UNDERSTANDING PAIN, TRAUMA AND POSTTRAUMATIC STRESS IN PATIENTS WITH CHRONIC PAIN: A TRANSLATIONAL INVESTIGATION

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Thesis submitted to fulfil the requirements for the degree of Doctor of Philosophy in the discipline of Psychology

2019

Paul Knight
Declarations

I declare that this thesis is my own account of my research and contains as its main content work which has not been previously submitted for a degree at any tertiary educational institution.

Paul D. Knight

Declaration/Statement Concerning Contribution of Others

I declare that all original research for this study as reported in this thesis was undertaken by me during my enrolment of the Degree of Doctor of Philosophy.

In addition, I claim the majority of authorship for each article presented in this thesis. In doing so, I declare that the co-authors as recorded below contributed to the relevant article by way of critically analysing and commenting on that article, as necessary, so as to contribute to its interpretation. More specifically, my former hospital supervisor, Rosemary French, Clinical Psychologist, contributed advice relating to method, Chapter 3, and Dr Helen Davis and Professor Corinne Reid contributed their expertise in relation to the analysis and report of the quantitative data present in Chapters 2, 3,4,5,7 and 9. They also provided valuable input into the thematic analysis of structured interviews undertaken in Chapter 8 and into the final review of all the studies in this thesis in Chapter 9. Each author provided their final approval of the relevant article prior to journal submission.

This thesis conforms to the Graduate Research Degrees Thesis Style Guideline: Thesis by Publications/Manuscripts as published by Murdoch University Graduate Research Office; and the Australian Code for the Responsible Conduct of Research (2007). The Murdoch University ethics project number for this thesis is 2005/093.

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Abstract

Background. Interdisciplinary chronic pain management programmes are costly and effective for many participants. However, it remains a conundrum as to why a substantial proportion of patients do not make clinically significant improvements in mood and functioning.

Aims. This programme of research takes a translational, mixed methods approach to addressing this question, triangulating a series of interconnected basic research studies with evaluation of intervention, in combination, to: (i) explore the association between posttraumatic stress in chronic pain patients and objectively assessable event characteristics (injury severity, cause of pain (trauma- or non-trauma related), time in pain (sub-acute or chronic); and aspects of subjective patient experience of pain (complete or partial memory of the event; diffuse or specific pain); (ii) investigate developmental aspects of the co-evolution of pain and distress by exploring clinically relevant posttraumatic stress between subacute and chronic pain patients; (iii) investigate the impact of trauma on injury recovery by exploring psychological sequelae of trauma-induced compared to non-trauma related pain; (iv) explore broader premorbid and acute contextual factors impacting recovery by undertaking a case analysis of patients’ view of their lives and the impact on pain self-management.

Method. In a series of five studies, chronic pain participants whose pain was traumatic in origin (N=64) were compared with both a subacute traumatic pain group (N=77) and a chronic non-traumatic pain group (N=88). A qualitative study (N=10) further investigated the impact of social history on pain self-management.

Results. All groups reported significant (but similar) rates of posttraumatic stress. Further, compared to the subacute group, chronic groups reported higher rates of
diffuse pain, and complete memory of their pain event. Type of pain event, injury severity scores, and gender were not associated with clinically relevant posttraumatic stress in any group. In the subacute group, a significant relationship was found between distress and partial memory of the pain event. The qualitative case study found that participants’ unique histories contributed to “self-rules” that provided a premorbid lens through which their pain was interpreted, and their pain response was informed.

Conclusion. Posttraumatic stress is a significant feature of chronic pain and is already evident in the subacute phase of recovery. Vulnerability to, and maintenance of, pain and traumatic distress cannot be understood purely through the lens of objective event characteristics though these are the indices routinely collected by health experts. The subjective experience of pain holds more hope for predicting psychological outcomes. Collection of this information during hospital screening may afford a means of making more judicious judgements about resource allocation, access to services, and ultimately may provide an evidence base to inform a personalized medicine approach to treatment planning.
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List of Abbreviations

ACT  Acceptance and Commitment Therapy
AIS  Abbreviated Injury Scale
BPS  Biopsychosocial
CBT  Cognitive Behavioural Therapy
DSM 5  Diagnostic and Statistical Manual of Mental Disorders (5th ed)
FH  Fremantle Hospital
HADS  Hospital Anxiety and Depression Scale
IES-R  Impact of Event Scale- Revised
ISS  Injury Severity Score
NISS  New Injury Severity Score
MTOC  Major Trauma Outcome Clinic
PCPM  Person-centred Contextualised Pain Model
PTSS  Posttraumatic stress symptoms
PSS-SR  Posttraumatic Stress Symptom Scale
PUMP  Pain Understanding and Management Programme
PTSD  Posttraumatic Stress Disorder
QOL  Quality of Life questionnaire
RPH  Royal Perth Hospital
RMDQ    Roland-Morris Disability questionnaire
TBI      Traumatic Brain Injury
6MWT     Six Minute Walk Test
**Glossary**

The following is a list of definitions of terms related to pain and trauma which are used throughout this thesis.

**Pain**

The terms “acute”, “subacute” and “chronic” pain are defined according to length of time within which the healing process occurs. This thesis adopts the following definitions:

**Acute pain.** Four weeks or less (Bonica & Loeser, 2001; Potter, 1998): Acute pain patients are not directly considered in this thesis as the acute physical recovery aspects of their condition are still likely to be unresolved, which may interfere with the consideration of psychological factors.

**Subacute pain** is the cross over period between acute and chronic pain, ranging between one month (five weeks; Keefe, 1982) and six months (Thienhaus & Cole, 2002). In Study 2 (chapter three), participants have subacute pain as they attended a trauma clinic three months post-discharge from hospital.

**Chronic pain.** Pain which is of six-months or more duration is frequently used to define chronic pain (DSM 5, American Psychiatric Association, 2013). A more elaborate definition is:

“Pain experienced every day for three months or more in the previous six months”. (Access Economics, 2008, p.11 citing the International Association for the Study of Pain definition of chronic pain, IASP, 1979).

To be conservative in the studies that follow, participants in the chronic pain groups had pain persisting for a year or more.
Trauma

**Traumatic event.** A major change in the DSM 5 (American Psychiatric Association, 2013) is that the Posttraumatic Stress Disorder (PTSD) category has been moved from the Anxiety Disorders chapter in the DSM IV-TR (American Psychiatric Association, 2000) to a Trauma and Stressor-Related Disorders chapter. The DSM 5 (Criteria A), definition requires the person be exposed to “death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence” (p. 271). The previous DSM-IV-TR (American Psychiatric Association, 2000) criteria (Criterion A2) for an “intense fear, helplessness or horror” response has been deleted because this criterion was found to have no utility in predicting the onset of PTSD (Kubany, Ralston, & Hill, 2010). The DSM 5 has clarified and narrowed the types of events that qualify as “traumatic”. The DSM-IV-TR (American Psychiatric Association, 2000) requirement of “threat to physical integrity” (p. 427) has been removed. Medically based trauma is now limited to sudden catastrophe (e.g., waking during surgery or anaphylactic shock) – therefore non-immediate, life-threatening illness, such as terminal cancer, medical incidents involving natural causes, such as a heart attack, do not qualify as trauma (Pai, Suris, & North, 2017). Under the new criteria, the onset of chronic pain would not in itself qualify as a “trauma” no matter how severe, unless it was precipitated by or associated with a traumatic event.

The DSM 5 (American Psychiatric Association, 2013) definition of PTSD has been adopted throughout this thesis, along with the following criteria.
PTSD. The present qualifying criteria for PTSD in DSM 5 (American Psychiatric Association, 2013) are:

A. Stressor (one required): Directly experiencing the traumatic event(s); witnessing the event(s); learning that the event(s) occurred to a close relative or close friend; experiencing repeated or extreme exposure to aversive details of the event(s) (e.g., first responders).

B. Intrusion symptoms (one required): Unwanted upsetting memories: nightmares; flashbacks; emotional distress after exposure to traumatic reminders; physical reactivity after exposure to traumatic reminders.

C. Persistent avoidance (one required) of stimuli associated with the trauma: Trauma-related thoughts or feelings; trauma-related external reminders.

D. Negative alterations in cognitions and mood (two required) that are associated with the traumatic event. In addition to “inability to recall key features of the trauma” (not due to head injury, alcohol or drugs) this criterion also includes: overly negative thoughts; exaggerated blame, negative affect, decreased interest in activities, feeling isolated, difficulty experiencing positive affect – two criteria required for diagnosis of PTSD.

E. Alterations in arousal and reactivity (two required) that are associated with the traumatic event (including irritability or aggression; risky or destructive behaviour; hypervigilance; heightened startle reaction; difficulty concentrating, difficulty sleeping).

F. Duration of symptoms (required): one month or more.
**G Functional significance (required):** the symptoms create distress or functional impairment (e.g., in the individual’s social interactions, capacity to work or other important areas of functioning).

**H. Exclusion (required):** the symptoms are “not due to medication, substance use or other illness”.
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It was an epic voyage in completing this thesis, beginning with the first tentative tap on a keyboard, followed by years of meandering through diverse theoretical perspectives. Along the way myriads of statistics, hundreds of words and even entire studies were discarded.

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Dedications

Lovingly dedicated to:

My long-term partner and finally fiancée

Penny Anne Glanville (née Gray)

Called by the Lord 9th March 2014

My Mother

Joyce Knight

Passed into God’s Kingdom 24th September 2018
CHAPTER 1

Introduction
1.1 Introduction

This thesis investigated the relationship between chronic pain and post-traumatic stress following traumatic pain – a powerful impactor on individual wellbeing, with only modest responsiveness to current psychological therapies, and constituting a significant burden of disease for communities.

