain. The research had a balanced focus between negative aspects, and, positive/adaptive aspects of the overall reported pain experience.

Variables included in the research were selected following an extensive review of the psychological research literature pertaining to pain theory and predominant affective and cognitive factors found, or inferred, to be associated with the experience of chronic pain. This review (see below) enabled the identification of inconsistencies or gaps in existing knowledge of the empirical relationships between some variables of interest. Of particular merit in utilising a sample of participants reporting a diverse range of chronic pain conditions, was the potential for discovery and empirical validation of the extent to which factors impede or facilitate positive adaptation to living with chronic pain; in particular, the role of positive outlook (affect) and mindfulness in fostering resilience against the frequently comorbid experience of significant emotional distress.

CHAPTER 2

The World is Not Flat: An Historical Overview of Pain Theories

The conceptualisation of pain as an unpleasant sensory *and* emotional experience is widely acknowledged, having emerged from increasing empirical support over the past forty years as to the interdependence and interactive nature of mind and body in the pain experience (Australian Pain Society, 2002; Engel, 1977; Fernandez, 2002; Gallagher, 2004; Gatchel, 2004, 2005; Gibson & Helme, 2000; Horn & Munafo, 1997; International Association for the Study of Pain, 1997; Keefe, Rumble, Scipio, Giordano, & Perri, 2004; Keefe et al., 2002; Kleinman, Brodwin, Good, & DelVecchio Good, 1994; McWilliams, Goodwin, & Cox, 2004; Melzack, 1975, 2001; Melzack & Casey, 1968; Melzack & Wall, 1965, 1996; Merskey, 1990; Moreno, Garcia, & Pareja, 1999; Turk & Okifuji, 2002; Wall, 2000). The acknowledgement of the role and contribution made by factors other than biological is a pivotal advance in understanding the nature of pain; indeed, it has irrefutably established that the world of pain is not flat.

The Biomedical Perspective

Quantum advances in medical technologies and refined research practices have progressively enabled an intricate insight to the anatomy and physiology of the pain experience. Underpinning most research from the time of Descartes' dualistic mind-body philosophy of the 17th Century up until the latter half of the 20th Century, the biomedical model of pain provided the theoretical basis and direction of study. Descartes' classic drawing (C1644: "De l'homme", cited in Brooks & Tracey, 2005, see Figure 4) conceptualised the process of pain as the rapid transfer of minute particles from an external source which entered the body

and, in turn, pulled on some kind of internal pain-thread located at the site and running up to the brain; much like someone pulling on a rope attached to a bell.

Figure 4: Descartes' conceptualisation of pain (Brooks & Tracey, 2005)

Over the next three hundred years, developing simultaneously alongside revolutionary developments in the fields of genetics, physiology and anatomy, the biomedical paradigm continued to view pain as being caused and maintained exclusively by biological factors (Weisberg & Clavel Jr, 1999); that is, by means of nociceptive activity resulting from physiological disturbance, trauma, or disease (Melzack, 1993). Moreover, it was presumed that, ultimately, all pain-related processes could be broken down to components that could be understood in molecular biological terms (Borrell-Carrio, Suchman, & Epstein, 2004). In addition, this dualistic theory inferred that mind and body functioned separately and independently (Engel, 1977; Gatchel, 2004), thereby categorising pain as either *somatic* – identifiable organic cause (*real* pain), or *psychogenic* – no known organic cause (*not real* pain). For the most part, the biomedical view – that pain is

a sensation which functions to alert us to harm, or which signifies underlying pathology (Duncan, 2000) – remained the accepted scientific viewpoint for hundreds of years (Gatchel, 2005). Consequently, increasingly sophisticated treatment options for the alleviation of pain were developed which emphasised somatic interventions such as surgical, physical, and chemical therapies (Duncan, 2000; Weisberg & Clavel Jr, 1999).

Attention to biomedical factors and interventions is often essential and sufficiently effective in the diagnosis and treatment of acute pain episodes due to injury or disease. However, the experience of pain sometimes persists beyond treatment, or is refractory to treatment, or the reported severity of pain is not proportionate to the level of underlying tissue damage or disease, if any (Keefe, Abernethy, & Campbell, 2005; Weisberg & Clavel Jr, 1999). The conundrum as to why some people report little pain in the presence of significant injury or disease, whereas some people continue to experience intense pain in the absence of injury or disease, underscores the likelihood that factors other than underlying physical pathology are involved.

The Gate-Control Theory of Pain

In the 1960's, a significant theoretical shift occurred when a new multidimensional perspective on pain – the gate-control theory – was formally proposed (Melzack & Casey, 1968; Melzack & Wall, 1965). The seminal significance of this theory in advancing our understanding of pain perception was the incorporation of psychological factors into the model. Gate-control theory emphasises that pain is a subjective experience, whereby physiological and psychological processes are interactive and essential components, and that both

have potentiating or moderating effects on pain perception (Melzack & Casey, 1968; Melzack & Wall, 1965; Turk, 1996). Pain is viewed as an integration of three competing systems: (a) sensory-discriminative – the neurophysiology of pain, (b) cognitive-evaluative – thought processes about pain and its meaning, and (c) motivational-affective – emotional responses derived from the unpleasantness of noxious pain sensations (Turk, 1996). The gate-control model proposes that 'gate' mechanisms, located in the dorsal horn at each level of the spinal cord (International Association for the Study of Pain, 1997), determine the intensity of pain experienced, dependant upon whether the gate is open (pain) or closed (no pain). Competing influences from both ascending and descending pathways modulate the processing and transmission of nociceptive signals (International Association for the Study of Pain, 1997). It is asserted that nociceptive signals can be influenced by maladaptive thoughts, feelings, and behaviours. For example, negative thinking, stress, tension, sadness, poor nutrition, and lack of sleep can open the gate and thus intensify severity of pain, whereas adaptive coping strategies can close the gate and thus reduce perceived pain severity (Fernandez, 2002).

Fernandez (2002) summarized the overall pain experience as encompassing several pain-related phenomena –

1. *Tissue damage* – which may be caused by injury, illness or disease, and is an associated characteristic of pain, but such damage is not essential for pain to be experienced.
2. *Nociception* – when noxious sensory activity from a stimulus site is transmitted via the central nervous system to receptors in the brain for processing, the output is perceived as pain. Nociception

refers to the intermediary processes between stimulus and pain response. It involves a series of neurological and biochemical events beginning with activation of receptors sensitive to chemical, thermal or mechanical stimuli, through to release of neurotransmitters by nociceptive neurons which modulate transmission of signals along ascending spinothalamic pathways to various parts of the brain.

3. *Sensation* – the brain codes information received from sensory neurons, and the immediate properties of this information are internally experienced in terms of quality and intensity of the pain signal. A noxious physical sensation located somewhere in the body is an essential component of pain.
4. *Perception* – an active process whereby nociceptive sensation may be selectively interpreted according to the setting in which the sensation is perceived, or past experience with similar sensations.
5. *Cognition* – encompasses the storage, transformation, and retrieval of information, together with a reflective evaluation and interpretation as to the meaning ascribed to the pain sensation.
6. *Affect* – emotions or moods (e.g., fear or sadness) that occur in response to noxious sensation. The experience of negative affect is an essential component of pain.
7. *Motivation* – an internal process influenced by mood, emotional state, personality, culture, and instinct, that energizes an individual towards a particular action.

8. *Behaviour* – observable actions in response to all of the abovementioned phenomena (e.g., grimacing, limping, changing daily activities, avoiding activities, help-seeking.)

According to Fernandez, the two essential components of pain are sensation and affect. That is, without an unpleasant physical sensation occurring somewhere in the body, the concept of pain does not exist.

The Neuromatrix Theory of Pain

As an extension to gate-control theory, Melzack (1999) also proposed that underlying some forms of chronic pain are genetically predetermined brain mechanisms which generate patterns of nerve impulses via a widely distributed neural network – a *neuromatrix*. The output pattern generated by the neuromatrix is perceived as pain, and is determined by the influences of multiple inputs over time, including sensory, cognitive, and affective experience (Melzack, 1999, 2001). The neuromatrix model is shown in Figure 5, illustrating the type of factors that contribute to patterns of activity generated by the neuromatrix, together with the multiple dimensions of pain experience generated by output patterns.

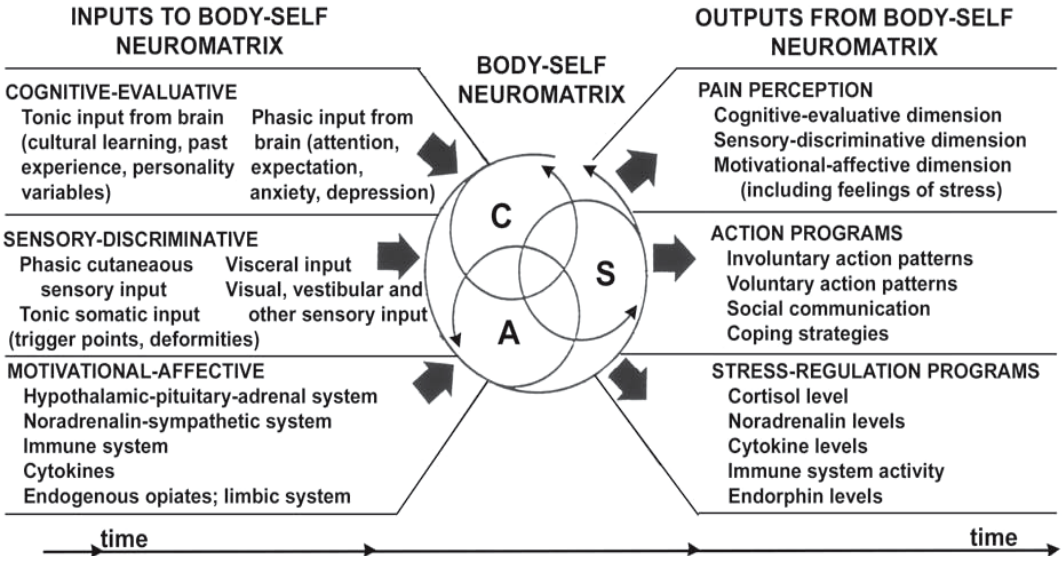


Figure 5: The neuromatrix model (Extracted from Melzack, 2001, p.1382)

Neuromatrix theory emphasises the role of stress in the pain process. For example, hormonal influences such as increased cortisol production in response to physical injury, psychological stress, or even in response to high levels of the sex-hormone oestrogen, disrupt the brain's homeostatic regulation systems (Melzack, 2001). This, in turn, activates neural, hormonal, and behavioural activity aimed at restoring homeostasis. Cortisol produces and maintains high levels of glucose which enables a rapid response to threat or injury, however, to maintain this level of glucose, the requirement for sustained release of cortisol may begin to break down proteins in muscle, inhibit calcium replacement in bone, damage nerve fibres, and suppress the immune system (Melzack, 2001). In this respect, the experience of high levels of ongoing stress is implicated as a likely contributing factor in the development of chronically painful conditions due to the cumulative and deleterious effect of stress hormones on the body (Melzack, 2001).

The Biopsychosocial Model of Pain

Consistent with the move towards theoretical and cross-disciplinary convergence of biomedical and psychological sciences, George Engel developed a model which not only encapsulated biological and affective factors associated with pain, but also gave consideration to social experience and contextual factors, and their implications in human suffering, disease and illness (Borrell-Carrio et al., 2004; Engel, 1977). In 1977, the biopsychosocial model of pain was formally proposed, asserting that complex and dynamic interactions among biological, psychological, and social factors could not be considered in isolation as distinct or independent components (Gatchel, 2005). Moreover, the presumption of a dynamic interaction among factors shifted the focus for understanding pain away from *disease* processes – objective biological events, to *illness* – a subjective experience or belief that tissue damage or disease may be present (Gatchel, 2005).

The biopsychosocial model nevertheless acknowledges that chronic pain attributed to biological disruption from injury or disease is strongly associated with sensory peripheral factors, such as progressive inflammation and tissue damage in rheumatoid and osteoarthritis (B. T. Brown, Bonello, & Pollard, 2005). Moreover, as pain of any origin becomes increasingly chronic, psychological changes may occur as the individual's response moves from brief emotional reactions to chronic psychological problems (Gatchel, 1996). Consistent with gate-control and neuromatrix theories, the biopsychosocial perspective on pain presumes some form of physical pathology or changes generating pain sensation (Turk & Okifuji, 2002), and that a combination of factors may perpetuate the pain experience and worsen clinical symptoms (Gatchel, 2005; Turk & Okifuji, 2002).

The biopsychosocial model is currently considered a promising approach to better understanding the experience of chronic pain (Gatchel, 2005). It is recognised however, that the model is still an evolutionary work-in-progress (Gatchel, 2004; Suls & Rothman, 2004) requiring more research and comprehensive identification and analyses of processes linking biological, psychological, and social phenomena. Nevertheless, over the past 30 years, widening conceptual recognition of the biopsychosocial model is suggested in the frequency of citations in Medline, from six articles during the period from 1974 to 1977, to 350 articles from 1999 to 2001 (Suls & Rothman, 2004). Indeed, the biopsychosocial model of pain has established itself as a valid model for research, practice, and policy in the field of health psychology (Dersh et al., 2002; Gatchel, 2004; Keefe et al., 2002; Suls & Rothman, 2004).

CHAPTER 3

Literature Review

This section will review past research findings, literature, measurement scales, and some unanswered questions pertaining to the relationship of sensory-discriminative aspects of chronic pain to both (a) affective-motivational factors: depression, anxiety, and positive outlook, and (b) cognitive-evaluative factors: negative problem orientation, catastrophizing, and mindfulness.

Chronic pain and affect

Results from an extensive array of research studies have invariably shown a significant association between the experience of chronic pain and negative affect. A directional relationship between pain and affect is sometimes assumed, with assertions of causality inferred without due consideration of the limitations imposed by whatever design and statistical method was employed in the study. In an applied sense, the *chicken–or–egg* scenario is a potentially dangerous one whereby the use of inappropriate or ineffective interventions may be suggested in miscast findings. In reality, the experience of chronic pain is unique to the individual, and thus the relationship between pain and affect varies accordingly (Fernandez, 2002).

Although no model is as yet sufficiently comprehensive to explain the relationships between chronic pain and affect (Dersh et al., 2002), Fernandez (2002) suggests that any, or all, of the following associations of affect to pain may apply: (a) *correlate* – co-occurrence; pain is unpleasant and therefore affective in quality; no causal inference, (b) *predisposing factor* – an inherent attribute generating a tendency to a particular outcome, (c) *precipitating factor* – relatively

immediate trigger of a response (e.g., panic attack leading to chest pain) (d) *exacerbating factor* – aggravates rather than initiates a response (e.g., pain "flares up" during times of intense emotion), (e) *consequence* – implies a causal link (e.g., pain causes affective distress), or (f) *maintaining factor* – extends the duration of pain in time rather than amplifying it in intensity.

Chronic pain, depression, and anxiety

As might be expected due to the unpleasant and aversive qualities of pain, extensive research over many years across a broad range of pain conditions has conclusively established a significant association between chronic pain, depression and anxiety (Ackerman & Stevens, 1989; Cano, 2004; Casten, Parmelee, Kleban, Lawton, & Katz, 1995; Edwards, Haythornthwaite, Sullivan, & Fillingim, 2004; Gagliese & Melzack, 1997; Gibson & Helme, 2000; Kerns, Rosenberg, & Otis, 2002; McWilliams et al., 2004; Miller, Fletcher, & Kabat-Zinn, 1995; Osman et al., 1997; Rhudy & Meagher, 2000; Rode, Salkovskis, & Jack, 2001; Ruehlman et al., 2005; Scherer-Dickson, 2004; Staud, Price, Robinson, & Vierck, 2004; Sullivan & D'Eon, 1990; Tan, Jensen, Robinson-Whelen, Thornby, & Monga, 2001; Turk, Robinson, & Burwinkle, 2004; V/eroy, Tanum, & Bruaset, 2005; Williams, 2003; Winfield, 2000; Zautra, Fasman, & Reich, 2005) . Moreover, depression and anxiety are the most commonly reported and prevalent of the known psychological comorbidities (Dersh et al., 2002; Gallagher, 2004; Von Korff & Simon, 1996). For example, in a large American (USA) study investigating chronic spinal pain and its comorbidity with physical and mental health problems in the general population (n=5692), the prevalence of reported chronic back pain (lasting at least one year) was found to be 19% (Von

Korff et al., 2005); anxiety and depressed mood had strong associations to back pain, with 35% of chronic back pain sufferers also suggestive of comorbid psychological disorders (Von Korff et al., 2005).

Chronic pain and positive outlook

Chronic pain is at the very least an unpleasant experience and, as alluded to earlier, has been attributed as a correlate, consequence, risk factor, predictor, and comorbid reality of distressing psychological experiences such as depression and anxiety. Understandably, the focus of much applied empirical investigation has, to date, been on clinical populations in relation to negative manifestations of the pain experience, and subsequent development of treatments and therapies designed to alleviate physical symptoms and emotional distress. However, not everyone living with a pain disorder is chronically depressed or unduly anxious, and this recognition highlights one of the conceptual limitations of contemporary empirical research.

It is also noteworthy that much less empirical attention has been paid to positive aspects and outcomes associated with adaptation to chronic pain. Specifically, questions remain largely unanswered as to how, when, or why, many people seem to successfully adapt to their illness, or are seemingly resilient against the affective distress so frequently associated with chronic pain experience. In two recent studies examining the role of positive affect in the experience of pain in a sample of 124 women with osteoarthritis or fibromyalgia (Zautra, Fasman et al., 2005; Zautra, Johnson, & Davis, 2005), it was found that weekly reports of higher levels of positive affect resulted in lower levels of negative affect, and also predicted lower levels of pain in subsequent weeks.

Conversely, elevations in pain severity and reported stress predicted increases in negative affect over subsequent weeks (Zautra, Johnson et al., 2005).

Although replication and validation of these preliminary findings, prior to the current study, had not yet been reported in studies examining other pain conditions or the general population, results were at least suggestive of positive affect being a potential resource in blunting the short term negative impact of pain, and perhaps as a source of resilience and longer term adaptation. Nevertheless, the role of positive affect in the overall pain experience was unclear, and warranted further investigation.

Measuring depression, anxiety, and positive outlook

Most questionnaires used to assess mood in chronic pain sufferers were not developed in pain populations. Many measures also include somatic items which result in inflated scores for pain sufferers (Pincus et al., 2004) thereby confounding or invalidating results. A new scale – The Depression, Anxiety, and Positive Outlook Scale (DAPOS) – was recently published which measures all three affective variables in the context of the experience of pain (Pincus et al., 2004).

The scale was derived from a selection of non-somatic items from the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983). In development of the scale, exploratory and confirmatory factor analyses supported three factors: depression, anxiety, and positive outlook (Pincus et al., 2004). Being a new scale, there were no published studies beyond the initial findings of

the scale developers which assessed the psychometric utility of DAPOS across a range of chronic pain populations.

Chronic pain and cognition

The sensation of pain demands one's immediate attention, interrupts current activity, and interferes with a range of cognitive processes (Van Damme, Crombez, & Eccleston, 2004). Applying one's attention to pain is, in many respects, an adaptive process whereby thoughts become focussed to evaluate the significance and meaning of the pain, and determine appropriate strategies to reduce or eliminate it (Van Damme et al., 2004). In acute pain episodes such as those caused by injury or short-term illness, cognitive attention and behavioural adaptation function effectively in facilitating the healing process. However, when pain persists or continues to worsen over time despite engaging all manner of adaptive cognitive, behavioural, biochemical, and instinctive strategies to alleviate it, it is not surprising that negative or dysfunctional thoughts may surface and, over time, develop into enduring cognitive dispositions. Moreover, the way an individual copes with emergent maladaptive or dysfunctional thought processes can lead to intensification and prolonging of emotional distress (Wells & Matthews, 1996).