1.1.1 Impact of Chronic Pain

In 2007, a report by Access Economics (2007) for MBF Foundation in collaboration with the University of Sydney Pain Management Research Institute Australia found that persistent pain is one of the most common health conditions in Australia, affecting about 3.2 million people in 2007, or 1 in 5 people under 65 years, and 1 in 3 people 65 years and older. Chronic pain is defined as being of six-month or more duration (DSM 5) (American Psychiatric Association, 2013).

The Access report notes that the prevalence of chronic pain is expected to increase to five million by 2050. It estimated that the cost of chronic pain in 2007 was approximately AUD$34.3 billion (or AUD$10,847 per person with pain), which includes AUD$11 billion in lost productivity costs, and AUD$7 billion in direct health care costs. It found that chronic pain prevalence was comparable to, or higher than, a number of National Health Priority Areas (NHPAs) including cardiovascular disease, cancer, musculoskeletal disease, injuries, mental disorders, asthma and diabetes. In the Australian population, 16.4% (4.0 million Australians) reported back pain in 2017-18, which was the most commonly reported chronic condition after reported mental health and behavioural conditions (20.1%) (Australian Institute of Health and Welfare, 2018). The relationship between

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1 As at December 2017 the last major economic report produced in Australia, (Pain Australia, 2017)
chronic pain and posttraumatic stress, particularly chronic pain attributed to a traumatic event, provides the focus for this programme of research.

1.1.2 Rates of Comorbidity of Pain, PTSD, Anxiety and Depression

There is a dearth of recent research (2010 onwards) in relation to prevalence rates for chronic pain and PTSD, anxiety and depression in hospital outpatients - most related to small studies and prevalence rates for particular types of pain (e.g., cancer pain) or very narrow populations (e.g., rheumatism, military veterans). The most recent identified studies relating to PTSD, anxiety, and depression in chronic pain outpatients are indicative of the literature and are discussed below.

1.1.2.1 Pain and PTSD (see Glossary for detailed definition of PTSD. Chronic comorbid pain and posttraumatic stress symptoms are common sequelae after a traumatic event. An Australian study of PTSD in outpatients with traumatic injury twelve months post hospital discharge (N = 433) found that those who reported current pain were three times more likely to have probable PTSD than those without pain (Giummarra et al., 2017). A meta-analysis by Norwegian researchers, Siqveland, Hussain, Lindstrøm, Ruud, and Hauff (2017) reported a pooled mean prevalence of 9.7% PTSD among chronic pain patients in 21 studies. However, PTSD rates in patients with pain after traumatic injury, is much higher. A Dutch study of major trauma patients (N = 226) found 23% had probable PTSD one year after injury (Haagsma et al., 2012). Akhtar, Ballew, Orr, Mayorga, and Khan (2018) in a cross-sectional study investigated the prevalence of PTSD symptoms in chronic pain patients (N = 265) attending an American multidisciplinary pain clinic. Twenty-eight percent screened positive for PTSD symptoms compared to a lifetime prevalence of 6.8% in the general population (citing the National Comorbidity Survey Replication, Kessler, Berglund, et al.,
In other studies, the prevalence of diagnosable PTSD in patients attending for multidisciplinary chronic pain rehabilitation has been variously calculated to be between 23% and 48% (Ahman & Stalnacke, 2008; Andersen, Andersen, Vakkala, & Elklit, 2012; Asmundson, Bonin, Frombach, & Norton, 2000; Stalnacke, 2012) compared to 3.5% in the Australian general population (Australian Bureau of Statistics, 2008) suggesting that this is a risk population that requires specialist attention. It also raises the question of what other kinds of psychological distress may be relevant for trauma-related chronic pain given the high rates of comorbidity of PTSD with other mental health conditions (Galatzer-Levy, Nickerson, Litz, & Marmar, 2013).

1.1.2.2 Pain and depression. A meta-analysis, including 14 articles on a population with pain and 42 articles on a population with depression (Bair, Robinson, Katon, & Kroenke, 2003), estimated the mean depression rate to be as high as 52% in patients presenting at pain clinics or inpatient programme, ranging from 13% to 85% (e.g., 13% in gynaecology clinics; 52% in pain clinics or inpatient programme; 85% in dental clinics addressing facial pain). Conversely, pain occurred in an average of 65% of patients presenting with depression (ranging from 15-100% depending on the setting). Bair et al., cited an international study (Gureje, Von Korff, Simon, & Gater, 1998), which found that patients with pain lasting more than six months were more than four times as likely to have a depressive disorder as those without chronic pain. By comparison, American surveys of the general population have estimated the prevalence of major depression at 6.7% (Kessler, Chiu, Demler, & Walters, 2005).

The incidence of depression after traumatic injury has been found to be 27% (Soberg, Bautz-Holter, Roise, & Finset, 2010) to 45% (Ahman & Stalnacke, 2005).
More recently, an American study by Sullivan-Singh et al. (2014) of 158 patients admitted to inpatient rehabilitation after moderate to severe Traumatic Brain Injury (TBI) found, at one year post-injury, 34% had pain, and 22% had diagnosable depression. Comorbid pain and depression declined from 27% at baseline (during inpatient rehabilitation) to 18% at one year.

1.1.2.3 Pain and anxiety. Comorbid chronic pain and anxiety is also prevalent. Asmundson and Katz (2009) undertook a review of the literature. Seven studies between 1986 and 2005 indicated an elevated prevalence of generalised anxiety of 25-29% in treatment-seeking pain samples. However, other studies have found anxiety in a chronic pain population to be as high as 39-44% (Ahman & Stalnacke, 2008; Stalnacke, 2012). By comparison, American surveys of the general population have estimated the prevalence of anxiety at about 18% (Kessler, Berglund, et al., 2005).

1.1.2.4 Triple comorbidity of PTSD, anxiety and depression. There was a paucity of studies relating to triple comorbidity rates in the context of chronic pain. However, one study of war veterans (Ginzburg, Ein-Dor, & Solomon, 2010) assessed at one, two and 20 years after active service found the triple comorbidity rate to be between 27-30% at each assessment. It was estimated that almost one half of the war veterans would report a lifetime triple comorbidity.

1.1.3 Treatments for Chronic Pain and PTSD

Many patients will spontaneously recover from PTSD symptoms within a year. For example, Morina, Wicherts, Lobbrecht, and Priebe (2014) in a large meta-analysis (42 studies, 81,642 participants) found an average of 44% of individuals with PTSD at the beginning of the studies were, without treatment, non-cases at follow-up after a mean of 40 months. Nevertheless, an Australian National Survey of
Mental Health and Wellbeing (Issakidis, Sanderson, Corry, Andrews, & Lapsley, 2004) found that PTSD is undertreated in Australia, and the survey suggested that only 40% of the respondents with PTSD were in current contact with health services for their condition. Early (< 12 months post injury) CBT treatment can assist with posttraumatic stress symptoms. For example, Bisson, Shepherd, Joy, Probert, and Newcombe (2004) investigated the efficacy of CBT intervention for mitigating posttraumatic stress following physical injury (N = 152) at an accident and emergency department. At 1-3 weeks post-injury, participants were randomized to either a four-session CBT intervention that started 5–10 weeks after the injury, or to no intervention, and then followed up for 13 months. Posttraumatic stress symptoms were significantly more reduced at 13 months in the intervention group (adjusted mean difference = 8.4, 95% CI 2.4–14.36) than in the non-intervention group. However, crucially, some patients with pain who wait longer than six months from referral to access treatment worsen both in terms of psychological health and health-related quality of life (Lynch et al., 2008). Comorbid pain and PTSD is thought to be particularly difficult to treat in that the conditions maintain and even aggravate each other (Sharp & Harvey, 2001).

There is, however, a growing awareness among health practitioners that chronic pain is not only influenced by an underlying pathology but by psychological and social factors. This has led to a greater focus in hospitals on an interdisciplinary approach which incorporates the use of Cognitive Behavioural Therapy (CBT) based psychological therapies (Scascighini, Toma, Dober-Spielmann, & Sprott, 2008). In hospital outpatient units such treatment often includes the use of (CBT) group programme to help patients understand and manage the distress and pain behaviours that may maintain or even exacerbate pain. Such programmes are, for some patients,
useful in bringing about improvements in mental well-being and physical functioning, but these programmes are far from universally effective. For example, Morley, Williams, and Hussain (2008) investigated clinically significant change (CSC) after a CBT programme for chronic pain patients (N = 600) and at one-month post-intervention found a CSC for only about 1 in 4 (25%) for depression, and 1 in 5 (18%) for anxiety. Only a small number (6%, or 1 in 17) achieved a CSC on a measure of behavioural activity, the 5-minute walk test.

This thesis will consider how we can better understand the psychological factors in chronic pain presentations following traumatic injury, with a view to providing a more detailed evidence-base to inform treatment.

1.2. Where to Begin? Translating Theory into Practice

1.2.1 Translational Research Framework

This programme of research is grounded in a translational research framework, which prioritises research questions and methodologies that have the aim of furthering the evidence-base for real world practice or bridging the “know-do gap” (Aymerich et al., 2014, p.1005). Translational research is variously defined, with common and essential elements defined by Rubio et al. (2010):

“…foster[ing] the multidirectional integration of basic research, patient-oriented research, and population-based research, with the long-term aim of improving the health of the public. T1 research expedites the movement between basic research and patient-oriented research that leads to new or improved scientific understanding or standards of care. T2 research facilitates the movement between patient-oriented research and population-based research that leads to better patient outcomes, the implementation of best
practices, and improved health status in communities. T3 research promotes interaction between laboratory-based research and population-based research to stimulate a robust scientific understanding of human health and disease.” (p.4)

In essence, translational research is designed to ‘link up’ research from ‘bench to bedside’ or laboratory to real world by (i) looking for gaps in the literature and setting about filling those gaps; and (ii) utilising real world data and practice as a key aspect of the research endeavour. In the context of Rubio’s definition, the current programme of research is intended to be a T1 type of translational research, bridging the gap between “basic research” (understanding more about the nature of the condition) and “patient-oriented research” (investigating ‘what works’ and what does not in the real world context) rather than T2 or T3. T1 research which is designed to ensure contextual validity in treatment design and implementation often emerges from a process of noticing when gold standard or evidence-based treatments do not work for a significant number of patients in the less controlled, real-world context. Specifically, this series of studies grew out of the author’s experience of working as a clinical psychologist in a major trauma unit and an outpatient pain management programme – the studies were designed to fill a gap in the available literature on evidence-based treatment for those patients with trauma-induced chronic pain who do not respond to standard CBT-based or biomedical interventions.

In accordance with the principles of translation, this programme of research prioritises contextual validity and clinical translatability in its methodological and design choices. Thus, when endeavouring to understand the nature of the psychological condition and treatment needs of patients with trauma-induced chronic pain, this research begins by confining itself to investigating diagnostic criteria and
potential predictors of posttraumatic stress, and also potentially comorbid anxiety and depression drawn from:

(i) a clinically relevant gold standard diagnostic tool, specifically the *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM 5)* (American Psychiatric Association, 2013). DSM 5 diagnostic criteria for PTSD can be found in the Glossary and are used internationally to guide diagnosis and treatment decisions in contemporary clinical contexts such as major trauma units. These criteria are based on historical distillation and expert consensus of what seem to be the key elements of each psychological condition, and

(ii) contemporary theories of comorbid chronic pain and psychological distress (particularly PTSD, but also relating to anxiety and depression).

This targeted, purposeful, approach is congruent with the investigative principles prioritised in translational research. Once this purposeful investigation was complete (see chapters 3-6), a further, more exploratory, investigation was undertaken exploring subjective patient-report on their experiences in relation to these targeted variable (see chapters 7-8).

### 1.2.2 Mixed Methods Approach

A mixed methods approach to translation was adopted in this programme of research. A mixed methods framework is particularly useful in situations where the knowledge base is preliminary, unreconciled or ‘stuck’. In such cases new insights may be generated from adopting different methodological perspectives and distilling congruent and incongruent messages as signposts for further exploration (Tashakkori & Teddlie, 2010). Within a translational framework this may involve comparing deep analysis of individual case studies, with broader landscape studies of outcomes for particular populations – through triangulation of data sourced from...
complementary methodologies in this way, shared findings can be highlighted to enhance strength of inference. Using mixed methods can also help to answer different aspects of the same question to create a more three dimensional understanding of the issues – in essence, it can assist researchers to develop bridges between previously irreconcilable translational stages – experimental work at one end and clinical practice at the other; statistical analysis at one end and the client voice at the other. The commitment to looking through different lenses locates both theory and stakeholder (expert and patient; or “expert by experience”; Happell et al., 2018) perspective as equally key considerations. The remainder of this chapter will consider the theory- and clinical practice-driven elements of this research. Patient perspective will be considered in more detail in chapter eight.

1.2.3 Ethnographic Methodology

Part of this thesis is undertaken within an ethnographic framework (Reeves, Kuper, & Hodges, 2008). In prefacing this work, the tradition is to ‘situate’ the researcher for the reader within the context of the research (Patnaik, 2013).

My role as a psychologist working and studying (since 2004) in the area of chronic pain, both within the public hospital and private systems, led me to the writing of this thesis. It grew out of a desire to understand what was working, and what was not, for our patients. In addition, my previous work with refugees, and sometimes with combat soldiers had led me to have an interest in posttraumatic stress symptoms, particularly where accompanied by apparently unresolvable pain. As well as assisting individuals to manage their chronic pain, I co-facilitate a short and long chronic pain programme within the hospital and, from time to time, within community health settings. The current research was undertaken in this context. While I have been the lead researcher on all aspects of these studies, I have been
fortunate enough to be surrounded by a great interdisciplinary chronic pain team comprising specialist doctors, physiotherapists, and occupational therapists – all of whom provide input into the treatment programme with invaluable and slightly different perspectives on the management of pain and distress. Where there was input into the treatment programme from other members of the hospital team, I have acknowledged them as part of the research team.

1.3. Searching for Clues: DSM 5 Diagnostic Criteria and Theories of Chronic Pain and Posttraumatic Stress

1.3.1 Chronic Pain Definitions and Assessment

Understanding pain is complex, as reflected in differing theoretical perspectives in the literature. An international organisation promoting research into the management of pain, the International Association for the Study of Pain (IASP) defined pain as:

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

("Pain terms: a list with definitions and notes on usage. Recommended by the IASP Subcommittee on Taxonomy," 1979, p. 250).

There has been criticism of this definition (Doleys, 2017),

“This definition of pain (chronic) has been of significant heuristic value. However, the definition and the models it has spawned tend to encourage the interpretation of pain as a measurable entity and implies that the patient’s experience of pain can be fully comprehended by someone other than the person in pain. Several major models of pain have been scrutinized and found
to propagate the notion of pain as a ‘thing’ and fall prey to biomedical reductionism and Cartesian (mind-body) dualism.” (p.1)

Raj (2007) refers to a five-axis assessment system recommended by IASP for multiaxial classification of chronic pain based on Merskey (1986), namely: region of the body, system (e.g., nervous, gastrointestinal), temporal characteristics (e.g., single episode, recurring), patient's statement of pain intensity and duration of pain, and aetiology. Commonly, the patient’s reported pain intensity ratings are used to assess pain (usually on a Numerical rating scale of 0 to 10 where “0” is no pain, and “10” is the most excruciating pain imaginable; Farrar, Young, Lamoreaux, Werth, Poole, 2001). However:

“Pain is a subjective experience (the experience is unique for each individual person with a different meaning to each person). The pain rating reflects a patient's interpretation of what that pain means for him/her at that moment and it is a combination of the patient's physical discomfort and emotional interpretation. Changes in pain intensity are valuable when measured for single individuals (for example, before and after a treatment), but they should not be used to compare pain between different individuals. One person's 4/10 might be another's 10/10.”

(The Joint Commission on Accreditation of Healthcare Organization in the United States, 2000).

Further, not only is subjectivity in rating pain across patients a problem, but the rating of pain intensity is more suited to a single pain site, rather than where there are multiple pain sites. Yet, logically, pain in multiple sites (discussed more fully in
section 4.2) may be a predictor of more significant or enduring pain experience and give rise to greater posttraumatic stress (Sharp & Harvey, 2001).

1.3.2 General Models of the Chronic Pain and Distress Experience

In attempting to identify the potential predictors of differential pain outcomes, in particular clinically relevant posttraumatic stress symptoms in the context of chronic pain, a range of well-known psychological theories and models of pain and PTSD were reviewed. In contemporary hospital and medical settings, it is now generally accepted that a biopsychosocial framework (Havelka, Lucanin, & Lucanin, 2009) is essential to understanding chronic pain and distress in contrast to past times when purely medical models were considered gold standard. Within a biopsychosocial framework, more specific diathesis-stress models of ill-health came to prominence in the 1960’s drawing on both genetic vulnerability and psychosocial or environmental factors (Asmundson & Wright, 2004). The assumptions of the diathesis-stress model have been summarized by Eysenck (1983) and Temoshok and Dreher (1992) and, uniquely, incorporate premorbid factors that impact pain response, both physical and psychological in addition to acute or ‘post-event’ factors. Firstly, individuals must possess a relatively permanent predisposition to the condition in question (in this case, chronic pain). Secondly, such individuals must experience some sort of stress (e.g., a traumatic injury). A major strength of the diathesis-stress model is that it explains why some people may experience a high degree of trauma yet not succumb to persistent pain, whereas others may suffer from much pain after minor injury. This model would suggest that the presence of a traumatic event by itself may be a necessary but not sufficient predictor of chronicity of pain and of poor psychological outcomes for chronic pain patients. Instead, there may be pre-existing factors that provide clues to patients who are more likely to
experience long-lasting effects of pain.

Some models focus on internal events, such as Loeser’s (1982) conceptual model of chronic pain and distress, which distinguishes four components of the pain experience: nociception (i.e., awareness of tissue damage), pain, suffering, and pain behaviours. Each of these domains, apart from pain behaviours, are private internal events that cannot be measured by others. Pain behaviours are observable and are often influenced by context (e.g., more pain behaviours at home as compared to attending a job interview). “Pain behaviours” were described by Loeser (1982, p. 146) as “the actions or inactions that imply the presence of tissue damage such as saying “ouch”, grimacing, taking pills, lying down, refusing to work and seeking health care”. In psychological jargon, many of these behaviours may more broadly include avoidance of pain, associated distress and situations in an effort to reduce suffering (Flor & Hermann, 2004; Hayes et al., 1999). A similar framework, the “Glasgow Illness Model”, was formulated by Waddell, Bircher, Finlayson, and Main (1984) and highlights physical problem, psychological distress (primarily anxiety and depression), illness behaviour, and social interactions. In sum, pain behaviours may be important predictors of chronicity of pain as well as of anxiety, depression and PTSD in chronic pain.