According to an information processing model called the Self-Regulatory Executive Function (Fisher & Wells, 2009; Wells & Matthews, 1996) such distress can be attributed to sustained and inflexible attention and cognitive response to threats or negative thoughts being experienced. Moreover, Fisher and Wells (2009, p.15-16) assert that there are positive and negative metacognitive beliefs people have about thinking. Positive meta-beliefs relate to the perceived advantages of thinking about things in a certain way (for example, that worrying

or ruminating helps one to plan, anticipate threats, and be prepared). Negative meta-beliefs relate to thoughts being uncontrollable or having dangerous outcomes (for example, thinking about something will make you crazy; "I have no control over my worrying"). There are several maladaptive cognitions identified as being associated with the experience of chronic pain, some of which are thought to have a mediating influence between pain and increasing levels of psychological distress (Gibson & Helme, 2000; Turk & Rudy, 1992).

Chronic pain and negative problem orientation

Negative problem orientation is a dispositional cognitive construct, conceptualised as a set of dysfunctional attitudes towards social problem-solving (Robichaud & Dugas, 2005a). It reflects an individual's tendency to have a negative attitude towards problems, negative beliefs, or self-doubt about problem-solving ability, and a tendency to be pessimistic about outcomes (Robichaud & Dugas, 2005a). Negative problem orientation has been implicated as a major factor in problem-solving deficits identified in persons with a range of mental health disorders, including generalized anxiety disorder and, in particular, depression (D'Zurilla & Nezu, 1999; Robichaud & Dugas, 2005a) . In clinical populations, it has been found that deficits in abilities to solve problems occurring in the social environment are rarely associated with poor problem-solving skills; rather, negative problem orientation has been identified as the primary contributing component (D'Zurilla & Nezu, 1999; Robichaud & Dugas, 2003).

It is conceivable that chronic pain sufferers may experience such negative cognitions and develop this tendency over time, given the ongoing nature of pain disorders that have not abated with available treatments. Chronic pain, itself,

could be viewed as an insolvable problem. The specific role of negative problem orientation in the overall experience of chronic pain remains empirically unclear, although it makes intuitive sense to suggest that persistent pain may foster a negative problem orientation which may contribute to and/or mediate pain-related affective distress (Shaw, Feuerstein, Haufler, Berkowitz, & Lopez, 2001). Moreover, considering previous findings as to the influential contribution of negative problem orientation to depression and anxiety, it was a cognitive construct worthy of investigation as part of the overall pain experience.

Measuring negative problem orientation

Negative problem orientation is frequently measured as a subscale of more global measures of problem solving ability, such as the Social Problem Solving Inventory – Revised Short Form (D'Zurilla & Nezu, 1999). In this context, problem orientation is conceptualised as a cognitive-emotional set, thereby combining cognitive and affective components, and potentially confounding findings pertaining to its role in mediating affective distress. A recently published scale – The Negative Problem Orientation Questionnaire – was developed with regard to the construct being conceptualised as a purely cognitive one (Gosselin, Pelletier, & Ladouceur, 2000; Robichaud & Dugas, 2003, 2005a, 2005b).

Chronic pain and catastrophizing

Catastrophizing is a pain-specific cognitive construct defined as an individual's exaggerated negative orientation towards actual or anticipated pain experiences (Sullivan et al., 1995). It is conceptualised by three dimensions: (a)

rumination – tendency to increase attentional focus on pain-related thoughts, and an inability to suppress or divert attention away from pain-related thoughts, (b) *magnification* – tendency to exaggerate the threat of painful stimuli, and (c) *helplessness* – tendency to adopt a helpless orientation to coping with painful stimuli (Sullivan et al., 1995). Catastrophizing, in general, has been reported to mediate responses to pain (Turk & Rudy, 1992) and has been identified as a crucial contributing factor to maladaptive pain behaviours and emotional distress resulting from chronic pain (Gibson & Helme, 2000; Jensen, Turner, Romano, & Karoly, 1991; Sullivan et al., 1995; Sullivan & D'Eon, 1990; Sullivan, Lynch, & Clark, 2005; Sullivan, Tripp, & Santor, 2000).

However, the mediating influence of *specific dimensions* of pain catastrophizing is not well understood, empirically. For example, it has been established that catastrophizing heightens pain experience (Sullivan et al., 1995) and has a significant positive association with anxiety and depression (Cano, 2004; Haaga, 1992; Hassett, Cone, Patella, & Sigal, 2000; Lackner & Quigley, 2004; Osman et al., 1997; Sullivan & D'Eon, 1990; Tan et al., 2001; Turner, Mancl, & Aaron, 2004) but it is remains unclear as to the unique or combined mediating effect, if any, of rumination, magnification, and helplessness, between pain, and, depression and anxiety.

Measuring catastrophizing

Prior to the development of a multidimensional cognitive model of catastrophizing (Sullivan et al., 1995), the construct was ordinarily measured as a subscale of more global measures of coping, such as the Coping Strategies Questionnaire (CSQ) (Rosenstiel & Keefe, 1983). It was empirically determined

that items in the catastrophizing subscale of the CSQ more closely resembled a symptomatic measure of depression, thereby confounding analyses and rendering the measure redundant (Sullivan & D'Eon, 1990). In an effort to redress problematic conceptual and methodological issues, a new self-report measure called the Pain Catastrophizing Scale (Sullivan et al., 1995) was developed for use in clinical and non-clinical populations. Confirmatory factor analyses have suggested that the PCS taps a single pain-related cognitive construct characterized by three dimensions: rumination, magnification, and helplessness (Osman et al., 2000). The reliability and validity of the PCS has been reported across both clinical and general community samples (Osman et al., 2000; Osman et al., 1997; Sullivan et al., 1995; Van Damme, Crombez, Bijttebier, Goubert, & Van Houdenhove, 2002).

Chronic pain and mindfulness

It should be noted that cognitive tendencies have also been identified which are reported to facilitate adaptive responses to pain, both physically and psychologically. To do so, however, has meant turning back the clock to recognize the potential benefits of mindfulness. The construct of mindfulness has its roots in the Buddhist tradition of meditation, and remains at the core of Buddhist teachings of acceptance and relief of suffering (Kabat-Zinn, 2003). As a cognitive construct, mindfulness pertains to attention, and may therefore be considered a universal phenomenon – it is an inherent human capacity to be mindful, to varying degrees, at any given moment in time (Kabat-Zinn, 2003). Mindfulness, as a dispositional construct, encompasses the tendency of an

individual to be aware and focus attention in a non-judgmental or accepting way on experience occurring in the present moment (Baer, Smith, & Allen, 2004).

Over the past twenty years, an increasing number of reports have begun to appear in the empirical literature showing the effectiveness of clinical interventions based on training in mindfulness skills (Baer, 2003). For example, mindfulness-based stress reduction (MBSR) programs, whereby relaxation and meditation skills are taught to participants over several weeks, are credited with beneficial outcomes across a broad range of clinical populations, including reported reductions in *pain* (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1984; Kabat-Zinn, Lipworth, Burney, & Sellers, 1987), and, *anxiety* and *depression* (Carlson, Speca, Patel, & Goodey, 2004; Carlson, Ursuliak, Goodey, Angen, & Speca, 2001; Delmonte, 1985; Kabat-Zinn et al., 1992; Miller et al., 1995). A willingness to accept pain has also been identified as an influential aspect of coping with chronic pain (McCracken & Vowles, 2006; Vowles, McCracken, McLeod, & Eccleston, 2008).

Mindfulness-based treatments are now being incorporated in structured psychological therapy aimed at relapse prevention, including mindfulness-based cognitive therapy (MBCT) for *depression* (Mason & Hargreaves, 2001; Scherer-Dickson, 2004; Teasdale, Segal, & Williams, 1995; Teasdale, Segal, & Williams, 2003). Training in mindfulness skills, within a context of synthesizing acceptance and change, is also utilised in behavioural interventions such as dialectical behaviour therapy (DBT) for the treatment of borderline personality disorder (Baer, 2003).

Measuring mindfulness

There are several recently published self-report inventories for measuring mindfulness. Variation across definitions and contextual issues pose problems in generalizing findings beyond the particular samples utilised in developing the individual measures. Moreover, most of the available measures were not specifically developed for use in pain populations. For example, the Freiburg Mindfulness Inventory (Buchheld, Grossman, & Walach, 2001) was developed with individuals attending meditation retreats, and was designed for use only by those with meditation experience, whereas the Mindful Attention Awareness Scale (K. W. Brown & Ryan, 2003) assesses, in more general terms, mindfulness as present-centered attention-awareness, and was explicitly designed for use in the general population. Neither the FMI nor the MAAS assess accepting without judgment, which is reported to be an integral attitudinal aspect of mindfulness associated with adaptive responding to problematic situations, and prevention of impulsive or maladaptive responses (Baer et al., 2004). The Chronic Pain Acceptance Questionnaire (CPAQ) assesses engagement and acceptance of pain experience (Vowles et al., 2008). The multidimensional Kentucky Inventory of Mindfulness Skills (Baer et al., 2004) incorporates this factor as one of four mindfulness dimensions: (a) *observing* – noticing, attending to stimuli (e.g., body sensations, cognitions, emotions); (b) *describing* – labelling or noting of observed phenomena with words; (c) *acting with awareness* – engaging fully in one's current activity with undivided attention, or focusing with awareness on one thing in the moment; (d) *accepting (or allowing) experience without judgment* – to

allow reality to be as it is without attempts to avoid, escape, or change it (Baer et al., 2004).

More recently, Baer and her colleagues conducted a series of exploratory and confirmatory factor analyses across several self-report measures of mindfulness, using large samples of university students as their source of data (Baer et al., 2006). They examined 112 items from five different measures, and derived facets of mindfulness consistent with the KIMS plus an additional facet of *non-reactivity to inner experience*, which incorporated items from the FMI and Mindfulness Questionnaire (MQ, Chadwick et al., 2005, cited Baer et al., 2006). Subsequently, a new 39-item self-report measure called the Five-Facet Mindfulness Questionnaire was derived. Given the comprehensiveness of the dimensions which it addresses and the statistical support offered by its developers, this new measure of mindfulness was considered appropriate for use in the current studies.

Summary

Literature pertaining to chronic pain theory, models, measurement, and research dating back over several decades, has continued to evolve into a far ranging field of study. The biopsychosocial model of pain recognizes the influential role of both physical and psychological factors. Based on this model, the present studies utilized measures selected to reflect a combination of factors not previously examined collectively but which had been shown, or were suspected, to be influential in overall chronic pain experience. Three studies were conducted.

Study 1 examined the psychometric properties of a battery of pain, cognitive and affective measures, using a sample of voluntary participants

reporting chronic pain. Utilizing data from a subset of these participants, Study 2 explored the mediating relationship between reported pain experience, dispositional cognitions, and affect. Participants from that study who agreed to take part in a follow-up study comprised the sample for Study 3. This study examined the experience of pain over time (one month), and sought to replicate the findings from Study 2. Further, this final study sought to ascertain the influence of initial affect scores, both positive and negative, on pain scores reported one month later.

CHAPTER 4

Method

Participants

Ethics approval (H05STU516) for conducting the research was granted by the University of Southern Queensland Human Research Ethics Committee. A convenience sample of participants reporting any non-malignant chronic pain condition was sought from across the general community through known contacts and community/pain support groups (e.g., members of the Queensland branch of the CFS/ME/FMS Support Association, and the Toowoomba Chronic Pain Education and Support Group). Details about the study were also distributed via letterbox drops in the Toowoomba region, and were also submitted on internet-based (Australian) pain support groups and websites. In addition, participation was offered to the student population (Psychology) at the University of Southern Queensland (USQ). Participation was voluntary, and subjects were advised that they could withdraw from the study at any time. There was no financial remuneration offered for participation, although subjects could elect to be placed into a Psychology Department draw for small cash prizes. Alternatively, eligible USQ student participants could apply for course credit for research participation.

An Australian chronic pain sample comprising 361 participants was obtained for Study 1. Participants for Study 2 (N = 269) were determined through merging of matched data from each measurement scale examined in Study 1. Sample for Study 3 (N = 140) was determined through data received from a sub-set of participants from Study 1 who agreed to take part in a follow-up study.

Measures

Participation in this research involved completing either a paper or web-based version of a survey questionnaire. The survey comprised several sections including an information sheet outlining the study (Appendix A), consent form (Appendix B), participant's unique user code (Appendix C), demographic information pages (Appendix D), five measurement scales (see below), and a reply-paid envelope (for paper version).

Profile of Chronic Pain: Screen (PCP:S; Ruehlman et al., 2005; Appendix E)

This 15-item multidimensional scale was designed for use in the general population and derived with regard to the biopsychosocial model of chronic pain. It is reported to measure three aspects of the pain experience: (a) *Severity* – the intensity or aversive quality of pain (4 items; possible range 0 to 30), (b) *Interference* – impact of pain on enjoyable activities, relationships, responsibilities, personal goals, self-care, and cognitions (6 items; possible range 0 to 36), and (c) *Emotional burden* – feelings related to pain, e.g., sad, tense, angry, isolated, less enjoyment of life (5 items; possible range 0 to 25). Scoring instructions were provided in a manual written by the scale developers (Ruehlman & Karoly, 2006). Internal reliability (telephone interview; $N = 2406$) was reported as α (Cronbach's alpha) = *Severity* .89, *Interference* .91, and *Emotional burden* .91.

Test-retest reliability of PCP:S scores at one week (telephone interview; $n = 64$) was reported as $r = .77$, .79, and .85, respectively (Ruehlman et al., 2005). Additionally, an outpatient chronic pain sample, recruited from primary health care centres (N=244), completed a paper-and-pencil version of the PCP:S. Internal

reliability estimates for this group were reported as *Severity* .68, *Interference* .92, and *Emotional burden* .88. Retest correlation coefficients were reported (at approximately one week; $n = 72$) as .83, .86, and .81, respectively (Ruehlman & Karoly, 2006). In scale development, response bias was examined using the Self-Deception (SD) and Impression Management (IM) scales from the Balanced Inventory of Desirable Responding (BIDR; Paulhus, 1991, cited Ruehlman & Karoly, 2006, p.27). All dimensions of the PCP:S showed low and nonsignificant correlations with SD and IM, suggesting low levels of social desirability response bias. The psychometric properties of a web-based version of the scale had not been reported.

Negative Problem Orientation Questionnaire (NPOQ; Robichaud & Dugas, 2005a, 2005b; see Appendix F).

This scale is an English translation of the original French version (Gosselin et al., 2000) which is the first measure specifically designed to measure the disruptive cognitive construct of negative problem orientation (NPO) directly, rather than as a component of more global measures of problem solving ability. Consistent with psychometric properties of the French version, factor analysis of the English translation revealed a 12-item single factor measure reflecting a cognitive predisposition for negative beliefs concerning problems and problem-solving ability (Robichaud & Dugas, 2005a).

The NPOQ measure uses a 5-point rating scale for each item, ranging from 1 (not at all true of me) to 5 (extremely true of me). Total scores range from 12 (absence of NPO) to 60 (high levels of NPO). Internal reliability ($N = 201$ undergraduate university students) for the English version was reported as $\alpha =$

.92. Test-retest reliability at 5 weeks (n = 44) was reported as r = .80, p < .01 (Robichaud & Dugas, 2005a).

Pain Catastrophizing Scale (PCS; Sullivan et al., 1995; see Appendix G)

This is a 13-item scale using a 5-point rating scale for each item, ranging from 0 (not at all) to 4 (all the time). A total *Catastrophizing* score is calculated (possible range 0 to 52), together with scores for three reported subscales: *Rumination* (4 items; possible range 0 to 16), *Magnification* (3 items; possible range 0 to 12), and *Helplessness* (6 items; possible range 0 to 24). Normative data for means and percentile scores from a sample of participants with compensation claims lodged for lost-time work accidents (N = 851) is provided in the PCS Manual (Sullivan, 2004) with clinically significant levels of pain catastrophizing suggested at or above a cut-off total score of 30, or, subscale scores of 11, 5, and 13, respectively. However, it is questionable that the reported experience and levels of catastrophizing in compensation claimants is representative of more general samples of chronic pain sufferers.

Internal reliability (n = 429) was reported as α (Cronbach's alpha) for *Total PCS* = .87, *Rumination* = .87, *Magnification* = .66, and *Helplessness* = .78 (Sullivan et al., 1995). Test-retest reliability at 6 weeks was reported as r = .75; and at 10 weeks, r = .70 (Osman et al., 2000). The multidimensional structure of the scale has been supported with confirmatory factor analyses revealing good fit of data to a 3-factor model, based on scores obtained from samples of undergraduate psychology university students (Osman et al., 1997; Sullivan et al., 1995; Van Damme et al., 2002), and community participants (Osman et al., 2000).

Five-Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; see Appendix H)

This 39-item multidimensional scale, measures five facets of mindfulness using a 5-point rating scale ranging from 1 (never or very rarely true of me) to 5 (very often or always true): *Observe* (8 items; possible range 8 to 40), *Describe* (8 items; possible range 8 to 40), *Act with awareness* (8 items; possible range 8 to 40), *Accept without judgement* (8 items; possible range 8 to 40), and *Non-Reactivity* (7 items; possible range 7 to 35). Internal reliability of facets was reported as α = .83, .91, .87, .87 and .75, respectively (Baer et al., 2006).

Depression, Anxiety and Positive Outlook Scale (DAPOS; Pincus, Williams, Vogel & Field, 2004; see Appendix I)

This is an 11-item multidimensional scale, comprising three subscales each measured using 5-point rating scale ranging from 1 (almost never) to 5 (almost all the time): *Depression* (5 items; possible range 5 to 25); *Anxiety* (3 items; possible range 3 to 15); *Positive Outlook* (3 items; possible range 3 to 15). Internal reliability: α (Cronbach's alpha), and test-retest reliability estimates have not yet been reported. Development of this scale for use within pain populations, specifically excluded somatic items due to the potential for criterion contamination – it has been found that pain sufferers often heavily endorse items on other measures such as fatigue and sleep problems, thereby inflating scores purportedly reflecting level of negative affect (Bradley, 1996; Morley, Shapiro, & Biggs, 2004; Pincus, Burton, Vogel, & Field, 2002; Pincus et al., 2004).

Procedure

Data Screening

All data screening and analyses were conducted using the Statistical Package for Social Sciences (SPSS) Graduate Student Version 15.0. Prior to analysis, survey data for each scale was checked for accuracy of input, and screened for missing values, univariate and multivariate outliers, and normality. Due to the type of statistical analyses planned for each study, in particular the execution of parallel analysis for each measure in Study 1, the impact of both univariate and multivariate outliers was examined thoroughly as part of the screening process. The influence and impact of outliers was considered carefully, and preliminary data analyses undertaken both with and without potential outliers, so as to ensure statistical robustness of findings.

Profile of Chronic Pain: Screen (PCP:S)

Missing Data. Two cases were deleted due to the entire page (items 8 through 15) being blank. Three cases with a single missing item response each were detected, and were replaced with the series mean score.

Univariate outliers. Potential univariate outliers were identified by converting all cases on each variable to z scores and assessing those which exceeded +/-3.29 ($p<.001$). Five cases on Item 4 had a z score of 3.70 ($p<.001$) so were initially recoded from a value of 0 (very little pain in the last 3 months) to 0.9, each remaining less than the next lowest score, but still resulting in a z score >3.29. These cases were deleted. On Item 1, four other cases had z scores of –4.46 or –3.62 ($p<.001$) with values of 0 or 1 (less than once per month of pain lasting > 3 minutes). These cases were deleted. Two preliminary Principal Component

Analyses (PCA) with promax rotation were conducted – inclusive and exclusive of outliers – with no difference found in the number of components extracted.

Multivariate outliers. Potential multivariate outliers were identified if Mahalanobis distance (MAH) exceeded the critical chi square value of 37.697 ($p<.001$). Several runs were conducted, successively identifying and deleting a total of 14 multivariate outlier cases from the data.

Negative Problem Orientation Questionnaire (NPOQ)

Missing Data. Four cases, each with a single missing response (Item 1, 5, 8, 12 respectively) were detected, and these missing values were replaced with the Mean score for each item.