Yet other models and theories of the pain and anxiety, depression and posttraumatic stress emphasize the interaction of external and internal factors. One of the best-known models is the gate control theory of chronic pain postulated by Melzack and Wall (Melzack & Wall, 1965; Melzack & Wall, 1996). The authors hypothesised that the structures in the spinal cord act as a gate for sensory input that the brain interprets as pain. The gate may be closed by activity in the spinal cord but also by messages that descend from the brain which are influenced in turn by
premorbid and acute or ‘post-event’ contextual factors. Thus, the experience of pain may not only be influenced by sensory factors, but by beliefs, prior experiences, and emotional and cognitive factors. Melzack (2001) extended the gate control theory. His “neuromatrix” theory (relating to a network of neurons throughout the brain) placed a stronger emphasis on the brain’s role in pain perception. Melzack argued that chronic psychological or physical stress is often associated with chronic pain but, until the concept of his neuromatrix conceptual framework, the relationship had been poorly understood. Melzack postulates that pain is primarily caused by the output of a neural network (neurosignatures) in the brain and not directly by sensory input evoked by injury, inflammation, or other pathology. The neuromatrix may act even in the absence of sensory input, for example, as in the case of phantom limb pain (i.e., the absence of pain even in the absence of a body part). In sum, this theory again acknowledges the potentially impactful role of both premorbid and acute or post-event contextual aspects of beliefs, prior experiences, and emotional and cognitive factors, and that each of these factors may be predictors of psychological distress (used as a general term but including anxiety, depression and posttraumatic stress) in the context of chronic pain.

McEwen (1998) emphasized the impact of both internal and external stressors and proposed a theory of allostasis in relation to disease. According to this theory, where potentially stressful challenges occur, the body adapts or changes to achieve and maintain stability (homeostasis). This involves activation of neural, neuroendocrine and neuroendocrine-immune mechanisms. Ordinarily, the body copes effectively with such challenges and these adaptive systems are turned on and turned off efficiently (so the person survives). However, there are a number of circumstances in which allostatic systems may either be over-stimulated or not
perform normally. McEwen (1998, citing McEwen and Stellar, 1993) called this condition "allostatic load" or “the price of adaptation”. McEwen argues that this disequilibrium can result in a physiological response to stress and psychological distress.

McEwen argues that such allostatic load may take place in four situations:

(i) Frequent stress, prolonged exposure to stress;
(ii) Adaptation to repeated stressors of the same type is lacking, resulting in prolonged exposure to stress hormones
(iii) An inability to shut off allostatic responses after a stress is terminated;
(iv) Inadequate responses by some allostatic systems triggering compensatory increases in others (e.g., if cortisol secretion does not increase in response to stress, secretion of inflammatory cytokines, which are counter-regulated by cortisol increases).

McEwen postulated that allostatic load can lead to disease (including chronic pain) over long periods. Robinson et al. (2009) agreed, further asserting that allostatic load accumulated through both internal and external stressors. One might argue here that the influence of frequent or prolonged stress, and the inability to adapt to repeated stressors results in entrenched and maladaptive patterns of behaviours, which can perpetuate or even aggravate acute pain and distress.

Extending the notion of adaptation, Craig (2003) suggested that pain itself is a “homeostatic emotion”. He argued that the human feeling of pain is both a distinct sensation and a motivation (i.e., a specific emotion that reflects homeostatic behavioural drive, similar to temperature, itch, hunger and thirst). Pain may be regarded as one of many possible human emotions through which the integrity of the
body can be maintained in the face of conditions that threaten to disturb its homeostasis.

An explanatory model for pain, based on learning theory and memory, was advanced by Flor and Hermann (2004) and was more recently elaborated by Flor (2012) following a review of scientific literature. Flor (2012) argued that central, rather than peripheral, factors may be important to pain chronicity. She proposed that chronic pain is characterized by learning-related and memory-related plastic (mouldable) changes of the central nervous system, accompanied by maladaptive changes in body perception. Consequently, pain memories are formed at all levels of the nervous system, which is capable of maintaining a pain event in the absence of peripheral nociceptive input. Flor postulated that both explicit (semantic) and implicit types of learning and memory processes are important in chronic pain. However, implicit memory processes may be more pronounced, and Flor argues that because the implicit memory process is non-conscious it may be more difficult to treat. Flor further argues that the extinction rather than the acquisition of pain memories is the main problem in chronic pain. Further, even if a memory is extinguished, it may be reactivated by a change in context. Generalization of stimuli and responses can also make an acquired response difficult to extinguish. Finally, stressful events (e.g., a flare-up of pain) can act as an unconditioned stimulus and can reactivate an extinguished memory. Hence, memory will be considered as a central mechanism in the current investigation of posttraumatic stress following trauma.

Finally, theorists, such as Hayes (2012) emphasize the relationship between avoidant behaviours and pain and distress. Such authors postulated that pain becomes suffering when people have unaccepted thoughts and feelings and they
attempt to avoid the experience of pain and its attendant feelings of sadness, uncertainty, worthlessness. A related model that has received much attention is the fear-avoidance model (Tyrer, 2006; Vlaeyen & Linton, 2000). This fear–avoidance model is associated with a cycle of pain catastrophizing, hyper-vigilance, increased escape and avoidance behaviours, resulting in increased pain intensity and functional disability. In contrast, low fear of pain and “confronting” the pain leads to recovery.

In sum, biopsychosocial theories of pain coalesce on a number of key points:

(i) the interconnectedness of physical and psychological aspects of the pain experience, implicating the need for multiaxial assessment;

(ii) both premorbid and acute or post-event contextual factors that influence the pain experience, and subsequent posttraumatic stress symptoms, anxiety and/or depression;

(iii) both external and internal, conscious and pre-conscious factors affecting the pain experience, with memory being implicated;

(iv) a developmental aspect of the co-evolution of pain and psychological distress (including anxiety, depression and posttraumatic stress) in which adaptation to stress (in this case pain or a traumatic event) may or may not occur over time.

The evidence-base for these theories is still emerging. Of particular interest in the current thesis, these points of coalescence of biopsychosocial theories provide a platform for model development and empirical investigation in the context of application to trauma-related events, which is the focus of the current series of studies.
Consideration is next given to better understanding the psychological impact of trauma events through the lens of diagnostic criteria for post-traumatic stress, and theoretical models of comorbid pain and PTSD.

1.3.3 DSM 5 Criteria for PTSD

The DSM 5 (American Psychiatric Association, 2013) is one of two internationally recognised gold standard clinical diagnostic manuals. The DSM 5 PTSD criteria were selected over the International Classification of Diseases (ICD-10) (World Health Organization, 1992) given pending changes for the proposed ICD-11. In any event, Kuester et al. (2017) found that the agreement in PTSD diagnosis between DSM-5 and the proposed ICD-11, and between the superseded DSM-IV and DSM-5 was high (both $p < 0.001$). Nevertheless, (as evidenced by the revision of the DSM IV -TR, (American Psychiatric, Association, 2000) it is not always clear that even diagnostic criteria are in fact associated with the overall PTSD diagnosis. For example, Criterion A2 (“intense fear, horror, or helplessness”) in the DSM IV-TR was not included in the DSM 5 as it was found that “the subjective response does not add predictive ability to the objective definition” of PTSD and excluded individuals (e.g. military personnel) who did not experience this response (Pai, Suris, & North, 2017).

Key criteria from the DSM 5 include (see Glossary for more detail):

- A “traumatic event” for PTSD (Criterion A) must include either the threat of death or “actual or threatened serious injury, or sexual violence”.

- Disrupted memory, “an inability to recall key features of the traumatic event”, is another DSM 5 criterion which seems important to an assessment of possible PTSD - as previously noted, is also implicated in the maintenance of chronic pain. Although disrupted memory is not classified in a separate category (it
is one of seven criteria included in Criterion D, Negative cognitions\(^2\), McNally (2009) argued that memory of the trauma is “the heart of the diagnosis” (of PTSD) to which the core symptoms (Criteria B-E) are all tied:

“One cannot have intrusive memories (Criterion B) in the abstract. An intrusive memory must be a memory of something, and that something is the traumatic event (p.599).”

The remaining criteria (refer Glossary to this thesis - Criteria B: Intrusions; C: Avoidance. D: Negative cognitions; E Alterations in arousal and reactivity) are also responses to an event (rather than direct causal stimuli), may overlap with symptoms of anxiety or depression, and potentially may be intertwined, maintained or aggravated by other external stressors and life experiences rather than being uniquely linked to the traumatic event. There are three other required criteria:

Criterion F relates to duration of symptoms (one month or more); Criterion G relates to functional significance (the symptoms create distress or functional impairment); and Criterion H is an exclusion (namely that the symptoms are “not due to medication, substance use or other illness”). The assumption in the DSM 5 is that the symptoms are post-trauma, but it is not clearly operationalized in the DSM 5 as to how these symptoms may be distinguished from pre-existing symptoms.