Univariate outliers. Potential univariate outliers were identified if z scores exceeded +/-3.29 ($p<.001$). Only one case was detected with a z score of 3.50 for Item 3, having a value of 5 (extremely true). This item was recoded to 4.1, still exceeding the next highest score, resulting in a z score of 2.56, and so was retained.

Multivariate outliers. Potential multivariate outliers were identified if MAH exceeded the critical chi square value of 32.909 ($p<.001$). Several runs were conducted, successively identifying and deleting a total of 35 multivariate outlier cases from the data. Subsequently, a further six cases were identified as potential univariate outliers all on Item 8, with z scores of 3.50, and raw score values of 5. All were recoded to 4.1, and retained for further analysis.

Skewness/Kurtosis. Item 8 was significantly positively skewed prior to (1.623) and after (1.402) the recoding of univariate outliers (above). Square root and logarithmic transformations were conducted for this item, resulting in

skewness values of 1.254 and 0.978 respectively. A bivariate scatterplot was also reviewed depicting Item 8 (most skewed) and Item 1 (least skewed), whereby the relationship appeared linear. For ease of interpretation, and given that all items were positively skewed to varying degrees, all original values were retained for further analysis.

Pain Catastrophizing Scale (PCS)

Missing Data. A total of 23 data points across various items were missing from the dataset. These missing values were replaced with the series Mean for each applicable item.

Univariate Outliers. Potential univariate outliers were identified if z scores exceeded +/-3.29 ($p<.001$). Six cases were detected with z scores of 3.33 for Item 7, having a value of 4 (extremely true). All were recoded to 3.1, still exceeding the next highest score, and were retained. No further univariate outliers were detected.

Multivariate Outliers. Potential multivariate outliers were identified if MAH exceeded the critical chi square value of 34.528 ($p<.001$). Several runs were conducted, successively identifying and deleting a total of 14 multivariate outlier cases from the data. No further multivariate outliers were detected.

Skewness/Kurtosis. All variables were positively skewed to varying degrees, so a visual check of linearity was first conducted by reviewing a scatterplot depicting Item 2 (most skewed) and Item 6 (least skewed). The relationship appeared linear, so no transformation of data was undertaken.

Five-Facet Mindfulness Questionnaire (FFMQ)

Missing Data. Two cases were deleted because of large amounts of missing data: 20 items (entire page) and 13 items, respectively. A further 17 cases had a total of 30 missing values across 19 items, variously. These items were each replaced with the appropriate series Mean.

Univariate Outliers. There were no univariate outliers identified with z scores exceeding +/-3.29 ($p<.001$).

Multivariate Outliers. Potential multivariate outliers were identified if MAH exceeded the critical chi square value of 73.402 ($p<.001$). Several runs were conducted, successively identifying and deleting a total of 26 multivariate outlier cases from the data. No further outliers were detected.

Depression Anxiety and Positive Outlook Scale (DAPOS)

Missing Data. Two cases were identified with all items left blank, and so were deleted. Two other cases had one missing value on Item 3 and 6, respectively, which were replaced with the appropriate series Mean.

Univariate Outliers. Initially, there were no univariate outliers detected.

Multivariate Outliers. Potential multivariate outliers were identified if MAH exceeded the critical chi square value of 31.264 ($p<.001$). Several runs were conducted, resulting in deletion of 14 multivariate outlier cases. Subsequently, 12 cases were identified as potential univariate outliers, all on Item 11, with z scores of 3.399 and raw score values of 5 (I think about harming myself "almost all the time"). All were recoded to 4.1, still exceeding the next highest score, and were retained for further analysis.

Skewness/Kurtosis. Item 11 was significantly positively skewed prior to (2.128) and after (1.877) the recoding of univariate outliers (above). Square root and logarithmic transformations were first conducted for this item, resulting in skewness values of 1.858 and 1.651, respectively. A visual check of linearity was also conducted by reviewing a scatterplot depicting Item 11 (most positive skew) and Item 4 (most negative skew), whereby the relationship appeared linear. For ease of interpretation, transformed variables were not retained for use in further analyses.

CHAPTER 5

Study 1

The purpose of this study was to explore the structural and psychometric properties of each measurement scale. A frank investigation was warranted for several reasons. The sample of participants used in this study reported a wide range of circumstances and non-malignant chronic pain conditions. Chronic pain was considered as the disorder, in its own right, for this research. Most of the measures selected for use in the study were not derived from pain populations. For example, in the development of the PCP:S, findings were based on a large community sample of telephone interviewees. Properties of paper and online versions of this measure had not been reported. Further, the PCP:S, FFMQ, and DAPOS measures were relatively new, and so had not undergone extensive independent validation and assessment. The psychometric utility and clinical application of most of the measures was, therefore, primarily untested against chronic pain populations.

Procedure

This study involved conducting exploratory principal component analyses on all scales. Parallel analysis was first conducted to determine the appropriate number of components for extraction. This procedure was investigated and selected as the best extraction option over other, arguably, less accurate or flawed methods such as eigenvalues greater than 1 and scree test. The commonly used ‘eigenvalues greater than 1’ method has been found to retain too many factors (Lee & Comrey, 1979; Zwick & Velicer, 1986), which may lead to error in interpretation and meaning of solutions. The scree plot test involves visual,

sometimes subjective, decisions as to where the scree actually begins. Parallel analysis has not been commonly utilised in psychological research to date, perhaps in part because it is not a generic option available in statistical software applications such as SPSS. However, there is increasing acknowledgement by statisticians that it is a superior procedure (Hayton, Allen, & Scarpello, 2004; O'Connor, 2000) and it has been shown to be one of the most accurate extraction methods (Hayton et al., 2004; Zwick & Velicer, 1986).

Basically, parallel analysis specifies the number of components to extract from a data set which account for more variance than components derived from random data. A large number of random data sets are generated to *parallel* the actual data with equal numbers of cases and variables (O'Connor, 2000). Eigenvalues from both sets of data (actual and random) are compared, and only those components with eigenvalues greater than those from the random data, are retained. An SPSS syntax file provided by O'Connor (2000) was used for conducting parallel analysis of data in this Study. Parallel analysis eigenvalues were obtained from 100 randomized data sets (permutations of the raw data), using principal components analysis as the extraction method, and specifying the 95^{th} percentile for eigenvalue confidence intervals.

In the original development of the measures used in this study, only more traditional methods of factor extraction had been utilised, without regard to parallel analysis. So, in addition, a series of Principal Component Analyses (PCA) requiring the extraction of components with eigenvalues greater than 1, were also conducted. These additional analyses were undertaken to enable comparison, confirmation, or examination of solutions, especially wherever the number of components extracted varied from expected for any of the measurement scales.

Consideration was also given as to the method of rotation applied to the data to enable an interpretable solution. Rotation is an integral part of component analysis. Its purpose is to identify from the data a simple structure that best represents any derived components and the measured variables which underlie them. The two methods of rotation are orthogonal and oblique. Orthogonal rotation assumes that the components do not correlate with each other, whereas in oblique rotation the components are allowed a moderate degree of correlation. In the real world, it is more likely that components will correlate to some extent, so an oblique method was used for this study. Promax is an oblique method of rotation which produces simple structure, and is recognised as the preferred method (Gorsuch, 1983). Promax rotation was therefore selected for use and applied to all principal component solutions generated in this study.

Results

Profile of Chronic Pain: Screen (PCP:S)

Parallel analysis was first conducted on the data (N = 337) to identify the number of components for extraction. Results of this analysis are shown in Figure 6, indicating that two components should be extracted.

Raw Data	Random Data
8.007937	1.448321
1.711065	1.342618
1.011264	**1.262058** > raw data eigenvalue

Figure 6: Parallel analysis eigenvalues for PCP:S

For comparison, a Principal Component Analysis (PCA) with promax rotation was also conducted, requiring the extraction of components with eigenvalues greater than 1. This resulted in three components being extracted. A PCA with Promax rotation was then conducted, as per parallel analysis findings, requesting extraction of two components. The pattern matrix (see Table 1) revealed a clean structure, with derived components now labelled for the purpose of this research as Physical Burden (Items 1-10) and Emotional Burden (Items 11-15). Internal reliability for these components was indicated with Cronbach's alpha $\alpha = .93$ (Physical Burden) and $\alpha = .88$ (Emotional Burden).

Table 1

Principal Component Analysis Pattern Matrix for Profile of Chronic Pain: Screen (N =337)

	Component	
Item No.	Physical Burden	Emotional Burden
6	.942	
3	.896	
7	.889	
5	.879	
8	.857	
4	.740	
1	.649	
9	.628	
2	.620	
10	.618	
13		.918
11		.890
12		.868
14		.732
15	.459	.474

Note. Promax rotation with Kaiser normalization; converged in 3 iterations.

An additional PCA was separately conducted on Physical Burden items, revealing what may be considered as second-order components of Severity (Items 1,2,4) and Interference (Items 3, 5-10). These dimensions (see Table 2) are consistent with those originally specified by the scale developers, except for Item 3 which should have loaded on Severity, but instead loaded on Interference. Internal reliability coefficients for these second-order component scores were also acceptable, with $\alpha = .75$ (Severity) and $\alpha = .93$ (Interference).

Table 2

Principal Component Analysis Pattern Matrix for Physical Burden Items (N=337)

	Second-order Component	
Item No.	Interference	Severity
8	.965	
5	.943	
7	.887	
6	.877	
9	.725	
10	.722	
3	.659	
4		.894
2		.846
1		.719

Note. Promax rotation with Kaiser normalization; converged in 3 iterations.

Negative Problem Orientation Questionnaire (NPOQ)

Parallel analysis was conducted on the data (N = 326) to identify the number of components for extraction. Results of this analysis are shown in Figure 7, indicating that one component should be extracted.

Raw Data	Random Data
7.994574	1.400060
0.732692	**1.300017** > raw data eigenvalue

Figure 7: Parallel analysis eigenvalues for NPOQ

Additionally, a PCA with promax rotation was conducted for confirmation, requiring extraction of components with eigenvalues greater than 1. This also resulted in one component being extracted, consistent with the scale developers reported measure of Negative Problem Orientation. An internal reliability coefficient was determined with Cronbach's alpha $\alpha = .95$.

Pain Catastrophizing Scale (PCS)

Parallel analysis conducted on the data (N = 347) to identify the number of components indicated one component, only, to be extracted. Results of this analysis are shown in Figure 8.

Raw Data	Random Data
7.624918	1.405051
0.986994	**1.312821** > raw data eigenvalue

Figure 8: Parallel analysis eigenvalues for PCS

This varied from the three-dimensional model developed by Sullivan, so a PCA with promax rotation was conducted for comparison, requiring extraction of components with eigenvalues greater than 1, which also resulted in one component, only, being extracted. Internal reliability for the single construct measure of Pain Catastrophizing was indicated with Cronbach's alpha $\alpha = .94$.

A closer examination of this uni-dimensional finding was warranted to ascertain why the resulting component structure varied from the three dimensions so widely reported by Sullivan and colleagues. An additional PCA with promax rotation was conducted, forcing the extraction of three components. The pattern matrix (see Table 3) with values less than .3 suppressed, for clarity, was then examined. Dual loadings were noted for items 6, 3 and 7, however the derived structure may be considered similar to Sullivan's (1995) original findings. That is, component 1 was equivalent to the PCS dimension of Rumination (items 8,9,10,11) except for the addition of item 1: "I worry all the time about whether the pain will end". Component 2 was similar to the dimension of Helplessness (items 1,2,3,4,5,12) excluding items 1 and 12 which loaded elsewhere. Component 3 reflected the dimension of Magnification (items 6,7,13) but with the addition of item 12: "There is nothing I can do to reduce the intensity of the pain".

Table 3

Principal Component Analysis Pattern Matrix for Pain Catastrophizing Scale 3 Factors Requested (N = 347)

	Component		
Item No.	Rumination	Helplessness	Magnification
11	.930		
10	.867		
8	.818		
9	.786		
1	.735		
6	.529		.306
3	.527	.399	
2		.963	
5		.847	
4		.747	
13			.920
7		.414	.626
12			.396

Note. Promax rotation with Kaiser normalization; converged in 7 iterations.

Five-Facet Mindfulness Questionnaire (FFMQ)

Consistent with the scale developers' findings, parallel analysis indicated five components for extraction (see Figure 9). A PCA with promax rotation was conducted on the data (N = 333) to extract the components. The pattern matrix (see Table 4) revealed a clean structure, with the internally reliable (α = Cronbach's alpha) components computed to be: Non-Judgmental (8 items) α = .91; Describe (8 items) α = .91; Act Aware (8 items) α = .90; Observe (8 items) α = .80; Non-Reactivity (7 items) α = .79.

Raw Data	Random Data
8.302504	1.789553
6.611553	1.703795
2.934832	1.615171
2.606494	1.566770
2.101404	1.509060
1.228933	**1.456399** > raw data eigenvalue

Figure 9: Parallel analysis eigenvalues for FFMQ

Table 4

Principal component analysis pattern matrix for Five-Facet Mindfulness Questionnaire (N = 333)

Item No.	Component				
	Non-Judgmental	Describe	Act Aware	Observe	Non-Reactivity
30	.860				
35	.850				
25	.807				
10	.805				
39	.802				
17	.751				
3	.750				
14	.713				
16		.877			
12		.842			
2		.832			
22		.787			
37		.759			
7		.733			
27		.713			
32		.642			
38			.887		
34			.847		
13			.789		
28			.755		
5			.753		
8			.726		
23			.661		
18			.633		
15				.843	
20				.795	
26				.670	
31				.661	
6				.645	
11				.488	
1				.483	
36				.349	
29					.860
33					.742
24					.669
19					.661
9					.562
21					.561
4					.471

Note. Promax rotation with Kaiser normalization; converged in 6 iterations.

Depression Anxiety and Positive Outlook Scale (DAPOS)

Parallel analysis was first conducted on the data (N = 345) to identify the number of components for extraction. Results of this analysis are shown in Figure 10, indicating that two components should be extracted.

Raw data	Random Data
4.967875	1.372098
1.828504	1.272407
1.118669	**1.197269** > raw data eigenvalue

Figure 10: Parallel analysis eigenvalues for DAPOS

A PCA with promax rotation was then conducted, requesting extraction of two components. The pattern matrix (see Table 5) revealed a clean structure, with derived components hereafter labelled for the purpose of this research as Negative Affect (items 1,2,3,5,6,8,9,11) and Positive Outlook (items 4,7,10).

Table 5

Principal Component Analysis Pattern Matrix for Depression Anxiety and Positive Outlook Scale (N = 345)

Item No.	Component	
	Negative Affect	Positive Outlook
3	.832	
6	.816	
2	.815	
8	.751	
9	.751	
1	.701	
5	.662	
11	.474	
7		.890
10		.865
4		.800

Note. Promax rotation with Kaiser normalization; converged in 3 iterations.

Internal reliability for the components was indicated with Cronbach's alpha $\alpha = .89$ (Negative Affect) and $\alpha = .81$ (Positive Outlook). An additional PCA was separately conducted on Negative Affect items revealing what may be considered as second-order components, consistent with those originally specified by the scale developers, being Depression (items 1,3,5,8,11) and Anxiety (items 2,6,9) (see Table 6).

Table 6

Principal Component Analysis Pattern Matrix for Negative Affect (N = 345)

Item No.	Second-Order Component	
	Depression	Anxiety
5	.930	
1	.879	
8	.840	
3	.732	
11	.680	
6		.914
9		.849
2		.825

Note. Promax rotation with Kaiser normalization; converged in 3 iterations.

Internal consistency of scores for these second-order components was good with α = .88 (Depression) and α = .83 (Anxiety). For comparison, a PCA with promax rotation was also conducted, requesting extraction of components with eigenvalues greater than 1. This resulted in three components being extracted. A summary of reliability coefficients for all scales, including variations across paper and web survey scores, is shown in Table 7, below.

Table 7

Internal Reliability Coefficients for All Scales

Scale	No.Items	Cronbach's Alpha		
		Total	Paper	Web
Profile of Chronic Pain: Screen				
Physical Burden	10	.93	.91	.93
Severity	4	.75	.65	.77
Interference	6	.94	.92	.93
Emotional Burden	5	.88	.90	.87
Negative Problem Orientation Questionnaire				
Negative Problem Orientation	12	.95	.96	.95
Pain Catastrophizing Scale				
Pain Catastrophizing	13	.94	.94	.93
Rumination	4	.91	.92	.90
Helplessness	6	.88	.89	.88
Magnification	3	.71	.74	.71
Five Facet Mindfulness Questionnaire				
Observe	8	.80	.79	.78
Describe	8	.91	.92	.89
Act with Awareness	8	.90	.93	.90
Non-Judgement	8	.91	.93	.91
Non-Reactivity	7	.80	.78	.80
Depression Anxiety and Positive Outlook Scale				
Negative Affect	8	.89	.88	.88
Depression	5	.88	.86	.88
Anxiety	3	.83	.91	.78
Positive Outlook	3	.81	.81	.84

Discussion

There were several interesting findings from this study which will be addressed for each measurement scale. Overall, the results of exploratory principal component analyses of data from this chronic pain sample were consistent with reported dimensions for only two of the measures (NPOQ and FFMQ). Anticipated components were not (unless forcibly) extracted for one measure (PCS). Findings for the other two scales (PCP:S and DAPOS) showed some variation in the derived components compared to those specified for these relatively new measures.

Profile of Chronic Pain: Screen

A component emerged for Emotional Burden, however only one other component was indicated for extraction. This component effectively combined scores on all remaining items into a single interpretable dimension which was labelled Physical Burden. Although the subsequently derived subscales of Severity and Interference were calculated and shown to have adequate internal reliability, they were not considered sufficiently discrete for use or interpretation with confidence in other analyses. It is possible that the *3 months* time frame specified for each item (for consistency with other measures used in the current study, it was amended from "How often over the past *6 month*s…" specified on the published measure) may have affected findings. Moreover, six months is an appreciably longer time over which participants would have needed to recall and accurately report frequency of physical and emotional aspects of their pain experience. Whilst chronic pain experience may be ongoing, it might be difficult

to recall, for example, what was the "average level of pain on days when you had pain during the past 6 months" (item 2).

Severity was the least internally reliable of the dimensions (α = .65 paper-and-pencil version). On reflection, this is not surprising considering the elemental content of the Severity items: 1, 2 and 4. Item 1 measures *frequency* of any pain lasting more than a few minutes; item 2 measures *average level* of (any) pain; item 3 measures *greatest amount* of (any) pain. Over a period of three months, scores on these items could reasonably be expected to differ. It may also be that in utilising a telephone interview technique, structural properties of the measure as described by the scale developers resulted in part from a different interpretation by participants of the meaning of some items in the scale. Results also suggest the possibility that, for a chronic pain sample, the combination of items selected for use in the scale may not adequately address nor differentiate the constructs being measured. For completion, scale scores and reliability coefficients for Severity and Interference were calculated and reported, but were not utilised in other studies.

Instead, current findings suggested that a score for the dimension of Physical Burden be calculated. This dimension, and scoring process, varied from procedures outlined in the PCP:S manual (Ruehlman & Karoly, 2006). Specifically, raw score values for items 2 and 4 were mathematically recalculated (from range of 0 – 9, down to 0 – 6) to be consistent with the scale range of all other items. Initially, scores were recoded to facilitate accurate parallel analysis of data permutations with equal possible variance for all items. Scale scores for Physical Burden (and Severity), were calculated and used in analysis according to this procedure. Conceptual distinction was not apparent in raw data eigenvalues

generated in analysis. Future researchers, or clinicians choosing to use this scale as a screening instrument, should interpret findings with caution until further psychometric and structural properties of the scale are confirmed across different populations and modes of test administration.

Negative Problem Orientation Questionnaire

Negative problem orientation emerged as an internally reliable single construct measure for this chronic pain sample. Use of the scale and interpretation of the construct, defined as an individual's tendency to have a negative attitude towards problems, negative beliefs, or self-doubt about problem-solving ability, and a tendency to be pessimistic about outcomes (Robichaud & Dugas, 2005a), was supported.