In seeking to adopt a translational approach, this thesis prioritises and foregrounds the realities of hospital outpatient units and their patients in methodological decision making. In such contexts, diagnostic criteria are paramount in clinical decision making and reflect current expert consensus on the nature of mental health conditions. As such, the DSM 5 definition of PTSD was used to guide

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\(^2\) Criterion D, in addition to “inability to recall key features of the trauma”, also includes: overly negative thoughts; exaggerated blame, negative affect, decreased interest in activities, feeling isolated, difficulty experiencing positive affect – two criteria required for diagnosis of PTSD.
the search for practice-relevant predictors of posttraumatic stress in the context of chronic pain. The DSM can be regarded as a clinician’s practical guide for communication, diagnosis and interventions. However, it is “descriptivist” (classification by symptoms), rather than theory driven (Lalumera, 2016) and, as such, theoretical models of comorbid pain and PTSD provided a complementary source of evidence to guide the development of this programme of research.

1.3.4 Specific Models of Comorbid Pain and PTSD

The current thesis is particularly concerned with posttraumatic stress, experienced by chronic pain outpatients who have experienced a traumatic event. Models of comorbid pain and PTSD capture key theoretical perspectives on how posttraumatic stress and pain can influence one another. Asmundson, Coons, Taylor, and Katz (2002) outlined four possible scenarios describing the relation between PTSD and chronic pain:

a. They co-occur but are unrelated

b. One causes the other (PTSD causes pain or vice versa)

c. Each influences the other in some way (e.g., chronic pain exacerbates the symptoms of PTSD or vice versa)

d. Or some third factor (for example, a genetic predisposition) causes both.

Asmundson, et al. (2002) note that the third and fourth possibilities are not mutually exclusive and go on to argue that there is mounting evidence against the first two possibilities.

A paper by Otis, Keane and Kerns (2003) reviewed four models:

1. Sharp and Harvey (2001) proposed a mutual maintenance model (i.e., chronic pain and PTSD are mutually maintaining conditions) and argued that attentional biases may be present in both chronic pain and PTSD
patients such that they attend to threatening or painful stimuli. An individual with PTSD may become emotionally or physically upset when reminded of the traumatic event and this may increase their pain. For individuals with chronic pain, the pain may serve as a reminder of the traumatic event, which will aggravate the PTSD. A vicious cycle is then created with avoidance, which leads to disorders, reduced physical activity and increased disability. This results in ineffective attempts to minimize pain and disturbing thoughts. Although the authors refer to a “mutual maintenance” model of pain and PTSD, it also models vulnerability (as do all the models referred to in this section) as it emphasizes the inherent vulnerability of certain individuals to comorbid chronic pain and distress.

Sharp and Harvey list seven factors that they believe contribute to the mutual maintenance of pain and PTSD and increase distress and dysfunction:

a. Attentional and reasoning biases toward threatening stimuli and pain-related stimuli
b. Anxiety sensitivity
c. Reminders of the trauma
d. Avoidance
e. Depression and reduced activity levels
f. Anxiety and pain perception
g. Cognitive demand (e.g., catastrophizing for pain patients and intrusive re-experiencing and catastrophizing for trauma patients) from symptoms limiting use of adaptive strategies.
In a longitudinal study, Liedl et al. (2010) investigated the predictions of the mutual maintenance model concerning the relationship between each PTSD symptom cluster and pain over the course of post-traumatic adjustment. They found that (i) the relationship between acute pain and twelve-month pain was mediated by hyperarousal symptoms at three months and (ii) the relationship between twelve-month hyperarousal and re-experiencing symptoms was mediated by three-month pain levels. The researchers concluded that the findings provided evidence of mutual maintenance between pain and PTSD (Tyrer, 2006; Vlaeyen & Linton, 2000).

There is some indication in other research literature that two of the potential maintaining factors listed by Sharp and Harvey, namely anxiety and depression, cause a greater vulnerability to chronic pain. For example, Shaw et al. (2010) considered whether pre-existing psychiatric diagnoses increased the likelihood of men (N = 140) transitioning from subacute to chronic pain. The participants were identified at six to ten weeks post-onset of low back pain by their primary providers and re-evaluated at six months post pain onset. A life-time history of at least one DSM-III-R psychiatric disorder was present for 59% (n = 83) of the patients. It was found that men with a diagnosis of pre-pain Major Depressive Disorder had approximately five times the risk of transitioning to chronic pain (OR = 4.99, 95% CI = 1.49, 16.76). Increased risk was also associated with a diagnosis of Generalized
Anxiety Disorder (GAD; OR = 2.45, 95% CI = 1.06, 5.68) and PTSD (OR = 3.23, 95% CI = 1.11, 9.44).

However, Ravn, Hartvigsen, Hansen, Sterling, and Andersen (2018) cast some doubt on the stringency of the mutual maintenance model. They commented that there were flaws in separating the symptoms of pain and PTSD within pain populations that could cause the identification of PTSD to be “inflated”. The researchers conducted a systematic review of the literature (N = 7 studies deemed of acceptable quality) to synthesize results from cross-lagged studies on pain and PTSD and in particular to assess the evidence for longitudinal reciprocity and potential mediators. They found that cross-lagged models showed inconsistent evidence of both bidirectional (i.e., mutual maintenance) and unidirectional interaction (when only one cross-lagged coefficient was significant) between pain and PTSD across time. The synthesis highlighted that hyperarousal and intrusion symptoms may be of importance as mediators in the cross-lagged relationships, but there was inconclusive evidence of catastrophizing as a mediator. They concluded that the research suggested “an entangled, but not necessarily mutually maintaining relationship between pain and PTSD symptomatology” (p. 2167).

2. Asmundson et al., (2002) proposed a shared vulnerability model of chronic pain and PTSD, emphasizing individual differences arising out of genetic and environmental influences. Here, anxiety sensitivity is considered a predisposing factor contributing to the development of both conditions. It was argued that people with high anxiety sensitivity become more fearful of physical sensations. When the traumatic stressor and pain-precipitating event
are the same or occur closely in time, anxiety sensitivity may “amplify the collective response and may increase vulnerability for development of both conditions” (p. 933). The shared vulnerability model postulates that the resultant attentional bias for threat serves as a shared cognitive vulnerability for both PTSD and chronic congruent stimuli which are then avoided, maintaining symptoms of anxiety and pain.

Based on this model (and Sharp and Harvey’s, 2001 mutual maintenance model), more recent studies have explored the association between attentional bias and autonomic arousal in individuals with PTSD and chronic pain by using experimental methods such as an acoustic startle test (Carleton, Duranceau, McMillan, & Asmundson, 2018), modified Stroop (Buckley, Blanchard, & Hickling, 2002) and dot-probe (Bardeen, Fergus, & Orcutt, 2013) tasks. Carleton et al. (2018) concluded from the positive findings in their study, as well from other studies they reviewed (citing Buckley, et al., 2002; Bardeen, et al., 2013; Schoth, Nunes, & Liossi, 2012), that persons with PTSD and chronic pain have attentional biases for trauma- or pain-related stimuli – but notably the results were not robust for anxiety (citing Crombez, Van Ryckeghem, Eccleston, & Van Damme, 2013). Carleton et al. concluded that their findings are supportive of both contemporary theory of comorbid chronic pain and PTSD (citing Asmundson & Katz, 2009) and DSM-5 classifications (American Psychiatric Association, 2013), and that chronic pain and PTSD may produce startle response patterns that are measurably distinguishable from those seen in other disorders.

3. Keane and Barlow (2002) proposed a *triple vulnerability* model for anxiety, PTSD and chronic pain. Here, there is:
a. A generalized biological vulnerability;

b. A generalized psychological vulnerability based on early experiences of control;

c. A more specific vulnerability in which an individual learns to focus on anxiety in specific situations.

They proposed that for people to develop a chronic pain condition they must also develop a belief that the pain is proceeding in an unpredictable and uncontrollable manner. When the pain is perceived to be uncontrollable, this leads to feelings of low self-efficacy and fear of entering situations in which pain may occur, leading to avoidance. This model also emphasizes vulnerability based on early experiences and a learnt vulnerability behaviour (focusing on anxiety in specific situation). Little empirical evidence for or against this model was found in the literature.

4. An amended fear avoidance model was put forward by Norton and Asmundson (2003; citing Vlaeyen & Linton, 2000) in relation to chronic pain, which emphasizes the contributions of physiological symptoms (e.g., heart rate, muscle tension and increased blood flow) and arousal (Keane & Barlow, 2002; Norton & Asmundson, 2003). They argue that this arousal in turn influences fear, anxiety, and catastrophizing, which increase avoidance behaviours – thus maintaining intrusions and arousal (PTSD).

Scioli-Salter et al. (2015) also returned to a more biological emphasis and focused on interrelated neurophysiology of chronic pain and PTSD that may contribute to the co-prevalence and synergistic interactions of the conditions. The authors postulate that shared pathophysiological mechanisms explain the comorbidity of chronic pain and PTSD. They raise the possibility
of treating chronic pain and PTSD simultaneously by therapies strategically targeting biological pathways. Scioli-Salter et al. (2015), like Norton and Asmundson (2003), attempt to explain the relationship between chronic pain and PTSD by giving more emphasis to biological factors. However, despite the attempts of medical doctors to find a “cure” for pain and associated distress, the underlying processes remain enigmatic. Again, little empirical evidence for or against this model was found in the literature where there is a general consensus in favour of a biopsychosocial framework addressing all elements an individual’s pain and distress.

Biopsychosocial models of chronic pain and other forms of psychological distress, specifically, anxiety or depression, follow the model presented in relation to PTSD with the significant difference being that there is no need to implicate a triggering traumatic event (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). Indeed there are no models in which trauma-induced chronic pain is paired with depression or anxiety – the likely assumption being that PTSD will best capture experiences of emergent psychological distress.