Pain Catastrophizing Scale

The dimensions of Rumination, Magnification and Helplessness did not emerge through either parallel analysis or principal component analysis, until forced extraction was conducted. Even then, the loading of items in the pattern matrix showed variation to the factor structure reported for this scale. Two of the items clearly belonged on components other than those specified in previous research (Sullivan et al., 1995). These findings might be due in part to differences in word or phrasing emphases between Canadian, American, and Australian populations. For example, in this study, the item "I worry all the time about whether the pain will end" loaded on the Rumination dimension. On face value, alone, that finding made sense to this researcher, with the focus of this item pertaining to *worrying all the time*, thus describing ruminative thoughts.

However, if the emphasis instead had been placed on *whether* the pain would end, it may have formed part of the Helplessness dimension. Similarly, the item "There is nothing I can do to reduce the intensity of the pain", should have been part of the Helplessness dimension, with a focus on *there's nothing I can do*. Instead, for this sample, emphasis may have been given to *intensity of the pain* thus aligning instead with the Magnification construct. This was an interesting finding considering the widely cited and seemingly accepted soundness of the structural and psychometric properties of the measure.

Further, it is noteworthy that participants who provided data for use in the original PCS development (Sullivan et al., 1995) comprised undergraduate psychology students, not pain patients. Confirmatory factor analyses reported for the PCS measure utilised data from samples of undergraduate psychology students (Osman et al., 1997; Van Damme et al., 2002) and community samples (Osman et al., 2000), not pain populations. Findings from the current study suggest that the multidimensional model of catastrophizing ascertained in previous studies, using only those items included in the scale, may not apply in pain populations.

For this chronic pain sample, interpretation of scores for three separate constructs was not considered appropriate, and may have led to misinterpretation of findings in other studies. For completion, scores for all of the dimensions were calculated and reported, but only the full-scale score for the construct of Catastrophizing warranted inclusion and interpretation in other analyses. Generalization of these findings beyond the current sample is cautioned. More empirical studies are required across different pain populations to replicate these findings of a single dimension for catastrophizing using this measure.

Five Facet Mindfulness Questionnaire

All derived components were entirely consistent with those published by the scale developers. The component structure was clean, and each of the five facets of mindfulness was found to be an internally reliable measure across both paper and online modes of test administration. The FFMQ was subsequently used and interpreted in other studies.

Depression, Anxiety and Positive Outlook Scale

A component emerged as expected for Positive Outlook, however only one other component was indicated by parallel analysis for extraction, effectively combining all remaining items into a single interpretable component which was labelled Negative Affect. Although the additional derived subscales of Depression and Anxiety were shown to be internally reliable, they were not sufficiently discrete, empirically, for interpretation in subsequent analyses. This was not a particularly alarming nor surprising finding in terms of this research, considering the frequently reported comorbid experience of anxiety and depression in reported distress associated with chronic pain (Dersh et al., 2002; Gallagher, 2004; Von Korff & Simon, 1996). Moreover, in the original process of development and testing of DAPOS, it was noted that anxiety and depression may indeed be better conceptualised as a single entity of *distress* (Pincus et al., 2004).

In the current study, the derived dimension of Negative Affect may therefore be considered to more generally capture the essence of pain-related distress. Another issue of note was in relation to Item 11: "*I think about harming myself*" (scored as 1= Almost never, through 5= Almost all the time). This researcher received several telephone enquiries from participants seeking to

clarify the meaning of this statement. There was some confusion over whether the item related to the potential for physical injury due to their pain-related disabilities, or, whether it related to feeling suicidal. Indeed, the potential for misinterpretation was also noted by Pincus et al. (2004) following a study involving patients referred from osteopathic clinicians, whereby patients requested an explanation of this "*self harm*" item. It is not known what proportion of participants in the current study misconstrued the meaning of this item. It is the recommendation of this researcher that the wording of Item 11 be changed, so as to leave no doubt that the statement refers to suicidal ideation. For completion, scores for all of the (published) dimensions were calculated and reported, but only Positive Outlook and a scale score calculated for Negative Affect warranted inclusion and interpretation in other analyses.

Future researchers should consider and test these findings if seeking to interpret results separately for anxiety and depression. According to results in the present study, in a clinical sense, differentiation of pain-related affective distress into Depression and Anxiety should not be conducted when scoring this measure.

Summary

Overall, the decision to use parallel analysis to determine the number of components for extraction across each measure, revealed a range of structural and psychometric strengths, deficiencies, and inconsistencies. All findings should be interpreted with some degree of caution, until further assessment and construct validation is obtained in future pain research. Nevertheless, findings from this study were empirically robust for this sample of participants, providing reliable data for use in Study 2 (see below) which utilised combined responses from all measures in a mediation model exploring reported pain experience.

CHAPTER 6

Study 2

The purpose of this study was to explore the relationship between reported pain experience, dispositional cognitions, and affect. Pain experience over the previous *3 months* was measured according to scores derived from the PCP:S for Physical Burden and Emotional Burden. Cognitive tendencies including Negative Problem Orientation (NPO), Catastrophizing (PCS), and five facets of mindfulness (Observe, Describe, Act with Awareness, Non-Judgment, Non-Reactivity) were assessed as to their influence on Negative Affect and Positive Outlook. A series of hierarchical regression and path analyses were conducted. It was predicted that some or all mindfulness facets would explicitly mediate Positive Outlook. It was also predicted that Negative Problem Orientation and Catastrophizing would mediate levels of pain-related Negative Affect.

Results

Demographics

Participant data included for this study comprises a subset (N = 269) of complete and valid data across all measurement scales from Study 1. Participants were selected for inclusion according to whether data was available for all scales. That is, some participants were not included in the current study because they had already been eliminated from Study 1 for reasons such as missing data or multivariate outliers, in one or more of the measurement scales. Summary information about the participants included for this study is shown in Table 8. The average age was 40 years, with those who completed the paper version of the survey being older and having lived with chronic pain for more years, than those

who completed the survey online. The majority of participants were women (78.1%). Pain was the most significant health issue for 72.9% of participants. Almost half (49.4%) of the participants reported previous diagnosis of an emotional disorder. The Means and Standard Deviations of scale scores are presented in Table 9.

Table 8

Study 2: Means, Standard Deviations, Frequencies and Percentages for Demographic Variables (N = 269)

Variable	Paper	Web	Total
	M (SD)	*M (SD)*	*M (SD)*
Age	54.94 (13.66)**	34.77 (12.67)**	40.84 (15.93)
Pain Duration (Years)	16.61 (14.10)**	7.80 (7.39)**	10.46 (10.67)
Visits to Dr. (Past 3 Mths)	4.20 (6.35)	3.29 (4.37)	3.56 (5.04)

	Total	Percentage
Gender		
Male	59	21.9 %
Female	210	78.1 %
Pain Most Significant Health Issue	196	72.9 %
Prev. Diagnosis Depression/Anxiety/Stress	133	49.4 %
Occupation		
Employed (Full-Time)	72	26.8 %
Employed (Part-Time)	38	14.1 %
Student (Full-Time)	50	18.6 %
Student (Part-Time)	20	7.4 %
Retired	24	8.9 %
Home Duties	19	7.1 %
Unemployed	6	2.2 %
Disabled	40	14.9 %

Note. Significant difference found between group characteristics: ** $p<.01$.

Table 9

Study 2: Means and Standard Deviations of Scores for All Scales (N = 269)

Scale	Paper *(n = 81)* *M (SD)*	Web *(n = 188)* *M (SD)*	Total *M (SD)*
Profile of Chronic Pain: Screen			
Physical Burden	40.52 (12.84)**	29.97 (13.43)**	33.15 (14.09)
Severity	13.85 (1.88)**	12.40 (2.73)**	12.84 (2.59)
Interference	26.67 (11.65)**	17.57 (11.48)**	20.31 (12.24)
Emotional Burden	12.53 (6.56)	11.68 (6.36)	11.94 (6.42)
Negative Problem Orientation Questionnaire			
NPO	24.42 (10.04)	22.48 (9.42)	23.06 (9.63)
Pain Catastrophizing Scale			
Pain Catastrophizing	15.92 (11.42)	14.03 (10.36)	14.60 (10.71)
Rumination	5.87 (4.48)	4.97 (4.11)	5.25 (4.24)
Helplessness	7.10 (5.43)	6.05 (4.79)	6.36 (5.00)
Magnification	2.95 (2.49)	3.00 (2.56)	2.99 (2.53)
Five Facet Mindfulness Questionnaire			
Observe	28.14 (6.20)**	25.58 (5.53)**	26.35 (5.85)
Describe	24.85 (7.75)**	27.85 (6.05)**	26.95 (6.74)
Act with Awareness	26.20 (7.64)	26.82 (6.28)	26.63 (6.71)
Non-Judgement	29.31 (8.14)*	26.92 (7.08)*	27.64 (7.48)
Non-Reactivity	21.69 (5.14)	20.81 (4.55)	21.08 (4.74)
Depression, Anxiety, Positive Outlook Scale			
Negative Affect	14.90 (6.51)*	16.82 (6.44)*	16.24 (6.51)
Depression	8.96 (4.22)*	10.28 (4.52)*	9.88 (4.67)
Anxiety	5.94 (3.23)	6.54 (2.74)	6.36 (2.90)
Positive Outlook	10.90 (2.83)	11.01 (2.70)	10.98 (2.74)

Note. Significant difference found in mean scores: * $p<.05$; ** $p<.01$.

Bivariate Correlations

Pearson product-moment correlations were conducted on relevant demographic characteristics of participants to all variables. As shown in Table 10, Gender was not related to any of the variables used in this study except for a small (r = .13) but significant association with the mindfulness facet Observe, with men reporting higher scores. The only variable related to length of time (PAINYRS) living with chronic pain was Physical Burden of pain (r = .18). Age was not related to affect, but did show associations with Physical Burden of pain scores, and the mindfulness facets: Observe and Describe. That is, as age increased so too did the reported physical burden of pain, and observing scores (noticing, attending to body sensations, cognitions, emotions). However, an increase in age was associated with a decrease in describing (labelling or noting of observed phenomena with words).

The most salient demographic characteristic was whether the participants reported a previous diagnosis by a healthcare professional of depression, anxiety or stress related condition. This (self-reported) diagnosis showed significant positive associations with Physical and Emotional Burdens of pain, Negative Problem Orientation, Catastrophizing, and Negative Affect. A previous diagnosis was also related to lower scores for Positive Outlook, and for the mindfulness facets: acting with Awareness and Non-Reactivity to inner experience.

Table 10

Study 2: Pearson Product-Moment Correlations for Participant Demographic Characteristics to All Variables (N = 269)

	GENDER	PAINYRS	AGE	PREVIOUS DEP/ANX/STRESS
PHYSICAL	.001	.179**	.277**	.316**
SEVERITY	-.019	.180**	.205**	.257**
INTERF	.005	.168**	.275**	.309**
EMOTION	-.029	.045	.012	.355**
NPO	-.047	.009	.066	.258**
PCS	-.047	.052	.006	.235**
PCS_RUM	-.053	.041	.011	.158**
PCS_MAG	-.070	.022	-.078	.210**
PCS_HEL	-.021	.065	.044	.262**
AWARE	-.103	.058	.034	-.195**
DESCRIBE	.028	-.089	-.141*	.006
OBSERVE	.129*	.084	.158**	.001
NON_JUDGE	-.007	.050	.098	-.057
NON_REACT	.007	.085	.061	-.121*
N_AFFECT	-.042	.002	-.092	.248**
DEPRESS	-.068	.008	-.082	.182**
ANXIETY	.010	-.008	-.080	.277**
POS_OUTL	.068	-.039	-.077	-.225**

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

Pearson product-moment correlations were then conducted on all measurement scale variables. For visual clarity, findings for each scale are presented in separate Tables. As shown in Table 11, Physical Burden was significantly associated with most variables. Interestingly, it was not related to Negative Affect scores, nor to facets of mindfulness except for Aware, r = -.19 (p < .01). Emotional Burden was significantly related to all variables except for mindfulness facets: Describe and Non-Reactivity. For the NPOQ (see Table 12), Negative Problem Orientation had small to moderate significant associations with most other variables except for the mindfulness facet: Observe. For PCS (see Table 12), the dimensions of Rumination, Magnification and Helplessness had very high levels of association to full-scale Catastrophizing scores with r = .92, .83, .94 (p<.01), respectively. Catastrophizing was significantly related to all other variables except for mindfulness facets: Observe and Non-Reactivity. For FFMQ (see Table 13), Observe had the least number of significant associations of all the mindfulness dimensions with scores from other measurement scales. For DAPOS (see Table 14), a very high correlation was noted between Negative Affect and its subscale Depression, r = .93 (p < .01). Moderate significant correlations in the expected direction were found for Negative Affect and Positive Outlook with most other variables.

Table 11

Study 2: Bivariate Pearson Product-Moment Correlations for Dimensions of PCP:S to All Variables at Time 1 (N = 269)

		1	2	3	4
1	PHYSICAL	(α =.93)			
2	SEVERITY	.761**	(α=.75)		
3	INTERF	.991**	.665**	(α=.94)	
4	EMOTION	.607**	.452**	.603**	(α=.88)
5	NPO	.130*	.023	.145*	.353**
6	PCS	.403**	.338**	.393**	.609**
7	PCS_RUM	.317**	.295**	.303**	.504**
8	PCS_MAG	.214**	.158**	.212**	.461**
9	PCS_HEL	.486**	.394**	.476**	.641**
10	AWARE	-.188**	-.168**	-.181**	-.351**
11	DESCRIBE	-.061	.010	-.073	-.036
12	OBSERVE	.112	.124*	.102	.124*
13	N_JUDGE	.029	.029	.027	-.287**
14	N_REACT	.054	.064	.048	.018
15	N_AFFECT	.057	.009	.064	.358**
16	DEPRESS	.099	.015	.111	.359**
17	ANXIETY	-.025	-.003	-.028	.251**
18	POS_OUTL	-.131*	-.013	-.148*	-.298**

Note. Internal reliability coefficients in parentheses; α = Cronbach's Alpha. *p<.05, **p<.01.

Table 12

Study 2: Bivariate Pearson Product-Moment Correlations for Dimensions of NPOQ and PCS to All Variables at Time 1 (N = 269)

		1	2	3	4	5
1	NPO	(α=.95)				
2	PCS	.554**	(α=.94)			
3	PCS_RUM	.496**	.924**	(α=.90)		
4	PCS_MAG	.558**	.832**	.701**	(α=.88)	
5	PCS_HEL	.482**	.935**	.775**	.680**	(α=.71)
6	AWARE	-.578**	-.426**	-.363**	-.421**	-.391**
7	DESCRIBE	-.363**	-.269**	-.262**	-.249**	-.228**
8	OBSERVE	.050	-.002	.033	-.005	-.029
9	N_JUDGE	-.590**	-.403**	-.361**	-.419**	-.344**
10	N_REACT	-.203**	-.118	-.137*	-.094	-.088
11	N_AFFECT	.631**	.493**	.418**	.516**	.438**
12	DEPRESS	.639**	.493**	.411**	.490**	.460**
13	ANXIETY	.432**	.345**	.306**	.404**	.275**
14	POS_OUTL	-.478**	-.435**	-.352**	-.420**	-.421**
15	PHYSICAL	.130*	.403**	.317**	.214**	.486**
16	SEVERITY	.023	.338**	.295**	.158**	.394**
17	INTERF	.145*	.393**	.303**	.212**	.476**
18	EMOTION	.353**	.609**	.504**	.461**	.641**

Note. Internal reliability coefficients in parentheses; α = Cronbach's Alpha.
*p<.05, **p<.01.

Table 13

Study 2: Bivariate Pearson Product-Moment Correlations for Dimensions of FFMQ to All Variables at Time 1 (N = 269)

		1	2	3	4	5
1	AWARE	(α=.90)				
2	DESCRIBE	.344**	(α=.91)			
3	OBSERVE	-.075	.263**	(α=.80)		
4	N_JUDGE	.507**	.266**	-.144*	(α=.91)	
5	N_REACT	.047	.339**	.465**	.007	(α=.80)
6	N_AFFECT	-.494**	-.283**	-.018	-.605**	-.188**
7	DEPRESS	-.445**	-.275**	-.052	-.604**	-.185**
8	ANXIETY	-.423**	-.213**	.039	-.428**	-.137*
9	POS_OUTL	.349**	.350**	.251**	.292**	.335**
10	PHYSICAL	-.188**	-.061	.112	.029	.054
11	SEVERITY	-.168**	.010	.124*	.029	.064
12	INTERF	-.181**	-.073	.102	.027	.048
13	EMOTION	-.351**	-.036	.124*	-.287**	.018
14	NPO	-.578**	-.363**	.050	-.590**	-.203**
15	PCS	-.426**	-.269**	-.002	-.403**	-.118
16	PCS_RUM	-.363**	-.262**	.033	-.361**	-.137*
17	PCS_MAG	-.421**	-.249**	-.005	-.419**	-.094
18	PCS_HEL	-.391**	-.228**	-.029	-.344**	-.088

Note. Internal reliability coefficients in parentheses; α = Cronbach's Alpha.
*p<.05, **p<.01.

Table 14

Study 2: Bivariate Pearson Product-Moment Correlations for Dimensions of DAPOS with All Variables at Time 1 (N = 269)

		1	2	3	4
1	N_AFFECT	(α=.89)			
2	DEPRESS	.927**	(α=.88)		
3	ANXIETY	.816**	.540**	(α=.83)	
4	POS_OUTL	-.446**	-.488**	-.249**	(α=.81)
5	PHYSICAL	.057	.099	-.025	-.131*
6	SEVERITY	.009	.015	-.003	-.013
7	INTERF	.064	.111	-.028	-.148*
8	EMOTION	.358**	.359**	.251**	-.298**
9	NPO	.631**	.639**	.432**	-.478**
10	PCS	.493**	.493**	.345**	-.435**
11	PCS_RUM	.418**	.411**	.306**	-.352**
12	PCS_MAG	.516**	.490**	.404**	-.420**
13	PCS_HEL	.438**	.460**	.275**	-.421**
14	AWARE	-.494**	-.445**	-.423**	.349**
15	DESCRIBE	-.283**	-.275**	-.213**	.350**
16	OBSERVE	-.018	-.052	.039	.251**
17	N_JUDGE	-.605**	-.604**	-.428**	.292**
18	N_REACT	-.188**	-.185**	-.137*	.335**

Note. Internal reliability coefficients in parentheses; α = Cronbach's Alpha.
*p<.05, **p<.01.

Hierarchical Regressions

To examine the influence of pain and cognition on (a) Negative Affect and (b) Positive Outlook, two 3-step hierarchical regressions were conducted. Due to the potential for scores being influenced by pre-existing psychopathology (e.g., depression, anxiety), dichotomous responses from participants as to whether they had previously been diagnosed with like-medical conditions, was entered at Step 1 in both analyses to control for a possible confound. Pain scores were entered at Step 2, and all cognitive variables scores were entered on Step 3.

Variables predicting Negative Affect.

Results from the regression analysis of variables predicting Negative Affect are shown in Table 15. R^2 was significant after each stage:

Step 1: $R^2 = .06$, F (1, 266) = 17.48, $p < .001$;

Step 2: $R^2 = .19$, F (3, 264) = 21.16, $p < .001$ with $\Delta R^2 = .13$, $\Delta F = 21.64$;

Step 3: $R^2 = .54$, F (10, 257) = 30.01, $p < .001$ with $\Delta R^2 = .35$, $\Delta F = 27.44$.

After controlling for the influence of previous affective distress/disorder diagnoses, significant predictors of Negative Affect were Physical Burden, Negative Problem Orientation, Catastrophizing, and the mindfulness facet: Non-Judgement. The effect of Emotional Burden was no longer significant in regression after the addition of all cognitive variables in Step 3.