1.3.5 Summary of General and Specific Models of Chronic Pain, PTSD, Anxiety and Depression

    General models of chronic pain provide a broad explanation of the factors that may contribute to distress in chronic pain outpatients highlighting:

    (i) the interconnectedness of physical and psychological aspects of the pain experience implicating the need for multiaxial assessment;

    (ii) both premorbid and acute or post-event contextual factors that influence the pain experience, and subsequent clinically relevant posttraumatic stress symptoms, (but also anxiety and depression);
(iii) both external and internal, conscious and pre-conscious factors affecting the pain experience, with memory being implicated;

(iv) a developmental aspect of the co-evolution of pain and psychological distress (anxiety, depression and/or posttraumatic stress) in which adaptation to stress (in this case pain or a traumatic event) may or may not occur over time.

Specific models of comorbid pain and posttraumatic stress add two further dimensions to this discussion. Specifically, that shared underlying cognitive and behavioural mechanisms create:

(v) shared vulnerability for chronic pain and also for complex posttraumatic stress; and

(vi) potentially unhelpful patterns of mutual maintenance.

These variables all have credible theorised roles as independent factors that may be relevant to the onset, maintenance or aggravation of persistent pain as summarised in Figure 1.
The main elements of these specific models of chronic pain and PTSD overlap considerably with the more general models of chronic pain, although in the comorbid models there is a greater emphasis on the traumatic event, and memory of the event.

1.3.6 Evaluation of Models

The models reviewed in sections 3.3 and 3.4 describe and attempt to explain the development and maintenance of chronic pain and distress. All the models adhere to broad biopsychosocial conceptual frameworks but differ in the emphasis given to the role of premorbid and acute or post-event factors in influencing the pain sensation, emotional distress, pain behaviours (especially avoidance), and response to stressful events in the development and maintenance of pain and PTSD.

Similarly, the mechanisms of impact differ, with each model focussing on different
levels of explanation from biological to cognitive to social. It is also noteworthy that cause and effect are often difficult to disentangle when examining the relations between chronic pain, distress and avoidant behaviours. It is clear that unscrambling the intersect between a traumatic pain event, chronicity of pain and posttraumatic stress remains a work in progress. Research is preliminary in identifying the nature of complex psychological distress in trauma-induced chronic pain patients, and even more so in understanding individual differences that may make some patients more vulnerable or treatment-resistant than others. The latter is of most concern to clinicians operating in resource-restricted hospital settings and provides the translational impetus for the current series of studies.

The reviewed models provide useful theoretical considerations for understanding a process of psychological vulnerability and mutual maintenance of pain and clinically relevant posttraumatic stress. The next step is to operationalise key elements of these models and also to look at the intersect between the factors highlighted.

### 1.4 The Current Programme of Study

This introductory chapter has outlined current limitations in the evidence-base for informing treatment planning for patients who are experiencing chronic pain and posttraumatic stress, as well as anxiety and depression following a traumatic injury. The available evidence makes it clear that there is a significant number of patients who experience chronic pain and posttraumatic stress following trauma-related injury and that there is a significant economic as well as social and individual impact of this distress. It is also clear that psychological therapies, mainly CBT, are effective for many but not for the majority – there remains a significant unmet need in this area.
The current programme of study takes as its starting point, key theories of pain and distress which coalesce around a biopsychosocial framework emphasizing the potential impact of both premorbid and post-injury factors; of internal and external factors; and of the nature of the event. From this starting point and given the constraints of a PhD sized piece of research, several elements of these models will provide the foundation stone for an investigation of the nature of clinically relevant posttraumatic stress in patients with trauma-related injury and chronic pain.

The translational impetus for this thesis helped to further prioritise which elements to focus on. Specifically, priority was given to features that are likely to be (i) most visible (or verbally accessible) in clinical contexts, and thus most amenable to assessment and investigation; and (ii) those that are likely to be open to being operationalized in the context of intervention planning, implementation and evaluation. This lens also recognizes the complexity of the co-evolution model of pain and posttraumatic stress, in which cause and effect is currently unclear and in which complex constellations of factors are likely to be implicated. In this context, evaluating multiple accessible indicators, both objective and subjective, seems the most supportable level of investigation. Conversely, mechanisms of impact such as genotypes, allostatic systems, cognitive biases, neural markers of emotion regulation, and anxiety sensitivity were excluded from consideration. Whilst each is important in understanding chronic pain, they are more readily investigated in laboratory studies and less available to clinicians as potential screening measures in a hospital context.

1.4.1 Aims in Thesis

The academic priority in this series of studies is to make an intellectual contribution to our understanding of the symptoms and drivers (rather than the
mechanisms) of comorbid chronic pain and clinically relevant posttraumatic stress following traumatic injury, specifically addressing:

1. the interconnectedness of physical and psychological aspects of the pain through multi-measure single sample assessment of event-related characteristics, patient-related characteristics, patient experience of pain, and patient report of posttraumatic stress;
2. premorbid, acute and post-event contextual factors that may influence the pain experience, and subsequent posttraumatic stress, in particular, broader life context (premorbid); injury severity (acute); and time since injury (post-event contextual factor);
3. both external and internal factors effecting pain and posttraumatic stress, specifically, the nature of the pain event (external: trauma or non-trauma event); extent of pain (internal); and memory of the event (internal);
4. the developmental aspect of the co-evolution of pain and posttraumatic stress by comparing sub-acute and chronic pain groups;
5. shared vulnerability for chronic pain and also for complex psychological distress, namely comorbid posttraumatic stress, anxiety and depression, by reporting on rates of comorbidity; and
6. potentially unhelpful patterns of mutual maintenance by considering rates of comorbidities in subacute and chronic groups.

Basic demographic factors that may influence each of these drivers will also be considered in relation to the composition of participant groups, specifically, age and gender.

The translational rationale behind this thesis is to inform the direction of
resources to those patients most likely to need them at an early stage, and to identify ways in which intervention could be personalized to increase chances of success. Holding this translational (T1) clinical frame of reference in mind helped to narrow the focus of the research to a manageable but potentially impactful investigation that stretches from ‘bench to bedside’ (Rubio et al., 2010).

This thesis sought to fill a primary gap in the research literature by answering the following questions:

1. Whether posttraumatic stress associated with chronic traumatic pain in hospital outpatients may be efficiently predicted by health practitioners from a combination of judiciously selected factors based both on theory and gold standard clinical diagnostic criteria (DSM 5, American Psychiatric Association, 2013) as described above. Two points in time were considered of relevance:
   a) at point of injury (subacute), identifying who is most at risk of developing chronic pain and clinically relevant posttraumatic stress;
   b) at point of treatment for chronic pain, identifying who is likely to benefit from standard treatments and who may require a different approach.

2. What is the nature of clinically relevant posttraumatic stress in patients with chronic pain after a traumatic event, with a particular interest in the interplay of comorbidities (in the context of models of complex vulnerability and mutual maintenance); and

3. Whether the selected predictive factors have sensitivity and specificity to trauma-induced chronic pain or whether they are also
found among pain patients whose injury event was not trauma related.

A series of studies is required to answer these questions, in combination. To this end, the following series of studies explored these factors by comparing chronic pain patients whose pain was of traumatic origin with (i) pain patients in the subacute stage whose pain was of traumatic origin, and (ii) a chronic pain group whose pain was assessed to be non-traumatic in origin. The first comparison assists us to understand the developmental trajectory of chronic pain post-trauma and is intended to inform early treatment planning and resource allocation by identifying those most at risk early in their recovery. The comparison of the traumatic and non-traumatic chronic pain groups enables a consideration of whether a traumatic pain event is sufficient to distinguish the expression and experience of distress between groups chronically affected by pain.

The thesis therefore aims:

1. To examine in depth the impact of potentially moderating factors on distress in chronic pain patients, namely: objective event-related characteristics of injury severity, nature of the pain-inducing event (traumatic or non-traumatic) and time since injury (acute, subacute or chronic phase of recovery); and subjective patient experience, specifically, self-reported extent of pain and extent of memory of the pain-inducing event;

2. To review and draw not only on theory and diagnostic practice but to investigate the patients’ own accounts of their pain and distress within their whole life-context, and to consider the individual characteristics and histories of hospital outpatients so as to add to the understanding of the relationship
between longstanding personal-contextual factors, distress and coping preferences in response to pain.

3. To understand what characteristics or influences contribute to, or cause pain and distress and to understand why for some patients, avoidance, hyperarousal and “boom-bust” behaviours do not change even after an intensive CBT pain management group programme.

4. Finally, to draw on the findings in these studies and the research literature to provide an efficient client-centred framework to supplement diagnostic criteria and improve personalisation of treatment choices.

1.4.2 Selection of Potential Predictors of PTSD after Traumatic Pain

There is a large array of potential predictors that have been argued to be associated with PTSD and chronic pain. As such, the determination of which ones to investigate within the scope of this PhD thesis, was admittedly subjective, and other researchers may have chosen differently. In line with the translational agenda, priority was given to IVs that were determinable by busy clinicians and which can be said to be patient-centred and directly related to a traumatic pain event (injury severity, pain extent, extent of memory of pain event) in patients attending a hospital outpatient department. Other factors that could be said to be associated with comorbid PTSD and chronic pain were less directly related to the traumatic event and included pre-hospital admission factors (e.g. cultural and social factors), and factors related to hospitalization (e.g. type of surgical intervention, intensive care duration) rather than the event per se or the patient’s experience of the event and associated trauma. Some psychological factors (e.g. anxiety and depression) (Daoust et al., 2018) may also be related to a traumatic pain event and comorbid with PTSD but it was felt that the relationship was potentially less direct and that these conditions may also be related
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to social or other factors. Similarly, other psychological factors (e.g. pain catastrophizing, e.g., Williams, Eccelston, & Morely, 2012; Norton and Asmundson, 2003; Sharp & Harvey 2001) were also considered to be broad constructs commonly associated with pain-related anxiety and depression, and not only PTSD (Quartana, Campbell, & Edwards, 2009). It is emphasized, therefore, that although there are other potential predictors of clinically relevant posttraumatic stress (social, cognitive or affective), this thesis confined itself to the main topic of chronic pain and PTSD.

Having regard to the translational priority of this research, the diagnostic criteria reviewed in this chapter can be helpfully distilled and organised into two broad categories of predictors which in combination are aimed at covering the experience of pain precipitated by a traumatic event:

1. **Event characteristics**: the nature of the event itself (traumatic or non-traumatic); injury severity; and time since event (chronic pain vs subacute pain).

2. **Patient experience of pain and trauma-related events**: (i) self-report of extent of pain and of memory of the pain event. Both pain and memory are subjective variables in the sense that clinicians must rely on the self-report of the patient in making their assessment. However, the reliance solely on clinician opinion of distress and pain and the mechanistic application of diagnostic criteria in clinician’s assessment may also lead to a lack of understanding of the patient condition (British Psychological Society, 2011; Bach & Moran, 2008). The fallibility of only using a pain intensity scale particularly for comparisons between participants was also discussed in section 3.2 above. As an alternative, I selected pain extent from among the five-axis classification system referred to by Raj (2007) on the basis that this was more objectively confirmable by the clinician and less open to subjective interpretation by participants. Smith, Elliott, Hannaford, Chambers, and Smith
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(2004) compared the prevalence of chronic back pain (CBP) at two points four years apart. Seventy-one per cent of participants (N = 2,184) still had chronic back pain (discrete or with other pain areas after 4 years. The researchers found that more severe pain (pain intensity) did not predict persistent pain at the same or more widespread.

(ii) The second subjectively determinable factor was the patients’ memory of the traumatic pain event (whether complete, partial or no recall). Disrupted memory, namely the inability to recall key features of the traumatic event is a key criterion of the DSM 5 (American Psychiatric Association, 2013, Criteria D - discussed above in section 3.1). On the other hand, it has been argued that a lack of memory of a traumatic pain event may spare the patient from the effects of injury-related traumatic memories (Gil, Caspi, Ben-Ari, Koren, & Klein, 2005; King, 2008). The utility of this combination of predictors will be evaluated by triangulating analyses between and within chapters. This sequence of analyses is based on data from patients from the same outpatient clinic to maximise comparability.

1.4.3 Complex Cases: A Mixed Methods Case Study Approach

Both clinical experience and the biopsychosocial model suggest that there will likely be some cases of extreme complexity which may elude interpretation through quantitative analysis of even carefully selected and diagnostically and theory-based, event and post-event, predictors. Certainly, it is likely that these cases are found amongst outpatients who do not benefit from standardised biomedical and CBT-based treatments. It was expected that some individual’s pain and trauma experience would be so complex and unique and set within a myriad of other life experiences that broader contextual elements would have to be investigated to adequately inform treatment needs. To this end, an in-depth case study, whole-of-
person, approach was adopted in relation to a selection of such cases with a view to better understanding the non-linear elements of chronic pain following trauma (Shaughnessy, Zechmeister, & Zechmeister, 2006). It was decided that triangulation of standard measures of pain and distress, with interview-derived ‘self-stories’ would enable an important appreciation of the influence of premorbid factors in the development of these cases.

The risk of not undertaking detailed case studies is that the standard risk assessment could raise the same criticism as medical models of pain, specifically, that it is “mechanistic” (Bach & Moran, 2008; British Psychological Society, 2011) and (as stated in the introduction to this paper) falls into a biomedical “mind-body” divide in which pain (or PTSD) is seen as a “thing” separate from the patient (Doleys, 2017). It also potentially underestimates the dynamic and shifting “load” (McEwen, 1998) of environmental and social life-events, which, as has been discussed, may give rise to symptoms reflecting PTSD, anxiety and depression, and maintain pain.

In sum, when treating a large number of patients, a mechanistic “one size fits all” approach may assist the majority of patients, leaving only the more complex patients to receive more targeted interventions. However, for these patients it seems important to look more deeply at personal contextual factors through a qualitative investigation of subjective experiences and the client’s broader contextual frameworks for understanding the world (Bach & Moran, 2008; British Psychological Society, 2011). From the general and specific theories outlined above, I argue that distress undergoes a shift from being primarily under direct autonomic control related to a traumatic pain event (a normal response to an adverse event) to being influenced and maintained by an accumulation of complex and often indirect
stressors (Törneke, 2010). In this sense, an over-focus by clinicians in the chronic stage on a narrow range of factors such as a historical traumatic event, or selected vulnerability factors and on medical or CBT-based treatments alone for persistent pain may simply be a distraction from the fundamental and idiosyncratic factors motivating the individual patient and dictating emotional and behavioural responses. In this paradigm, it is argued that longstanding, premorbid beliefs often observable in behavioural patterns provide a “window” into such complex life contexts and experiences that may impact both the experience of traumatic events and of pain itself, even though they may not relate directly to the event.

1.4.4 Overview of Thesis Chapters

Chapter 1 has provided an overview of this thesis to orient the reader and introduce relevant foundational information, specifically: the definitions of pain and PTSD and the rates of comorbidity between PTSD and anxiety and depression; and the theories and models of chronic pain and trauma.

Chapter 2 leads on from Chapter 1 and undertakes a literature review based on a systematic search of potential predictors of chronic pain and distress that are based on the theories (vulnerability) and diagnostic criteria for comorbid pain and PTSD. It seeks to translate the academic theory into real world hospital outpatient settings using a range of carefully selected and clinically available factors, namely: event-related characteristics (initial injury severity; nature of the event and time since injury); and patient experience (self-reported extent of pain and memory of the traumatic event). The review also explores the literature in regard to patient characteristics (age and gender) which may impact on posttraumatic stress after a traumatic pain event. Against the background of this literature review, the series of
five studies which follow Chapters 1 and 2 includes elements of objective-empirical and participant-researcher methodology.

In Chapter 3, Study 1, both the combined and univariate effect of the range of predictors (reviewed in Chapter 2) is investigated in a sample of participant outpatients attending a subacute trauma clinic (three months post hospital discharge after serious injury). The question is whether predictability of clinically relevant posttraumatic stress is enhanced by a combination of all or some of the carefully selected variables (event-related, subjective report of pain and memory extent) and as such a quantitative statistical approach is adopted.

Chapter 4 (Study 2) seeks to replicates the subacute trauma study (Study 1) in a chronic traumatic pain group and compares the findings to the findings to the same subacute trauma group. The question is whether predictability of clinically relevant posttraumatic stress is enhanced by a combination of all or some of the carefully selected variables (event-related, and subjective report of pain) and as such a quantitative statistical approach is adopted.

Chapter 5, Study 3, compares PTSD and comorbid distress in the patients whose chronic pain was traumatic pain in origin with those whose pain was non-traumatic. An important question is the extent to which the origin of the pain matters in predicting the extent of subsequent distress. The diagnosis of PTSD requires that
a traumatic event has occurred, but it is unclear whether this uniquely contributes to
greater subsequent distress or, indeed, whether it unhelpfully diverts clinical
attention away from patients with pain of non-traumatic origin who may be just as
distressed.

Collectively, Studies 1, 2 and 3 aim to provide an evidence base to inform
decisions made about prediction of PTSD and distress in chronic pain outpatients,
the likely need for intervention, and their follow-up. However, the question still
remains as to whether some hospital outpatients attending with traumatic pain have a
life context and history simply too complex for quantitative statistical analysis to
adequately provide an understanding into what has precipitated their pain and PTSD,
or for them to respond to “mechanistic” (Bach & Moran, 22008) hospital treatments
as usual. Given the economic realities of healthcare for chronic conditions, there is
an argument that such hospital outpatients should be identified and targeted at an
earlier stage, rather than adopting a response-to-intervention (trial and error)
approach, which is very costly and time consuming for patients and practitioners
alike. A more personalised psychological approach to assessment, and treatment is
important for these patients. Chapters 6 to 8 of this thesis seek to explore in depth the
complexity of pain and PTSD in patients who attend typical interdisciplinary
hospital outpatient pain management groups.

Chapter 6 reviews the contents of CBT-based chronic pain management
programme and the evidence for the overall efficacy of the interventions. The
relevance of models of chronic pain and PTSD to the intervention is discussed (e.g.,
in addressing avoidance or as sense of loss of control). Chapter 7, Study 4, evaluates
a typical pain management programme, in terms of quantitative outcomes for
clinically relevant posttraumatic stress and functioning. It explores whether pain
event characteristics (traumatic, non-traumatic) affect post-intervention outcomes and the participants’ choice of demonstrated pain management strategies.