Table 15

Hierarchical Regression Analysis Summary for Variables Predicting Negative Affect (N =269)

Variable		*B*	*SE B*	*β*	Effect
Step 1					
	Previous Dep/Anx/Stress	3.23**	.77	.25	
Step 2					
	Previous Dep/Anx/Stress	2.20**	.78	.17	
	Physical Burden	-.13**	.03	-.28	
	Emotional Burden	.48**	.07	.47	
Step 3					
	Previous Dep/Anx/Stress	1.42*	.62	.11	
	Physical Burden	-.06*	.03	-.13	
	Emotional Burden	.11	.07	.11	
	NPO	.17**	.04	.25	
	PCS	.08*	.04	.14	
	Aware	-.09	.05	-.09	
	Describe	-.01	.05	-.01	
	Observe	-.05	.06	-.05	
	Non-judgement	-.28**	.05	-.32	
	Non-reactivity	-.10	.07	-.07	
					R^2 = .54
					Adj R^2 = .52
					$R = .73^{**}$

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

Variables predicting Positive Outlook.

Results from the regression analysis of variables predicting Positive Outlook are shown in Table 16. R^2 was significant after each step:

Step 1: $R^2 = .05$, F (1, 266) = 14.19, $p < .001$;

Step 2: $R^2 = .11$, F (3, 264) = 11.07, $p < .001$ with $\Delta R^2 = .06$, $\Delta F = 9.08$;

Step 3: $R^2 = .38$, F (10, 257) = 15.88, $p < .001$ with $\Delta R^2 = .27$, $\Delta F = 16.01$.

After controlling for the effect of previous affective distress/disorder diagnoses, significant predictors of Positive Outlook were Negative Problem Orientation, Catastrophizing, and mindfulness facets: Observe and Non-Reactivity. The effect of Emotional Burden was accounted for after the addition of the cognitive variables in Step 3.

Table 16

Hierarchical Regression Analysis Summary for Variables Predicting Positive Outlook (N =269)

Variable	*B*	*SE B*	*β*	Effect
Step 1				
Previous Dep/Anx/Stress	-1.23**	.33	-.23	
Step 2				
Previous Dep/Anx/Stress	-.81*	.34	-.15	
Physical Burden	.02	.01	.10	
Emotional Burden	-.13**	.03	-.31	
Step 3				
Previous Dep/Anx/Stress	-.40	.30	-.07	
Physical Burden	.01	.01	.05	
Emotional Burden	-.05	.03	-.11	
NPO	-.07**	.02	-.24	
PCS	-.04*	.02	-.16	
Aware	.03	.03	.07	
Describe	.04	.02	.10	
Observe	.09**	.03	.19	
Non-judgement	.01	.03	.02	
Non-reactivity	.08*	.03	.14	
				R^2 = .38
				Adj R^2 = .36
				$R = .62^{**}$

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

Path Analyses

To test for specific mediator effects of dispositional cognitions on the affective response to pain experience, a series of path analyses was conducted (N = 269). All possible paths that met the significance criteria required for testing mediation (Baron & Kenny, 1986) were examined, using pain dimensions (Physical Burden or Emotional Burden) as independent variables, and affect variables (Negative Affect or Positive Outlook) as dependent variables. Each of the cognitive dimensions (Negative Problem Orientation, Pain Catastrophizing, or the mindfulness facets: Aware, Describe, Observe, Non-Judgment, Non-Reactivity) was tested as a potential mediator in the regression equations. For brevity, only results from those found to mediate the relationship between pain and affect are detailed here.

Results showed that Pain Catastrophizing mediated the effect of Emotional Burden of pain on Negative Affect (see Figure 11). Catastrophizing also mediated the effect of Emotional Burden of pain on Positive Outlook (see Figure 12).

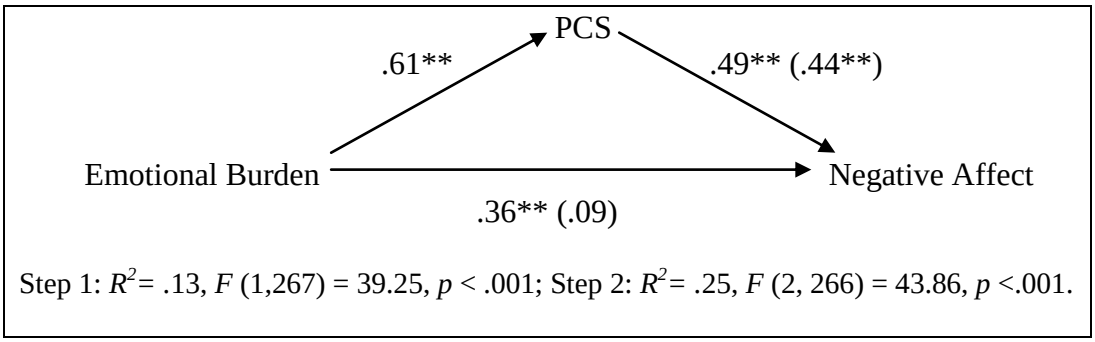


Figure 11: Mediation model between Emotional Burden and Negative Affect with Catastrophizing (PCS) as the mediator. Numbers in parentheses (on the paths) are the final beta weights generated from the tested model.

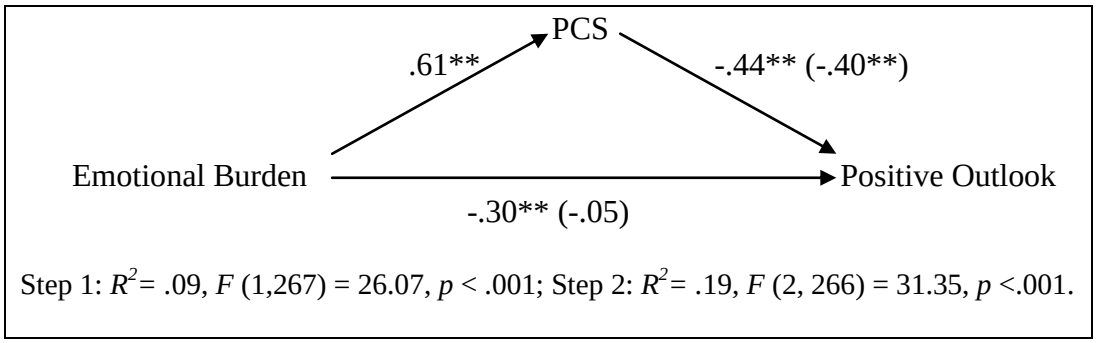


Figure 12: Mediation model of the relationship between Emotional Burden and Positive Outlook with Catastrophizing (PCS) as the mediator. Numbers in parentheses (on the paths) are the final beta weights generated from the tested model.

Statistically significant results were also shown for Negative Problem Orientation, Pain Catastrophizing, and mindful Awareness, each found to account for the influence of Physical Burden on Positive Outlook (see Figures 13,14,15).

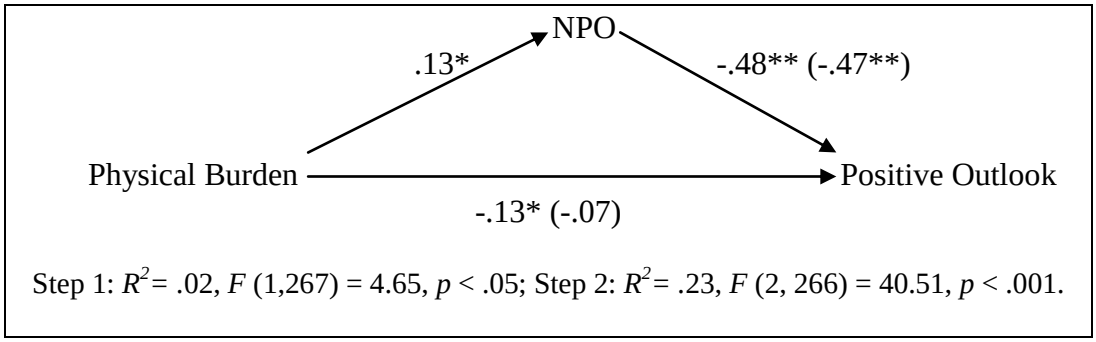


Figure 13: Mediation model of the relationship between Physical Burden and Positive Outlook with Negative Problem Orientation (NPO) as the mediator. Numbers in parentheses (on the paths) are the final beta weights generated from the tested model.

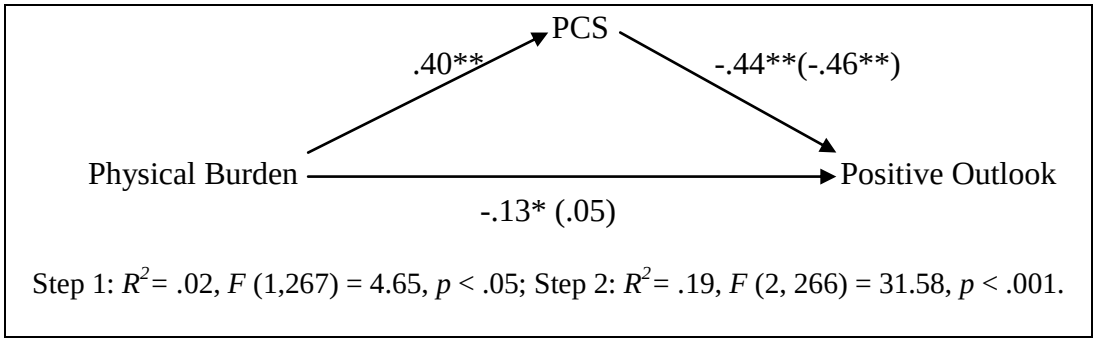


Figure 14: Mediation model of the relationship between Physical Burden and Positive Outlook with Catastrophizing (PCS) as the mediator. Numbers in parentheses (on the paths) are the final beta weights generated from the tested model.

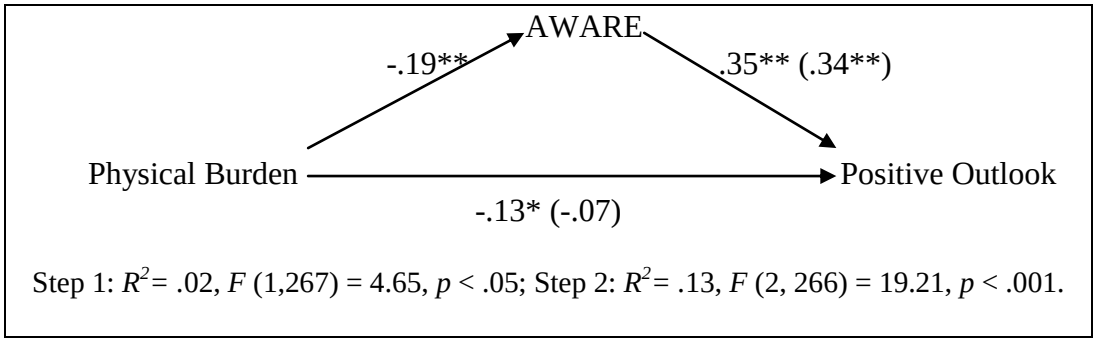


Figure 15: Mediation model of the relationship between Physical Burden and Positive Outlook with mindfulness facet: Aware as the mediator. Numbers in parentheses (on the paths) are the final beta weights generated from the tested model.

Discussion

Findings from this study confirmed that, for this chronic pain sample, some dispositional cognitions account for the influence of pain on affect. Of note were the results of path analyses showing Catastrophizing to be a particularly salient mediator in several maladaptive aspects of pain experience. Understandably, having an exaggerated negative orientation towards pain or anticipated pain, prevented having a Positive Outlook, over and above effects of the pain itself. Similarly, and consistent with an S-REF model of cognitive processing alluded to earlier (Fisher & Wells, 2009; Wells & Matthews, 1996), having Catastrophizing thoughts about pain, almost entirely accounted for the association of Emotional Burden and Negative Affect. In overall regressions, Negative Problem Orientation was also significant in predicting Negative Affect and (lower levels of) Positive Outlook. It also explained the negative impact of Physical Burden on Positive Outlook, comprehensively accounting for the association in much the same way as Catastrophizing. Together, these findings highlight the need for further studies to better appreciate the important contribution that cognition and metacognitions make to the overall pain experience, and the role they play in mediating significant emotional distress.

Conversely, present-moment mindful Awareness buffered the negative impact of Physical Burden of pain on having a Positive Outlook. This finding, together with results showing significant influence in regression (predicting Positive Outlook) by Observe and Non-Reactivity, suggests that a range of mindfulness skills may significantly contribute to resilience and adaptation in chronic pain experience. Training in mindfulness skills has been reported to

reduce affective distress (Carlson et al., 2004; Carlson et al., 2001; Delmonte, 1985; Kabat-Zinn et al., 1992; Miller et al., 1995), and findings from the current study would support use of such training specifically targeted to an individual's pain experience, so as to bolster positive adaptation.

CHAPTER 7

Study 3

The purpose of this study was to integrate and examine paticipants' reported experience of pain over *1 month* (4 weeks). Internal reliability analyses were again conducted on all measures. Test-retest correlations coefficients were calculated to estimate the temporal stability of constructs over 4 weeks. Further, the study sought to ascertain the influence of affective distress or positive outlook scores reported at Time 1, on pain reported at Time 2. It was predicted that Positive Outlook, acting as a source of resilience (Zautra, Johnson et al., 2005), would have a buffering effect on Physical and Emotional Burdens of pain reported at Time 2. Given the salience of previous emotional disorder diagnosis in regression (at Time 1), Negative Affect was expected to predict Emotional Burden of pain scores reported at Time 2. The mediating influence of cognition variables which met significance criteria for inclusion (Baron & Kenny, 1986), were tested across all appropriate paths in the model.

Further, the study conducted identical analyses to those at Time 1 (pain – cognition – affect model), to determine replicability of findings, but this time controlling for Time 1 affect scores (in lieu of previous emotional disorder diagnoses) as Step 1 in regressions. This was done to ascertain the ongoing influence of distress, or, positive adaptation, on reported levels of positive and negative affect over 4 weeks. Mediating cognitive variables were sought across all appropriately significant paths in the model (Baron & Kenny, 1986), and these were expected to be consistent with findings from Time 1. That is, NPO and PCS were expected to account for the influence of Physical Burden on Positive Outlook. PCS was also expected to explain the associations between Emotional

Burden of pain and affect (Negative Affect and Positive Outlook). The mindfulness facet: Aware, was expected to buffer the negative effect of Physical Burden of pain on Positive Outlook. A series of path analyses and hierarchical regression were therefore conducted.

Results

Survey data was received from 140 participants (68 Web, 72 Paper) who volunteered for this follow-up study conducted 4 weeks after initial survey completion. Scores for all scales are summarized in Table 17. Pearson product-moment correlations and internal reliability analyses were conducted on all variables. For visual clarity, findings for each scale are presented in separate Tables (18-21, see below).

Table 17

Study 3: Means and Standard Deviations of Scores for All Scales (N = 140)

Scale	Dimension	*M (SD)*
Profile of Chronic Pain: Screen		
	Physical Burden	34.38 (14.53)
	Severity	12.60 (2.77)
	Interference	21.78 (12.52)
	Emotional Burden	11.39 (6.83)
Negative Problem Orientation Questionnaire		
	NPO	22.89 (8.82)
Pain Catastrophizing Scale		
	Pain Catastrophizing	12.72 (9.94)
	Rumination	4.15 (3.90)
	Helplessness	6.09 (5.08)
	Magnification	2.48 (2.16)
Five Facet Mindfulness Questionnaire		
	Observe	26.85 (6.35)
	Describe	26.67 (7.47)
	Act with Awareness	27.29 (6.06)
	Non-Judgement	29.95 (7.02)
	Non-Reactivity	21.46 (4.82)
Depression, Anxiety, Positive Outlook Scale		
	Negative Affect	15.01 (5.81)
	Depression	9.25 (4.18)
	Anxiety	5.76 (2.56)
	Positive Outlook	10.79 (2.78)

Table 18

Bivariate Pearson Product-Moment Correlations for Dimensions of PCP:S to All Variables at Time 2 (N = 140)

		1	2	3	4
1	PHYSICAL	(α=.93)			
2	SEVER	.773**	(α=.77)		
3	INTERF	.990**	.676**	(α=.94)	
4	EMOTION	.607**	.482**	.599**	(α=.88)
5	NPO	.188*	.100	.197*	.478**
6	PCS	.319**	.249**	.315**	.502**
7	PCS_RUM	.260**	.175*	.263**	.445**
8	PCS_MAG	.120	.108	.116	.359**
9	PCS_HEL	.374**	.307**	.366**	.488**
10	OBSERVE	.110	-.023	.133	-.052
11	DESCRIBE	-.198*	-.184*	-.189*	-.173*
12	AWARE	-.129	-.143	-.119	-.242**
13	N_JUDGE	.114	.063	.118	-.110
14	N_REACT	.013	-.033	.022	-.164
15	N_AFFECT	.096	.108	.087	.488**
16	DEPRESS	.116	.118	.108	.470**
17	ANXIETY	.028	.053	.021	.337**
18	POS_OUTL	-.181*	-.082	-.192*	-.383**

Note. Internal reliability coefficients in parentheses; α = Cronbach's Alpha. *p<.05, **p<.01.

Table 19

Bivariate Pearson Product-Moment Correlations for Dimensions of NPOQ and PCS to All Variables at Time 2 (N = 140)

		1	2	3	4	5
1	NPO	(α=.92)				
2	PCS	.561**	(α=.93)			
3	PCS_RUM	.471**	.909**	(α=.91)		
4	PCS_MAG	.563**	.787**	.671**	(α=.63)	
5	PCS_HEL	.497**	.925**	.726**	.599**	(α=.89)
6	OBSERVE	.027	.073	.114	.040	.039
7	DESCRIBE	-.271**	-.208*	-.172*	-.226**	-.179*
8	AWARE	-.435**	-.207*	-.183*	-.212*	-.174*
9	N_JUDGE	-.444**	-.281**	-.250**	-.334**	-.216*
10	N_REACT	-.298**	-.195*	-.140	-.226**	-.179*
11	N_AFFECT	.621**	.377**	.316**	.422**	.315**
12	DEPRESS	.596**	.396**	.329**	.397**	.354**
13	ANXIETY	.434**	.206*	.179*	.308**	.135
14	POS_OUTL	-.462**	-.439**	-.387**	-.354**	-.412**
15	PHYSICAL	.188*	.319**	.260**	.120	.374**
16	SEVER	.100	.249**	.175*	.108	.307**
17	INTERF	.197*	.315**	.263**	.116	.366**
18	EMOTION	.478**	.502**	.445**	.359**	.488**

Note. Internal reliability coefficients in parentheses; α = Cronbach's Alpha.
*p<.05, **p<.01.

Table 20

Bivariate Pearson Product-Moment Correlations for Dimensions of FFMQ to All Variables at Time 2 (N = 140)

		1	2	3	4	5
1	OBSERVE	(α=.82)				
2	DESCRIBE	.206*	(α=.92)			
3	AWARE	-.005	.378**	(α=.87)		
4	N_JUDGE	.073	.134	.277**	(α=.91)	
5	N_REACT	.279**	.203*	.237**	.161	(α=.82)
6	N_AFFECT	-.025	-.166*	-.270**	-.488**	-.269**
7	DEPRESS	-.085	-.118	-.224**	-.511**	-.201*
8	ANXIETY	.083	-.184*	-.245**	-.271**	-.281**
9	POS_OUTL	.089	.260**	.278**	.283**	.241**
10	PHYSICAL	.110	-.198*	-.129	.114	.013
11	SEVER	-.023	-.184*	-.143	.063	-.033
12	INTERF	.133	-.189*	-.119	.118	.022
13	EMOTION	-.052	-.173*	-.242**	-.110	-.164
14	NPO	.027	-.271**	-.435**	-.444**	-.298**
15	PCS	.073	-.208*	-.207*	-.281**	-.195*
16	PCS_RUM	.114	-.172*	-.183*	-.250**	-.140
17	PCS_MAG	.040	-.226**	-.212*	-.334**	-.226**
18	PCS_HEL	.039	-.179*	-.174*	-.216*	-.179*

Note. Internal reliability coefficients in parentheses; α = Cronbach's Alpha.
*p<.05, **p<.01.

Table 21

Bivariate Pearson Product-Moment Correlations for Dimensions of DAPOS to All Variables at Time 2 (N = 140)

		1	2	3	4
1	N_AFFECT	(α=.85)			
2	DEPRESS	.919**	(α=.85)		
3	ANXIETY	.765**	.449**	(α=.79)	
4	POS_OUTL	-.464**	-.503**	-.231**	(α=.79)
5	PHYSICAL	.096	.116	.028	-.181*
6	SEVER	.108	.118	.053	-.082
7	INTERF	.087	.108	.021	-.192*
8	EMOTION	.488**	.470**	.337**	-.383**
9	NPO	.621**	.596**	.434**	-.462**
10	PCS	.377**	.396**	.206*	-.439**
11	PCS_RUM	.316**	.329**	.179*	-.387**
12	PCS_MAG	.422**	.397**	.308**	-.354**
13	PCS_HEL	.315**	.354**	.135	-.412**
14	OBSERVE	-.025	-.085	.083	.089
15	DESCRIBE	-.166*	-.118	-.184*	.260**
16	AWARE	-.270**	-.224**	-.245**	.278**
17	N_JUDGE	-.488**	-.511**	-.271**	.283**
18	N_REACT	-.269**	-.201*	-.281**	.241**

Note. Internal reliability coefficients in parentheses; α = Cronbach's Alpha.
*p<.05, **p<.01.

Survey responses for each scale at Time 1 were then matched by unique participant user code, with responses provided at Time 2. As shown in Table 22, most variables had moderate to high test-retest correlation coefficients ranging from .48 (Severity) to .88 (Describe).

Table 22

Test-Retest (4 Weeks) Correlation Coefficients for All Scales

Scale	Dimension	*n*	*r*
PCP:S	Physical Burden	91	.83
	Severity	91	.48
	Interference	91	.84
	Emotional Burden	91	.65
NPO	Negative Problem Orientation	84	.78
PCS	Pain Catastrophizing	92	.71
	Rumination	92	.62
	Magnification	92	.65
	Helplessness	92	.71
FFMQ	Observe	89	.79
	Describe	89	.88
	Aware	89	.84
	Non-Judgment	89	.76
	Non-Reactivity	89	.59
DAPOS	Negative Affect	100	.83
	Depression	100	.85
	Anxiety	100	.77
	Positive Outlook	100	.77

Path Analyses (a)

A series of path analyses was first conducted to test whether dispositional cognitions mediated the effect of Negative Affect or Positive Outlook at Time 1, on reported pain experience (Physical Burden or Emotional Burden) at Time 2. All possible paths that met the criteria required for testing mediation (Baron & Kenny, 1986) were examined, this time using affect scores at Time 1 as independent variables, and pain scores (Physical Burden or Emotional Burden, at Time 2) as dependent variables. Each of the cognitive dimensions (Negative Problem Orientation, Pain Catastrophizing, or the mindfulness facets: Aware, Describe, Observe, Non-Judgment, Non-Reactivity) was tested as a potential mediator in the regression equations. For brevity, only results from those found to mediate the effect over time (4 weeks) of affect on pain are detailed here, utilising a matched (by user code) sample of 100 participants.

Results showed that Negative Problem Orientation explained the influence of Negative Affect (Time 1) on Emotional Burden of pain (at Time 2; see Figure 16). Negative Problem Orientation also mediated the effect of Positive Outlook (Time 1) on Emotional Burden of pain (Time 2; see Figure 17).

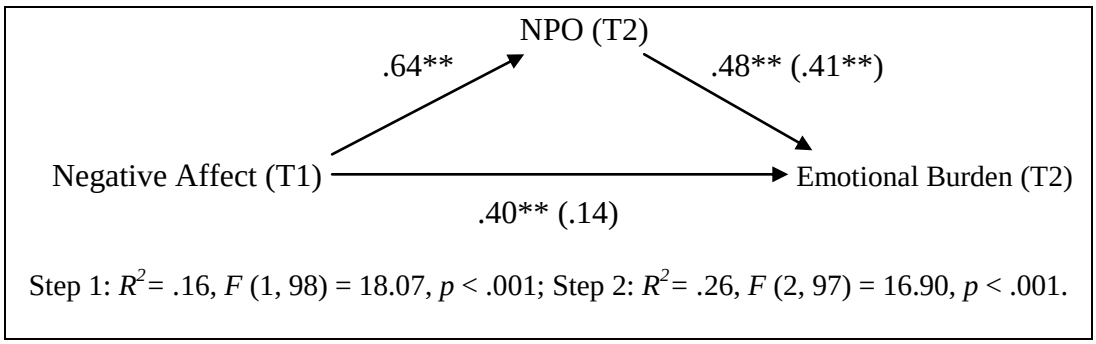


Figure 16: Mediation model of the relationship between Negative Affect (at Time 1) and Emotional Burden of pain (at Time 2) with Negative Problem Orientation (NPO) as the mediator. Numbers in parentheses (on the paths) are the final beta weights from the tested model.

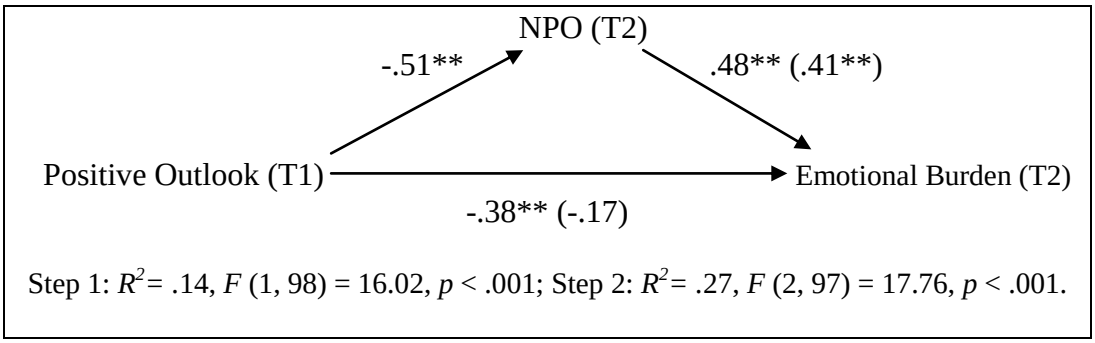


Figure 17: Mediation model of the relationship between Positive Outlook (at Time 1) and Emotional Burden of pain (at Time 2) with Negative Problem Orientation (NPO) as the mediator. Numbers in parentheses (on the paths) are the final beta weights from the tested model.

Hierarchical Regressions

In a replication of Study 2, two 3-step hierarchical regressions were conducted on variables predicting (a) Negative Affect or (b) Positive Outlook. This time, scores for Negative Affect and Positive Outlook from Time 1 were controlled for at Step 1 in both analyses (in lieu of dichotomous Previous Diagnosis variable used in Study 2, shown to be a salient predictor). A sample of 100 participants, matched by unique user code, was included in analyses. With a large effect size anticipated, the sample size was considered adequate (Tabachnick & Fidell, 2001) to proceed with regression analysis.

Variables predicting Negative Affect.

Results from the regression analysis of variables predicting Negative Affect are shown in Table 23. As indicated, R^2 was significant after each stage:

Step 1: R^2= .71, F (2, 97) = 116.60, p < .001;

Step 2: R^2= .73, F (4, 95) = 63.50, p < .001 with ΔR^2 = .02, ΔF = 3.76;

Step 3: R^2 = .75, F (11, 88) = 24.53, p < .001 with ΔR^2 = .03, ΔF = 1.34.

After controlling for affect scores (at Time 1), the only other significant predictor of Negative Affect was Negative Problem Orientation.

Variables predicting Positive Outlook.

Results from the regression analysis of variables predicting Positive Outlook are shown in Table 24. As indicated, R^2 was significant after each stage:

Step 1: R^2 = .60, F (2, 97) = 73.57, p < .001;

Step 2: R^2 = .61, F (4, 95) = 37.00, p < .001 with ΔR^2 = .01, ΔF = .78;

Step 3: R^2 = .66, F (11, 88) = 15.39, p < .001 with ΔR^2 = .05, ΔF = 1.80.

After controlling for affect scores (at Time 1), the only other significant predictor of Positive Outlook was the mindfulness facet: Non-Reactivity (to inner experience).

Table 23

Hierarchical Regression Analysis Summary for Variables Predicting Negative Affect at Time 2 (n =100)

Variable	*B*	*SE B*	*β*	Effect
Step 1				
Neg. Affect (Time 1)	.72**	.06	.76	
Pos. Outlook (Time 1)	-.32*	.14	-.14	
Step 2				
Neg. Affect (Time 1)	.67**	.06	.71	
Pos. Outlook (Time 1)	-.22	.14	-.10	
Physical Burden	-.03	.03	-.07	
Emotional Burden	.18	.07	.21	
Step 2				
Neg. Affect (Time 1)	.61**	.08	.65	
Pos. Outlook (Time 1)	-.19	.15	-.08	
Physical Burden	-.02	.03	-.04	
Emotional Burden	.14	.07	.16	
NPO	.11*	.06	.17	
PCS	-.05	.04	-.08	
Aware	-.01	.06	-.02	
Describe	.09	.05	.12	
Observe	-.02	.06	-.03	
Non-judgement	-.03	.06	-.04	
Non-reactivity	-.05	.08	-.04	
				R^2 = .75
				Adj R^2 = .72
				R = .87**

Note. R^2= .71 for Step 1 (p<.01); ΔR^2= .02 for Step 2 (p<.05); ΔR^2= .03 for Step 3 (*ns*). *p<.05, **p<.01.

Table 24

Hierarchical Regression Analysis Summary for Variables Predicting Positive Outlook at Time 2 (n =100)

Variable	*B*	*SE B*	*β*	Effect
Step 1				
Neg. Affect (Time 1)	-.07*	.03	-.15	
Pos. Outlook (Time 1)	.74**	.08	.70	
Step 2				
Neg. Affect (Time 1)	-.06	.03	-.14	
Pos. Outlook (Time 1)	.73**	.08	.68	
Physical Burden	-.01	.02	-.06	
Emotional Burden	-.01	.04	-.03	
Step 2				
Neg. Affect (Time 1)	-.01	.04	-.02	
Pos. Outlook (Time 1)	.75**	.09	.71	
Physical Burden	-.02	.02	-.10	
Emotional Burden	.00	.04	.00	
NPO	.04	.03	.14	
PCS	-.04	.02	-.14	
Aware	-.00	.03	-.01	
Describe	.00	.03	.01	
Observe	-.01	.03	-.02	
Non-judgement	.06	.03	.16	
Non-reactivity	.10*	.04	.17	
				R^2 = .66
				Adj R^2 = .62
				R = .81**

Note. R^2= .60 for Step 1 (p<.01); ΔR^2= .01 for Step 2 (*ns*); ΔR^2= .05 for Step 3 (*ns*).
*p<.05, **p<.01.

Path Analyses (b)

As the cognition variables were found not to exert any appreciable collective influence in regressions controlling for affect at Time 1 (despite showing several moderate bivariate correlations with each dependant variable), a series of path analyses was additionally conducted (N =140). This replicated the procedure undertaken in Study 2, to test for specific mediator effects of dispositional cognitions on the affective response to pain experience. Several reductions in pain–affect associations were noted, however most were not significant. Only statistically significant findings are illustrated below (see Figures 18,19,20). As shown, the effect of Physical Burden of pain on Positive Outlook was mediated by three of the cognitive variables: Negative Problem Orientation (NPO), Catastrophizing (PCS), and the mindfulness facet Describe. The findings for NPO and PCS are consistent with results from Study 2, both previously found to account for the effect. In the current study, a different mindfulness facet – Describe – mediated the relationship whereas Aware (mediator in Study 2) did not. Moreover, no mediator was found to account for the influence of Emotional Burden on either Negative Affect or Positive Outlook.

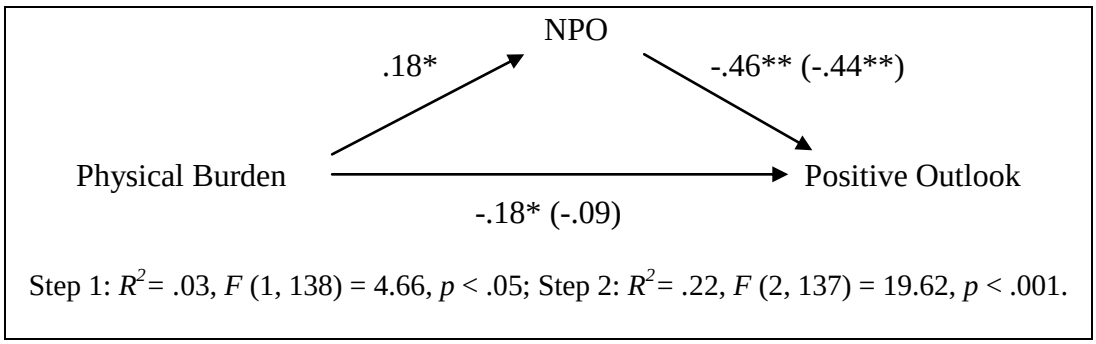


Figure 18: Mediation model of the relationship between Physical Burden of pain and Positive Outlook with Negative Problem Orientation (NPO) as the mediator. Numbers in parentheses (on the paths) are the final beta weights generated from the tested model.

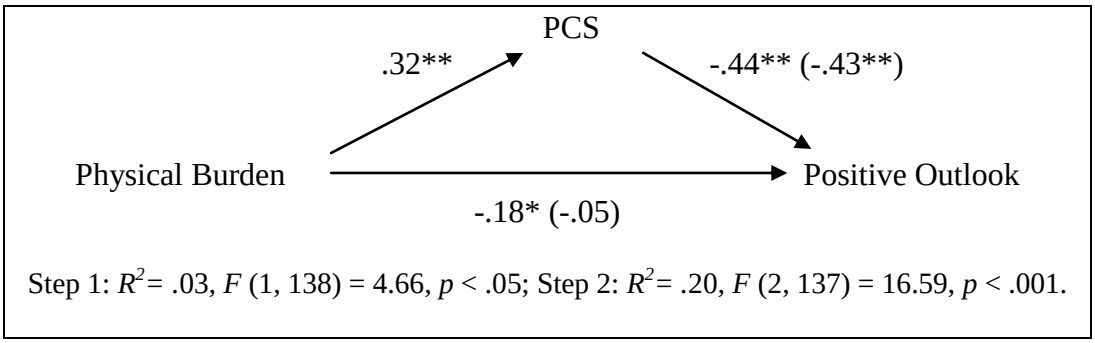


Figure 19: Mediation model of the relationship between Physical Burden of pain and Positive Outlook with Catastrophizing (PCS) as the mediator. Numbers in parentheses (on the paths) are the final beta weights generated from the tested model.

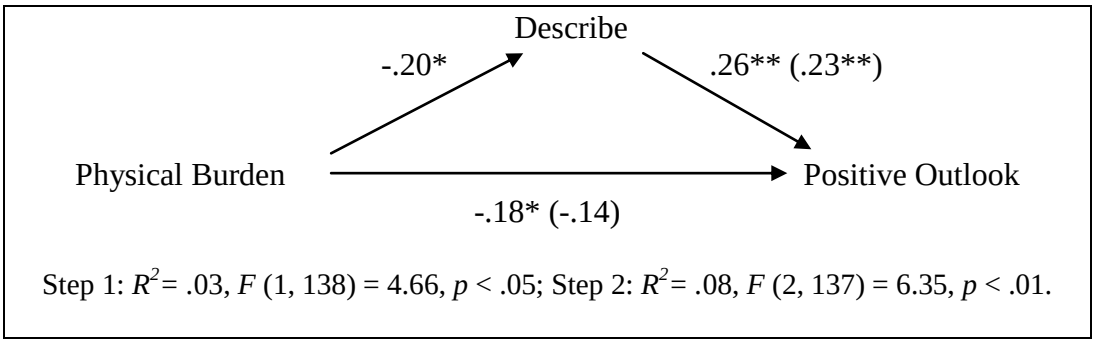


Figure 20: Mediation model of the relationship between Physical Burden of pain and Positive Outlook with mindfulness facet: Describe as the mediator. Numbers in parentheses (on the paths) are the final beta weights generated from the tested model.

Discussion

Findings from this study suggest several things. First, the test-retest correlation coefficients indicate temporal stability of the constructs (4 weeks). The lowest association was found for pain scores measuring Severity (r = .48) which, arguably, reflects the variable nature of nociceptive intensity over time in pain disorders, and further supports the decision made in the current research not to interpret scores on that dimension seperately, but rather as part of an overarching construct of Physical Burden (r = .83). All measures were again found to be internally reliable. The best predictor over time of pain-related affective distress, or, positive outlook, was shown to be previous reported affect scores. This finding suggests that, over and above the actual burdens of pain and pain-related thoughts, how an individual feels emotionally (negative or positive) most significantly influences how they continue to feel over time. Treatment for affective distress disorders is indicated in this finding, together with facilitating and nurturing positive outlook and adaptation. Results of path analyses suggest that dispositional cognitions, specifically Negative Problem Orientation, Catastrophizing, and, to a lesser extent, Describing (or noting observed phenomena with words), are each salient constructs predictive of the overall experience of chronic pain. In particular, results for NPO suggest that the experience of pain and pain-related affective distress is worsened, consistent with S-REF model of emotional disorder (Fisher & Wells, 2009; Wells & Matthews, 1996), in chronic pain sufferers who have negative attitudes, beliefs or self-doubt towards solving problems, or who are pessimistic about outcomes. Previous research findings as to the established association between NPO and emotional distress in clinical populations (D'Zurilla & Nezu, 1999; Robichaud & Dugas,

2005a), have been supported in the current study of a chronic pain sample. Further, NPO completely accounted for any buffering influence that Positive Outlook had on Emotional Burden of pain over time, suggesting that NPO is indeed a dysfunctional and deleterious cognition. The implications of this finding are that therapies such as metacognitive therapy (Fisher & Wells, 2009) or variants of mindfulness-based cognitive therapy (Teasdale et al., 1995; Teasdale et al., 2003), should be considered with a view to lessening the emotional burden and experiential distress associated with chronic pain, rather than simply treating the emotional upset in isolation. Longitudinal clinical studies are necessary to examine and ascertain the significance of any improved outcomes.

Catastrophizing and the mindfulness facet: Describe, were also shown to account for the influence of Physical Burden on Positive Outlook, but in different ways. First, having an exaggerated negative orientation towards actual or anticipated pain experience predicts that an individual will not have a positive outlook, over and above the actual burden of pain. Conversely, describing in words what is being experienced in the present moment may buffer the physical effects of pain which might otherwise prevent an individual from having a positive outlook. In that regard, training in mindfulness skills targeted to specific descriptors of pain experience may foster more effective coping and adaptation to living with chronic pain. Additional research examining these and other associations of cognition, pain and affect are required across other pain populations.

CHAPTER 8

Conclusions

Strengths and Limitations of the Research

This research examined chronic pain from a biopsychosocial perspective. This approach is firmly grounded in current theory (gate-control and neuromatrix theories on pain) and thus enabled a more comprehensive identification and analysis of relevant factors associated with a multidimensional pain experience. Study 2 was, however, a single-point-in-time cross-sectional design and which precluded any causal inference of relationships between variables. Despite utilising a mediation model, there were many alternative or other path models which were not tested. This limitation was somewhat addressed in Study 3 (in part, a replication of Study 2) whereby a comparison of scores across time and additional path analyses were additionally conducted, enabling an assessment of the influence of affective factors (at Time 1), on reported pain experience (at Time 2).

Further, the research relied solely on self-report data from participants, which may have introduced bias (e.g., social desirability) into results. However, self-report measures are considered the gold standard in pain assessment, due to the inherently subjective nature of pain experience. Participants were also assured, in writing, of confidentiality of their individual data, thereby decreasing the likelihood of overly favourable (or unfavourable) reporting of aspects of their particular pain experience.

Another limitation of the research was that pre-existing clinical psychopathology of individual participants (for example, diagnoses of clinical

depression, generalized anxiety disorder, personality disorders) was not ascertained from independent sources or medical practitioners. It is possible that mental health disorders existing prior to development of a chronic pain disorder, may have confounded reported levels of pain and pain-related distress reported in the study. Whilst it is more likely that pain precedes development of chronic affective distress, and also that comorbid psychological problems may be indicated more often than not in cross-sectional analysis, a general question was included with demographic data as to whether the participant had ever been diagnosed with, or received treatment for, depression and/or anxiety. This served as a control for the potential confound in reported levels of affective distress reported for each individual in Study 2.

Some of the measurement scales used in this research were relatively new, and were in need of further exploratory assessment and analysis as to their factor structure and psychometric utility for use in a diverse chronic pain population. Further, all scales were offered in either paper-and-pencil or web-based formats thereby enabling a comparison of scores across alternative modes of test administration.

Obtaining a convenience sample of participants reporting wide-ranging pain experiences resulted in a heterogenous chronic pain sample. This limits direct comparison or generalizability of empirical findings to most previous studies pertaining to a singular specific medical condition. Conversely, the focus of this research was on *pain*, as the disorder in its own right, which more comprehensively acknowledged a biopsychosocial perspective on chronic pain.

Contribution to the field of chronic pain research

This research has provided empirical support to the mediating role of dysfunctional *and* adaptive cognitions in chronic pain experience – no previous study had investigated the relationship between the combination of constructs measured in these studies. There were comparatively few previous studies which had empirically assessed factors involved in positive adaptation to chronic pain, despite a mounting body of literature asserting the contribution of mindfulness and positive affect in successful adaptation to pain. For example, the mediating role of mindfulness in fostering resilience was not, prior to conducting this research, conclusively nor empirically established. The current study has provided insight to the contribution of some mindfulness facets in bolstering successful adaptation to living with chronic pain.

Moreover, dispositional cognitions had received much less empirical attention (than sensory and affective factors), and there was a need to better understand their specific role in chronic pain. For example, Negative Problem Orientation was acknowledged as a major factor in clinical depression, but little was known about its contribution to, or association with, pain experience. The current research has now identified this construct as a meaningful and salient cognitive contributor to emotional burden and affective distress associated with chronic pain.

Catastrophizing was well recognized as a contributing factor to pain-related distress, but it was unclear as to the relative or unique contribution of each metacognitive-type facet (i.e., Rumination, Magnification, Helplessness) to pain experience. Interestingly, discrete catastrophizing dimensions did not emerge in this study, which raises some doubt as to the discriminant and clinical utility of

the measure's separate dimensions in Australian chronic pain populations. However, Catastrophizing was found to have significant influence in reported pain experience for this chronic pain sample, thereby highlighting the need for additional exploratory and confirmatory investigation of the construct in future pain research.

Summary

Exploratory analyses conducted on the measurement scales used in this research have revealed structural and psychometric strengths and deficiencies, all requiring further assessment and validation in future pain research. Overall, findings from this research have further elucidated the interrelationships of biopsychosocial aspects of chronic pain, raised new questions for research, highlighted clinical considerations, and contributed new insight to all of the abovementioned areas. In particular, it has been consistently shown that a range of dispositional cognitions play an important role in mediating the relationship between pain and affect.

CHAPTER 9

References

Ackerman, M. D., & Stevens, M. J. (1989). Acute and chronic pain: pain dimensions and psychological status. *Journal of Clinical Psychology, 45*(2), 223-228.

Australian Bureau of Statistics. (2004). *Musculoskeletal conditions in Australia: a snapshot*. Retrieved July 17, 2005, from http://www.abs.gov.au/Ausstats/abs@.nsf

Australian Bureau of Statistics. (2005). *Year Book Australia: Health status*. Retrieved July 19, 2005, from http://www.abs.gov.au/Ausstats/abs@.nsf

Australian Pain Society. (2002). *Position statement: The role of the psychologist in the management of persistent pain*. Retrieved October 10, 2005, from http://www.apsoc.org.au/pdfs/PsychPosition.pdf

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10*(2), 125-143.

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report. *Assessment, 11*(3), 191-206.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*, 27-45.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Arch Gen Psychiatry, 4*(1961), 561-571.

Borrell-Carrio, F., Suchman, A. L., & Epstein, R. M. (2004). The biopsychosocial model 25 years later: Principles, practice, and scientific enquiry. *Annals of Family Medicine, 2*(6), 576-582.

Bradley, L. A. (1996). Cognitive-behavioral therapy for chronic pain. In R. J. Gatchel & D. C. Turk (Eds.), *Psychological Approaches to Pain Management* (pp. 131-147). New York: The Guilford Press.

Brooks, J., & Tracey, I. (2005). From nociception to pain perception: imaging the spinal and supraspinal pathways. *Journal of Anatomy, 207*(2005), 19-33.

Brown, B. T., Bonello, R., & Pollard, H. (2005). The biopsychosocial model and hypothyroidism. *Chiropractic and Osteopathy, 15*(3).

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*(4), 822-848.

Buchheld, N., Grossman, P., & Walach, H. (2001). Measuring mindfulness in insight meditation (Vipassana) and meditation-based psychotherapy: The development of the Freiburg Mindfulness Inventory (FMI). *Journal for Meditation and Meditation Research, 1*(2001), 11-34.

Cano, A. (2004). Pain catastrophizing and social support in married individuals with chronic pain: the moderating role of pain duration. *Pain, 110*(2004), 656-664.

Carlson, L. E., Speca, M., Patel, K. D., & Goodey, E. (2004). Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, dehydroepiandrosterone sulfate (DHEAS) and melatonin in breast and prostate cancer outpatients. *Psychoneuroendocrinology, 29*(4), 448-474.

Carlson, L. E., Ursuliak, Z., Goodey, E., Angen, M., & Speca, M. (2001). The effects of mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients: 6-month follow-up. *Support Care Cancer, 9*(2), 112-123.

Casten, R. J., Parmelee, P. A., Kleban, M. H., Lawton, M. P., & Katz, I. R. (1995). The relationship among anxiety, depression, and pain in a geriatric institutionalized sample. *Pain, 61*(1995), 271-276.

Delmonte, M. M. (1985). Meditation and anxiety reduction: A literature review. *Clinical Psychology Review, 5*(1985), 91-102.

Dersh, J., Polatin, P. B., & Gatchel, R. J. (2002). Chronic pain and psychopathology: Research findings and theoretical considerations. *Psychosomatic Medicine, 64*(2002), 773-786.

Duncan, G. (2000). Mind-body dualism and the biopsychosocial model of pain: What did Descartes really say? *Journal of Medicine and Philosophy, 25*(4), 485-513.

D'Zurilla, T. J., & Nezu, A. M. (1999). *Problem-solving therapy: a social competence approach to clinical intervention* (2nd ed.). New York, NY: Springer.

Edwards, R. R., Haythornthwaite, J. A., Sullivan, M. J., & Fillingim, R. B. (2004). Catastrophizing as a mediator of sex differences in pain: differential effects for daily pain versus laboratory-induced pain. *Pain, 111*(2004), 335-341.

Engel, G. L. (1977). The need for a new medical model: A challenge for biomedicine. *Science, 196*(4286), 129-136.

European Federation of IASP Chapters. (2004). *About Pain*. Retrieved September 27, 2005, from http://www.efic.org/about_pain.htm

European Federation of IASP Chapters. (n.d.). *Unrelieved pain is a major global healthcare problem*. Retrieved September 1, 2005, from http://www.efic.org

Fernandez, E. (2002). *Anxiety, depression, and anger in pain*. Dallas, Texas: Advanced Psychological Resources, Inc.

Fisher, P., & Wells, A. (2009). *Metacognitive therapy*. East Sussex: Routledge.

Gagliese, L., & Melzack, R. (1997). Chronic pain in elderly people. *Pain, 70*(1997), 3-14.

Gallagher, R. M. (2004). Biopsychosocial pain medicine: Integrating psychiatric and behavioral therapies into medical treatment. *Seminars in Neurosurgery, 15*(1), 31-46.

Gatchel, R. J. (1996). Psychological disorders and chronic pain: Cause-and-effect relationships. In R. J. Gatchel & D. C. Turk (Eds.), *Psychological approaches to pain management: a practitioner's handbook* (pp. 33-52). New York: The Guilford Press.

Gatchel, R. J. (2004). Comorbidity of chronic pain and mental health disorders: The biopsychosocial perspective. *American Psychologist, Nov*(2004), 795-805.

Gatchel, R. J. (2005). *Clinical essentials of pain management*. Washington, DC: American Psychological Association.

Gibson, S. J., & Helme, R. D. (2000). Cognitive factors and the experience of pain and suffering in older persons. *Pain, 85*(2000), 375-383.

Gorsuch, R. L. (1983). *Factor Analysis* (2nd ed.). New Jersey: Lawrence Erlbaum Associates Inc.

Gosselin, P., Pelletier, O., & Ladouceur, R. (2000, October). *Le questionnaire d'attitude face au probleme: Developpement et analyses preliminaires [The Negative Problem Orientation Questionnaire: Development and preliminary analyses]*. Paper presented at the annual meeting of the Societe Quebecoise pour la Recherche en Psychologie, Hull, QC.

Haaga, D. A. F. (1992). Catastrophizing, confounds, and depression: A comment on Sullivan and D'Eon (1990). *Journal of Abnormal Psychology, 101*(1), 206-207.

Hassett, A. L., Cone, J. D., Patella, S. J., & Sigal, L. H. (2000). The role of catastrophizing in the pain and depression of women with fibromyalgia syndrome. *Arthritis and Rheumatism, 43*(11), 2493-2500.

Hayton, J. C., Allen, D. G., & Scarpello, V. (2004). Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis. *Organizational Research Methods, 7*(2), 191-205.

Horn, S., & Munafo, M. (1997). *Pain: Theory, research and interventions*. Bristol, PA: Open University Press.

International Association for the Study of Pain. (1997). *Curriculum on pain for students in psychology*. Retrieved October 10, 2005, from http://www.iasp-pain.org/psycho.html

International Association for the Study of Pain. (2003). How prevalent is chronic pain? *Pain - Clinical Updates, 11*(2), 1-4.

International Association for the Study of Pain. (2005). *Psychosocial and cultural aspects of pain*. Retrieved October 16, 2005, from http://www.iasp-pain.org/C11Psychosocial.pdf

Jensen, M. P., Turner, J. A., Romano, J. M., & Karoly, P. (1991). Coping with chronic pain: a critical review of the literature. *Pain, 47*(1991), 249-283.

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results. *Journal of General Hospital Psychiatry, 4*, 33-47.

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice, 10*(2), 144-156.

Kabat-Zinn, J., Lipworth, L., & Burney, R. (1984). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of Behavioural Medicine, 8*, 163-189.

Kabat-Zinn, J., Lipworth, L., Burney, R., & Sellers, W. (1987). Four-year follow-up of a meditation-based program for the self-regulation of chronic pain. *The Clinical Journal of Pain, 2*, 159-173.

Kabat-Zinn, J., Massion, A. O., Kristeller, J., Peterson, L. G., Fletcher, K. E., Pbert, L., et al. (1992). Effectiveness of a meditation-based stress

reduction program in the treatment of anxiety disorders. *American Journal of Psychiatry, 149*, 936-943.

Keefe, F. J., Abernethy, A. P., & Campbell, L. C. (2005). Psychological approaches to understanding and treating disease related pain. *Annual Review of Psychology, 56*, 601-630.

Keefe, F. J., Rumble, M. E., Scipio, C. D., Giordano, L. A., & Perri, L. M. (2004). Psychological aspects of persistent pain: Current state of the science. *The Journal of Pain, 5*(4), 195-211.

Keefe, F. J., Smith, S. J., Buffington, A. L. H., Gibson, J., Studts, J. L., & Caldwell, D. S. (2002). Recent advances and future directions in the biopsychosocial assessment and treatment of arthritis. *Journal of Consulting and Clinical Psychology, 70*(3), 640-655.

Kerns, R. D., Rosenberg, R., & Otis, J. D. (2002). Self-appraised problem solving and pain-related social support as predictors of the experience of chronic pain. *Ann Behav Med, 24*(2), 100-105.

Kleinman, A., Brodwin, P. E., Good, B. J., & DelVecchio Good, M. (1994). Pain as human experience: an introduction. In M. DelVecchio Good, P. E. Brodwin, B. J. Good & A. Kleinman (Eds.), *Pain as human experience: An anthropological perspective* (pp. 1-28). Los Angeles, CA: University of California Press.

Lackner, J. M., & Quigley, B. M. (2004). Pain catastrophizing mediates the relationship between worry and pain suffering in patients with irritable bowel syndrome. *Behaviour Research and Therapy*.

Lee, H. B., & Comrey, A. L. (1979). Distortions in a commonly used factor analytic procedure. *Multivariate Behavioral Research, 14*, 301-321.

Mason, O., & Hargreaves, I. (2001). A qualitative study of mindfulness-based cognitive therapy for depression. *British Journal of Medical Psychology, 74*(2001), 197-212.

McCracken, L., & Vowles, K. E. (2006). Acceptance of chronic pain. *Current Pain Headache Reports, 10*(2), 90-94.

McWilliams, L. A., Goodwin, R. D., & Cox, B. J. (2004). Depression and anxiety associated with three pain conditions: results from a nationally representative sample. *Pain, 111*(1-2), 77-83.

Melzack, R. (1975). The McGill Pain Questionnaire: major properties and scoring methods. *Pain, 1*(1975), 277-299.

Melzack, R. (1993). Pain: Past, present and future. *Canadian Journal of Experimental Psychology, 47*(4), 615-629.

Melzack, R. (1999). Pain and stress: a new perspective. In R. J. Gatchel & D. C. Turk (Eds.), *Psychosocial factors in pain* (pp. 89-106). New York: Guilford Press.

Melzack, R. (2001). Pain and the neuromatrix in the brain. *Journal of Dental Education, 65*(12), 1378-1382.

Melzack, R., & Casey, K. L. (1968). Sensory, motivational and central control determinants of pain: A new conceptual model. In D. Kenshalo (Ed.), *The skin senses* (pp. 423-443). Springfield, IL: Charles C Thomas.

Melzack, R., & Wall, P. D. (1965). Pain mechanisms: A new theory. *Science, 50*, 971-979.

Melzack, R., & Wall, P. D. (1996). *The challenge of pain* (2nd ed.). Wiltshire: Penguin.

Merskey, H. (1990). Body-mind dilemma in chronic pain. In E. Tunks, A. Bellissimo & R. Roy (Eds.), *Chronic pain: Psychosocial factors in rehabilitation* (2nd ed.). Florida: Robert E. Krieger Publishing Company.

Merskey, H., & Bogduk, N. (1994). IASP Task Force on Taxonomy. In H. Merskey & N. Bogduk (Eds.), *Classification of chronic pain* (2nd ed., pp. 209-214). Seattle, WA: IASP Press.

Miller, J. J., Fletcher, K. E., & Kabat-Zinn, J. (1995). Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders. *Journal of General Hospital Psychiatry, 17*(3), 192-200.

Moreno, M. I. C., Garcia, M. I. D., & Pareja, M. A. V. (1999). Cognitive factors in chronic pain. *Psychology in Spain, 3*(1), 75-87.

Morley, S., Shapiro, D. A., & Biggs, J. (2004). Developing a treatment manual for attention management in chronic pain. *Cognitive Behaviour Therapy, 33*(1), 1-11.

O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behaviour Research Methods, Instruments and Computers, 32*(3), 396-402.

Osman, A., Barrios, F. X., Gutierrez, P. M., Kopper, B. A., Merrifield, T., & Grittmann, L. (2000). The Pain Catastrophizing Scale: further psychometric evaluation with adult samples. *Journal of Behavioural Medicine, 23*(4), 351-365.

Osman, A., Barrios, F. X., Kopper, B. A., Hauptmann, W., Jones, J., & O'Neill, E. (1997). Factor structure, reliability, and validity of the Pain Catastrophizing Scale. *Journal of Behavioural Medicine, 20*(6), 589-605.

Pincus, T., Burton, A. K., Vogel, S., & Field, A. (2002). A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain. *Spine, 27*(5), 109-120.

Pincus, T., Williams, A. C. d. C., Vogel, S., & Field, A. (2004). The development and testing of the depression, anxiety, and positive outlook scale (DAPOS). *Pain, 109*(2004), 181-188.

Rhudy, J. L., & Meagher, M. W. (2000). Fear and anxiety: divergent effects on human pain thresholds. *Pain, 84*(1), 65-75.

Robichaud, M., & Dugas, M. J. (2003). *The Negative Problem Orientation Questionnaire: Psychometric properties of the English version.* Paper presented at the 23rd National Conference of the Anxiety Disorders Association of America (ADAA), Toronto, ON.

Robichaud, M., & Dugas, M. J. (2005a). Negative problem orientation (Part 1): psychometric properties of a new measure. *Behaviour Research and Therapy, 43*(2005), 391-401.

Robichaud, M., & Dugas, M. J. (2005b). Negative problem orientation (Part II): construct validity and specificity to worry. *Behaviour Research and Therapy, 43*(2005), 403-412.

Rode, S., Salkovskis, P. M., & Jack, T. (2001). An experimental study of attention, labelling and memory in people suffering from chronic pain. *Pain, 94*(2001), 193-203.

Rosenstiel, A. K., & Keefe, F. J. (1983). The use of coping strategies in chronic low back pain patients: Relationship to patient characteristics and current adjustment. *Pain, 17*(1983), 33-44.

Ruehlman, L. S., & Karoly, P. (2006). *Profile of chronic pain: Screen. Professional Manual*. Tempe, Arizona: Psychological Assessment and Training, LLC.

Ruehlman, L. S., Karoly, P., Newton, C., & Aiken, L. S. (2005). The development and preliminary validation of a brief measure of chronic pain impact for use in the general population. *Pain, 113*(2005), 82-90.

Scherer-Dickson, N. (2004). Current developments of metacognitive concepts and their clinical implications: mindfulness-based cognitive therapy for depression. *Counselling Psychology Quarterly, 17*(2), 223-234.

Shaw, W. S., Feuerstein, M., Haufler, A. J., Berkowitz, S. M., & Lopez, M. S. (2001). Working with low back pain: problem-solving orientation and function. *Pain, 93*(2001), 129-137.

Siddall, P. J., & Cousins, M. J. (2004). Persistent pain as a disease entity: Implications for clinical management. *Anesth Analg., 99*(2004), 510-520.

Staud, R., Price, D. D., Robinson, M. E., & Vierck, C. J. (2004). Body pain area and pain-related negative affect predict clinical pain intensity in patients with fibromyalgia. *The Journal of Pain, 5*(6), 338-343.

Sullivan, M. J. L. (2004). *The Pain Catastrophizing Scale - User Manual*. Montreal, QC: University of Montreal.

Sullivan, M. J. L., Bishop, S. R., & Pivik, J. (1995). The Pain Catastrophizing Scale: Development and validation. *Psychological Assessment, 7*(4), 524-532.

Sullivan, M. J. L., & D'Eon, J. L. (1990). Relation between catastrophizing and depression in chronic pain patients. *Journal of Abnormal Psychology, 99*(3), 260-263.

Sullivan, M. J. L., Lynch, M. E., & Clark, A. J. (2005). Dimensions of catastrophic thinking associated with pain experience and disability in patients with neuropathic pain. *Pain, 113*(3).

Sullivan, M. J. L., Tripp, D. A., & Santor, D. (2000). Gender differences in pain and pain behaviour: the role of catastrophizing. *Cognitive Therapy and Research, 24*(1), 121-134.

Suls, J., & Rothman, A. (2004). Evolution of the biopsychosocial model: Prospects and challenges for health psychology. *Health Psychology, 23*(2), 119-125.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Needham Heights, MA: Allyn & Bacon.

Tan, G., Jensen, M. P., Robinson-Whelen, S., Thornby, J. I., & Monga, T. N. (2001). Coping with chronic pain: a comparison of two measures. *Pain, 90*(2001), 127-133.

Teasdale, J. D., Segal, Z., & Williams, J. M. (1995). How does cognitive therapy prevent depressive relapse and why should attentional control (mindfulness) training help? *Behaviour Research and Therapy, 33*(1), 25-39.

Teasdale, J. D., Segal, Z. V., & Williams, J. M. G. (2003). Mindfulness training and problem formulation. *Clinical Psychology: Science and Practice, 10*(2), 157-160.

Turk, D. C. (1996). Biopsychosocial perspective on chronic pain. In R. J. Gatchel & D. C. Turk (Eds.), *Psychological approaches to pain management: a practitioner's handbook* (pp. 3-32). New York: The Guilford Press.

Turk, D. C., & Okifuji, A. (2002). Psychological factors in chronic pain: evolution and revolution. *Journal of Consulting and Clinical Psychology, 70*(3), 678-690.

Turk, D. C., Robinson, J. P., & Burwinkle, T. (2004). Prevalence of fear of pain and activity in patients with fibromyalgia syndrome. *The Journal of Pain, 5*(9), 483-490.

Turk, D. C., & Rudy, T. E. (1992). Cognitive factors and persistent pain: A glimpse into Pandora's box. *Cognitive Therapy and Research, 16*, 99-122.

Turner, J. A., Mancl, L., & Aaron, L. A. (2004). Pain-related catastrophizing: a daily process study. *Pain, 110*(2004), 103-111.

V/eroy, H., Tanum, L., & Bruaset, H. (2005). Symptoms of depression and anxiety in functionally disabled rheumatic pain patients. *Nordic Journal of Psychiatry, 59*(2), 109-113.

Van Damme, S., Crombez, G., Bijttebier, P., Goubert, L., & Van Houdenhove, B. (2002). A confirmatory factor analysis of the Pain Catastrophizing Scale: invariant factor structure across clinical and non-clinical populations. *Pain, 96*(2002), 319-324.

Van Damme, S., Crombez, G., & Eccleston, C. (2004). Disengagement from pain: the role of catastrophic thinking about pain. *Pain, 107*(2004), 70-76.

van Leeuwen, M. T., Blyth, F. M., March, L. M., Nicholas, M. K., & Cousins, M. J. (2005). Chronic pain and reduced work effectiveness: The hidden cost to Australian employers. *European Journal of Pain, In press*.

Von Korff, M., Crane, P., Lane, M., Miglioretti, D. L., Simon, G., Saunders, K., et al. (2005). Chronic spinal pain and physical-mental comorbidity in the United States: results from the national comorbidity survey replication. *Pain, 113*(3), 331-339.

Von Korff, M., & Simon, G. (1996). The relationship between pain and depression. *British Journal of Psychiatry, 168*(Suppl 30), 101-108.

Vowles, K. E., McCracken, L., McLeod, C., & Eccleston, C. (2008). The Chronic Pain Acceptance Questionnaire: Confirmatory factor analysis and identification of patient subgroups. *Pain, 140*(2), 284-291.

Wall, P. (2000). *Pain: The science of suffering*. London: Columbia University Press.

Weisberg, M. B., & Clavel Jr, A. L. (1999). Why is chronic pain so difficult to treat? Psychological considerations from simple to complex care. *Postgraduate Medicine, 106*(6), CME.

Wells, A., & Matthews, G. (1996). Modelling cognition in emotional disorder: The S-REF model. *Behaviour Research and Therapy, 34*, 881-888.

Williams, D. A. (2003). Psychological and behavioural therapies in fibromyalgia and related syndromes. *Best Practice and Research Clinical Rheumatology, 17*(4), 649-665.

Winfield, J. B. (2000). Psychological determinants of fibromyalgia and related syndromes. *Current Review of Pain, 4*, 276-286.

Zautra, A. J., Fasman, R., & Reich, J. W. (2005). Fibromyalgia: Evidence for deficits in positive affect regulation. *Psychosomatic Medicine, 67*(1), 147-155.

Zautra, A. J., Johnson, L. M., & Davis, M. C. (2005). Positive affect as a source of resilience for women in chronic pain. *Journal of Consulting and Clinical Psychology, 73*(2), 212-220.

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatr Scand, 67*(6), 361-370.

Zwick, W. R., & Velicer, W. F. (1986). Factors influencing five rules for determining the number of components to retain. *Psychological Bulletin, 99*, 432-442.

APPENDIX A

Research Information Sheet for Participants

USQ

AUSTRALIA

"CHRONIC PAIN" RESEARCH STUDY

You are invited to participate in this questionnaire study which investigates the experience of chronic pain. Your reported pain experience will be measured in terms of the severity and duration of physical aspects of your condition, as well as the effect that your pain has on how you think and feel, and its impact on your life in general. For the purposes of this study, chronic pain is defined as any (non-malignant) pain experience persisting for more than three months. It is anticipated that findings from this study will provide useful information for other researchers and clinicians, and will also help us understand aspects of chronic pain in a more comprehensive and meaningful way.

If you agree to participate in this study, please read and complete the **Consent Form** (next page). You will then be asked to complete a questionnaire. The measurement scales included in the questionnaire have been carefully selected to enable you to provide information about several aspects of your specific chronic pain experience. Even if some items do not seem to be particularly pain-related, it is very important that all items be answered. There are no right or wrong answers – your experience is unique, and all responses that apply to you are valid and meaningful. To avoid thinking too long about particular items that you might consider a bit "iffy", please note that the best answer will always be the first one that springs to mind.

The questionnaire should take no longer than 1 hour to complete. Try to complete the questionnaire in a single session if possible. Participation is completely voluntary, and you may withdraw from the study at any stage with no questions asked. All information provided by you will be treated confidentially, stored securely at the University of Southern Queensland (USQ), and will only be seen by the researcher. The results of this study will be reported in a thesis submitted for the award of Doctor of Philosophy (Psychology), and it is possible that overall findings may be published in psychology journals. Only group data will be reported in these documents – no information that could personally identify you in any way will be conveyed to anyone else at any stage.

Please note that a follow-up study is planned for one month after receipt of your completed questionnaire. It will also be in the form of a confidential self-report questionnaire. Your participation in this additional study is **optional**, but is strongly encouraged, as it will provide critical information linking aspects of your pain experience at different points in time. If you agree to participate in both studies, please cross the "**Study 1 AND Study 2**" box (next page), and you will then receive the second questionnaire in approximately one month's time. Again, you are free to withdraw from either study at any time. After completion of the research, a summary of overall findings will be supplied on request – please indicate your choice as requested on the questionnaire.

If you have any questions regarding this study you may contact the researcher - **Michele Chalmers on (07) 46311730 or 0408727249,** or **Dr. Murray Thompson on (07) 4631 2380**. If you have any concerns regarding the implementation of the project, you may contact the Secretary, **USQ Human Research Ethics Committee on 4631 2956**. In the event that you experience undue personal upset after completion of this questionnaire, please contact **Lifeline** on **131114.** (USQ students may also contact **Student Services Counselling** on **46312372**.)

THANK YOU FOR YOUR PARTICIPATION

Please keep this page for your reference

APPENDIX B

Consent Form

CONSENT FORM

- *I have read the above information, and understand the nature and purpose of this research.*
- *I understand that my participation is completely voluntary and that I may withdraw from the study at any time.*
- *I understand that the results of this study will be reported only in their aggregate form and I will not be identified individually.*
- *I understand that this consent form will be detached and stored separately from the rest of the questionnaire, so that my name is not attached to the questions.*
- *I declare that I am at least 18 years of age, and I hereby give my consent to participate in Study 1 (and Study 2, if so noted) by crossing the appropriate box below.*

STUDY 1 **ONLY** ⇩ ☐ STUDY 1 **AND** STUDY 2 ⇩ ☐

Signature: _____ *Date:* ____ / ____ / *2006*

In order to thank you for your participation, we would like to give you the opportunity to be entered into a draw for cash prizes ranging from $25 to $100. These prizes are drawn at the end of each semester, and entrants include those who have participated in psychological research during the semester.

- Would you like to be included in the draw for cash prizes? YES ☐ NO ☐
- Would you like to receive summary of findings from the research? YES ☐ NO ☐

(If YES...) Send by POST ☐ EMAIL ☐

CONTACT INFORMATION

PLEASE NOTE: Your contact details are strictly confidential. This page will be kept separate from your questionnaire so that you cannot be identified. Contact information is only required for (a) details of where to forward questionnaire for Study 2 (if applicable), (b) entry into the draw for cash prizes, and (c) details of where to send copy of summary of findings from the study (if requested).

If you are participating in **Study 1 *only***, and you do ***not*** wish to enter the draw for cash prizes, nor receive a copy of findings from the research, the following contact details are **NOT required.**

Name _____

Postal Address _____

_____ P/Code_____

Email Address _____

THIS CONSENT FORM MUST BE RETURNED WITH YOUR COMPLETED QUESTIONNAIRE

Please return both in the postage-paid envelope provided. Thank you.

APPENDIX C

Participant Code

USQ
AUSTRALIA

Chronic Pain Study

Department of Psychology
University of Southern Queensland

PARTICIPANT CODE

Why a code? Responses you provide in this survey are confidential, and will be stored separately from your Consent form. The participant code, known only to you, enables submission and processing of your survey responses without any personally identifying information. This unique code also enables us to "match up" your responses from this survey to any additional survey data which you may choose to provide in the future as part of this research. So you won't have to remember your code, you will generate it according to certain guidelines.

How to create your code.

1. Write the first two letters of your mother's maiden name (her surname at birth) (Example: If your mother's maiden name was Smith, you would put SM).
2. Write the day date on which your birthday falls (Example: If your birthday is on the 4th of the month, you would put 04).
3. Write the first two letters of your surname (Example: If your surname was Clark, you would put CL).

In this example, the unique ID number would be: | S | M | 0 | 4 | C | L |

Please write your unique participation code here: | | | | | | |

APPENDIX D

Demographics

SECTION A

1. Age: ☐☐ years

2. Gender: ☐ Male ☐ Female

3. What is your employment status? *(please cross one box only)*

☐ Employed full-time ☐ Student full-time ☐ Retired ☐ Unemployed

☐ Employed part-time ☐ Student part-time ☐ Home Duties ☐ Disabled

If you are in full or part-time employment please specify your occupation: _____

4. If you are unemployed, disabled, or retired, is it due to your pain? ☐ Yes ☐ No

5. Please list ALL of your current Medical Conditions - types of illness, disorder, injury, disease, etc.
(use reverse side of this page if insufficient space)

_____ _____

_____ _____

_____ _____

_____ _____

6. Have you ever been diagnosed with depression, anxiety, stress, or other similar condition? ☐ Yes ☐ No

If YES, please specify condition/s and approximate date (or year) of diagnosis.
(Use reverse side of this page if insufficient space)

Condition	Date diagnosed	Previous Treatment?	Current treatment?
_____	_____	☐ Yes ☐ No	☐ Yes ☐ No
_____	_____	☐ Yes ☐ No	☐ Yes ☐ No
_____	_____	☐ Yes ☐ No	☐ Yes ☐ No
_____	_____	☐ Yes ☐ No	☐ Yes ☐ No

7. What is your current method of Pain Management? (cross all that apply)

☐ Medication ☐ Psychotherapy ☐ Heat/cold packs

☐ Chiropractic ☐ Physiotherapy ☐ Other (please specify)

☐ Acupuncture ☐ Massage Therapy _____

8. Please list ALL of your current Medications (Prescription and Non-Prescription)
Use reverse side of this page if insufficient space

	Strength	Dosage (per day)

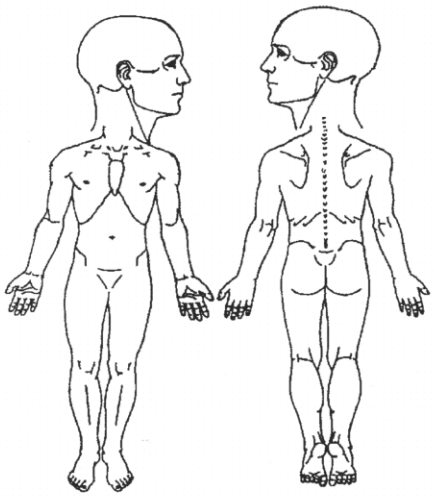
9. In the past 3 months, how many times have you seen a doctor or other healthcare professional regarding your pain? ☐☐ times

10. How long have you been living with chronic pain? ☐☐ years **OR** ☐☐ months

11. Is pain currently your most significant health issue? ☐ Yes ☐ No

If NO, what do you regard as your most significant health issue? _____

12. Please note on the diagram where you have pain. Mark "X" on specific pain locations, and/or shade in any large areas of pain, as appropriate. You may add any additional information about your pain which you think may be relevant. For example: various types of injury, illness, or disease involved; pain more pronounced in one area compared to others; pain worse at night; etc.



APPENDIX E

Profile of Chronic Pain: Screen

Items 1 – 7

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For information on item content, please refer to: Ruehlman, L. S., & Karoly, P. (2006). *Profile of chronic pain: Screen. Professional Manual*. Tempe, Arizona: Psychological Assessment and Training, LLC.

Items 8 – 15

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For information on item content, please refer to: Ruehlman, L. S., & Karoly, P. (2006). *Profile of chronic pain: Screen. Professional Manual*. Tempe, Arizona: Psychological Assessment and Training, LLC.

APPENDIX F

Negative Problem Orientation Questionnaire

SECTION C

People react in different ways when faced with problems in their daily lives (e.g., health problems, arguments, lack of time, etc.). Please use the scale below to indicate to what extent each of the following items correspond to the way you react or think when confronted with a problem. Please cross (X) the box that best corresponds to you for each item.

	Not at all true of me	Slightly true of me	Moderately true of me	Very true of me	Extremely true of me
1. I see problems as a threat to my well-being.	☐	☐	☐	☐	☐
2. I often doubt my capacity to solve problems.	☐	☐	☐	☐	☐
3. Often before even trying to find a solution, I tell myself that it is difficult to solve problems.	☐	☐	☐	☐	☐
4, My problems often seem insurmountable.	☐	☐	☐	☐	☐
5. When I attempt to solve a problem, I often question my abilities.	☐	☐	☐	☐	☐
6. I often have the impression that my problems cannot be solved.	☐	☐	☐	☐	☐
7. Even if I manage to find some solutions to my problems, I doubt that they will be easily resolved	☐	☐	☐	☐	☐
8. I have a tendency to see problems as a danger.	☐	☐	☐	☐	☐
9. My first reaction when faced with a problem is to question my abilities.	☐	☐	☐	☐	☐
10. I often see my problems as bigger than they really are.	☐	☐	☐	☐	☐
11. Even if I have looked at a problem from all possible angles, I still wonder if the solution I decided on will be effective.	☐	☐	☐	☐	☐
12. I consider problems to be obstacles that interfere with my functioning.	☐	☐	☐	☐	☐

APPENDIX G

Pain Catastrophizing Scale

SECTION D

Everyone experiences painful situations at some point in their lives.

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain.

Using the following scale, please cross (X) the box for each item to indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

		Not at all	To a slight degree	To a moderate degree	To a great degree	All the time
1	I worry all the time about whether the pain will end.	☐	☐	☐	☐	☐
2	I feel I can't go on.	☐	☐	☐	☐	☐
3	It's terrible and I think it's never going to get any better.	☐	☐	☐	☐	☐
4	It's awful and I feel that it overwhelms me.	☐	☐	☐	☐	☐
5	I feel I can't stand it anymore.	☐	☐	☐	☐	☐
6	I become afraid that the pain will get worse.	☐	☐	☐	☐	☐
7	I keep thinking of other painful events.	☐	☐	☐	☐	☐
8	I anxiously want the pain to go away.	☐	☐	☐	☐	☐
9	I can't seem to keep it out of my mind.	☐	☐	☐	☐	☐
10	I keep thinking about how much it hurts.	☐	☐	☐	☐	☐
11	I keep thinking about how badly I want the pain to stop.	☐	☐	☐	☐	☐
12	There's nothing I can do to reduce the intensity of the pain.	☐	☐	☐	☐	☐
13	I wonder whether something serious may happen.	☐	☐	☐	☐	☐

APPENDIX H

Five-Facet Mindfulness Questionnaire

SECTION E

Please rate each of the following statements using the scale provided. Please cross (X) the box that best describes your own opinion of what is generally true for you.

	Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1. I notice changes in my body, such as whether my breathing slows down or speeds up.	☐	☐	☐	☐	☐
2. I'm good at finding words to describe my feelings.	☐	☐	☐	☐	☐
3. I criticise myself for having irrational or inappropriate emotions.	☐	☐	☐	☐	☐
4. I perceive my feelings and emotions without having to react to them.	☐	☐	☐	☐	☐
5. When I do things, my mind wanders off and I'm easily distracted.	☐	☐	☐	☐	☐
6. When I take a shower or bath, I stay alert to the sensations of water on my body.	☐	☐	☐	☐	☐
7. I can easily put my beliefs, opinions, and expectations into words.	☐	☐	☐	☐	☐
8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	☐	☐	☐	☐	☐
9. I watch my feelings without getting lost in them.	☐	☐	☐	☐	☐
10. I tell myself I shouldn't be feeling the way I'm feeling.	☐	☐	☐	☐	☐
11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.	☐	☐	☐	☐	☐
12. It's hard for me to find the words to describe what I'm thinking.	☐	☐	☐	☐	☐
13. I am easily distracted.	☐	☐	☐	☐	☐
14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	☐	☐	☐	☐	☐
15. I pay attention to sensations, such as the wind in my hair or sun on my face.	☐	☐	☐	☐	☐
16. I have trouble thinking of the right words to express how I feel about things.	☐	☐	☐	☐	☐
17. I make judgments about whether my thoughts are good or bad.	☐	☐	☐	☐	☐
18. I find it difficult to stay focused on what's happening in the present.	☐	☐	☐	☐	☐
19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	☐	☐	☐	☐	☐

SECTION E

Please rate each of the following statements using the scale provided. Please cross (X) the box that best describes your own opinion of what is generally true for you.

	Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1. I notice changes in my body, such as whether my breathing slows down or speeds up.	☐	☐	☐	☐	☐
2. I'm good at finding words to describe my feelings.	☐	☐	☐	☐	☐
3. I criticise myself for having irrational or inappropriate emotions.	☐	☐	☐	☐	☐
4. I perceive my feelings and emotions without having to react to them.	☐	☐	☐	☐	☐
5. When I do things, my mind wanders off and I'm easily distracted.	☐	☐	☐	☐	☐
6. When I take a shower or bath, I stay alert to the sensations of water on my body.	☐	☐	☐	☐	☐
7. I can easily put my beliefs, opinions, and expectations into words.	☐	☐	☐	☐	☐
8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	☐	☐	☐	☐	☐
9. I watch my feelings without getting lost in them.	☐	☐	☐	☐	☐
10. I tell myself I shouldn't be feeling the way I'm feeling.	☐	☐	☐	☐	☐
11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.	☐	☐	☐	☐	☐
12. It's hard for me to find the words to describe what I'm thinking.	☐	☐	☐	☐	☐
13. I am easily distracted.	☐	☐	☐	☐	☐
14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	☐	☐	☐	☐	☐
15. I pay attention to sensations, such as the wind in my hair or sun on my face.	☐	☐	☐	☐	☐
16. I have trouble thinking of the right words to express how I feel about things.	☐	☐	☐	☐	☐
17. I make judgments about whether my thoughts are good or bad.	☐	☐	☐	☐	☐
18. I find it difficult to stay focused on what's happening in the present.	☐	☐	☐	☐	☐
19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	☐	☐	☐	☐	☐

APPENDIX I

Depression, Anxiety and Positive Outlook Scale

SECTION F

We would like to know how you have been feeling in the last few weeks. Please select a number by placing a cross (X) in the appropriate box for each statement, indicating how often you feel that way.

	Almost never				Almost all the time
1. I feel like a failure	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
2. I get a frightened feeling, as if something awful is about to happen	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
3. I feel guilty	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
4. I can laugh and see the funny side of things	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
5. I am disappointed in myself	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
6. I get a frightened feeling , like butterflies in the stomach	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
7. I feel cheerful	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
8. I blame myself constantly	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
9. I get a sudden feeling of panic	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
10. I look forward with enjoyment to things	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
11. I think about harming myself	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

That completes the survey. Please check that you have answered **all** items. Please return the Consent Form and Questionnaire in the postage-paid envelope provided. Thankyou for your participation.