Chapter 8 Study 5 investigates the variability in CBT treatment success among ten participants who attended the selected chronic pain management programme through utilising a mixed-methods approach. While the use of standard measures of pain and distress can indicate the magnitude of change with treatment, the qualitative case study analysis of patients’ responses (N =10) complemented this by offering insights into how the programme was perceived, patients’ differing attitudes toward and experiences of their own pain, specific behaviours that enhanced or detracted from treatment efficacy, and what they did and did not find helpful of the demonstrated pain self-management strategies. It also provided detailed information about aspects of patients’ life context, available support and additional stressors that were salient to them. This serves to illuminate some of the obstacles to effective treatment that occurred for particular people, as well as the considerable variation in uptake of pain management strategies taught. Such individualised in-depth analysis of patients’ pain and distress is ordinarily too burdensome for patients and for hospital staff in outpatient units to routinely assess.

In this thesis, how and when such comorbid pain and distress are investigated was determined by a combination of realistic scope of a PhD programme of study, relative relevance to the population of trauma-induced chronic pain (see 2.4 for further explication), availability of existing data and accessibility of collection of new data with this highly specialist and vulnerable chronic pain population.

The final Chapter 9 discusses the findings from all studies in terms of the aims of this thesis and in terms of current models of pain and PTSD.
A flow-chart for the studies in this thesis is set out below in Figure 2. In each chapter to follow, this figure will be used to introduce the chapter and highlight which section of this plan is being addressed.

The next chapter considers the research literature concerning potential early predictors of pain and distress.
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Introduction and literature review

Chapter 1
Introduction

Chapter 2
A comprehensive theory-driven and diagnostically driven review of potential predictors (IVs) of psychological distress in the context of chronic pain caused by a traumatic event: Objective event-related characteristics (injury severity: ISS); objective client characteristics (demographics: age, gender); subjective patient experience (self-reported extent of pain and memory of event).

Predictors of distress in subacute trauma patients

Chapter 3, Study 1
Outpatients attending a subacute trauma clinic (ISS>15), (early hospital utilization, 3-6 months post-discharge).

Predictors of distress in chronic pain patients with pain of (i) traumatic origin and (ii) non-traumatic origin

Chapter 4, Study 2
Outpatients attending a chronic pain management program (hospital utilization, pain > 1 year).

A quantitative analysis (profiling) of predictors of levels and incidence of psychological distress in chronic pain patients with pain event of traumatic origin (N=64).

A comparison of findings in Studies 1 and 2: Chronic pain trauma (N=64)
Subacute pain trauma (N=77)

Chapter 5, Study 3
Chronic pain trauma (N=64)
Chronic pain no trauma (N=88)

Compare distress and predictors between chronic pain trauma and chronic pain no trauma groups.

Understanding treatment outcomes for chronic pain patients

Chapter 6
A literature review of program contents and outcomes of chronic pain management groups.

Chapter 7, Study 4 (N=92). The association between traumatic and non-traumatic pain and outcomes after a pain management group intervention are explored.

Chapter 8, Study 5
Case studies (N=10)
Thematic analysis of structured interviews seeking themes relating to pain attributions, patient behavioral patterns, and most useful self-management strategies from CBT program utilised, motivations to self-manage pain.

A practical application: Triangulation of informal observations of behavioural patterns in group setting with measures and thematic categories.

Chapter 9
Final summary and Discussion.

Figure 2 A flow-chart for thesis
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POSTTRAUMATIC STRESS IN CHRONIC PAIN PATIENTS


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Introduction

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Summary

Early prediction of potential risk of PTSD in hospital patients with pain or serious injury is elusive. This review investigates evidence for a broad range of theory-derived potential predictors commonly available to clinicians in busy hospital outpatient settings which were categorized as: event characteristics (injury severity, patient experience (pain extent, memory of pain event). Patient characteristics (age, gender) were also reviewed as these may impact on vulnerability to PTSD and anxiety and depression after a traumatic pain event. The reviewed literature revealed some conflicting evidence for younger age and female gender, diffuse pain and consciousness or complete memory of the trauma/pain event as predictors of PTSD in chronic pain hospital outpatients.
Abstract

Background and aims. Early prediction by health practitioners of vulnerability to posttraumatic stress disorder in outpatients who have experienced serious or traumatic injury may help prevent escalation into chronicity. The research question addressed in this paper is whether there is evidence in the research literature to support the utility of theory-derived objective event characteristic (initial injury severity), and subjective client experiences (self-reported pain extent and memory of the pain event) in predicting clinically relevant posttraumatic stress symptoms. Patient demographics (age and gender) and its influence on PTSD as well as anxiety and depression was also explored although this research focused on comorbid pain and traumatic memory.

Methods. A literature review was conducted in relation to the hypothesised predictors of PTSD in hospital outpatients seeking treatment for chronic pain or past serious injury. Twenty-nine relevant studies (17 prospective and 11 retrospective) published between 1990 and 2018 were identified.

Results. There was no consistent evidence that univariate factors (event related, or subjective experience) relating to chronic pain or serious or traumatic injury could predict clinically relevant symptoms of PTSD, nor anxiety and depression. There was some evidence that the personal characteristics, younger age and female gender, were associated with PTSD in chronic pain and injured outpatients. Notably, injury severity did not predict PTSD. Although objectively rated injury severity was not strongly supported as a predictor of distress, patient self-report of pain site or extent may be predictive (particularly involving spinal pain). Patients’ memory of their
experience of the traumatic event and its association with PTSD is little understood given that even patients who were unconscious at the time of injury may develop PTSD.

Conclusions. The complexity of comorbid chronic pain and PTSD may necessitate a more sophisticated multivariable analysis of theory-based predictors or deep qualitative analysis of case studies rather than a mechanistic review of univariate factors. Further research is required to provide evidence-based clinical guidelines for targeted psychological treatment for patients at risk of developing chronic pain and psychological distress.
2.1. Introduction

2.1.1 Background to the Review

Persistent psychological distress (anxiety, depression and/or posttraumatic stress) is a common sequela where chronic pain arises out of a traumatic event. Posttraumatic Stress Disorder (PTSD) after traumatic injury is the most studied form of psychological distress and has variously been found to be 17% at four months post-discharge (Zatzick, Jurkovich, Gentilello, Wisner, & Rivara, 2002a) and 30-40% at twelve months post-discharge (Kessler, Chiu, Demler, & Walters, 2005). The incidence of depression after traumatic injury has been found to be 27% (Soberg, Bautz-Holter, Roise, & Finset, 2010) to 45% (Ahman & Stalnacke, 2008); and anxiety disorders 27-29% in treatment-seeking pain samples though trauma-related data is harder to come by (Asmundson and Katz, 2009). The triple comorbidity rate for PTSD, anxiety and depression after trauma has had surprisingly little attention despite recognised vulnerability for comorbidity. One longitudinal study of war veterans (Ginzburg, Ein-Dor, & Solomon, 2010) assessed at one, two and 20 years after active service found the triple comorbidity to be between 27-30%.

For most, but not all patients, pain and PTSD resolve within three months to a year of initial injury. However, delayed treatment for PTSD is a complicating factor in that many patients will become increasingly difficult to treat (Bisson, Shepherd, Joy, Probert, & Newcombe, 2004; Freedman, Brandes, Peri, & Shalev, 1999; Lynch et al., 2008). Comorbid chronic pain and post-traumatic stress disorder (PTSD), is particularly difficult to treat as the two conditions may be mutually maintaining, or even aggravating to each other (Sharp & Harvey, 2001).

Biopsychosocial theories of comorbid chronic pain and PTSD, propose that some individuals have an inherent vulnerability to both pain and PTSD (Asmundson,
Coons, Taylor, & Katz, 2002; Keane & Barlow, 2002); and acknowledge also the potential influence of both premorbid and post-event contextual factors on the subjective experiences of pain and distress as well as on beliefs and cognitions (including memory of a pain event) (Melzack, 2001). In addition to these vulnerability and contextual theories, at a clinical level, the Diagnostic and Statistical Manual of Mental Disorders (DSM 5, American Psychiatric Association, 2013) sets down criteria for health practitioners in their assessments of PTSD: in addition to the necessity of a precipitating traumatic event involving actual or threatened severe injury, a key feature is memory disruption relating to the event.

Key factors distilled from this literature are summarised in Figure 1.

**Figure 1.** Independent factors that may be relevant to the onset, maintenance, or aggravation of persistent pain.

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4From section 3.5, chapter 1
Early identification of those vulnerable to developing PTSD and chronic pain is crucial. While there are a multitude of factors that could be investigated within the categories summarised above, there is also a translational impetus when working in clinical settings to prioritise investigation of those factors that may be most readily accessible to the treating team in a hospital outpatient setting, as the ‘frontline’ point of resource allocation and treatment decision making.

The research question addressed in this paper is therefore whether posttraumatic stress in patients with chronic pain attributed to traumatic causes may be predicted from a handful of theory-derived factors, but particularly that subset of factors which are also readily and routinely accessible to clinicians in busy outpatient departments.

This review aims to synthesise the empirical evidence concerning predictors of PTSD (as well as depression and anxiety) in outpatients with chronic pain. We seek to provide an evidence-base to assist hospital practitioners in efficiently identifying outpatients who are less likely to improve spontaneously at an early (subacute) stage and to whom treatment should be directed to prevent the progression to chronicity.

### 2.1.2 Translationally Relevant Theory and DSM-based Predictors

Based on a consideration of biopsychosocial theories for comorbid chronic pain and PTSD; DSM 5 criteria for PTSD; and the realities of the hospital-based trauma unit, several potential predictors of posttraumatic stress in chronic pain outpatients were identified (Knight, unpublished PhD dissertation) and were subsequently categorised into:

#### 2.1.2.1 Event characteristics. Initial injury severity, which is relevant to the traumatic nature of the event (DSM 5, “traumatic” defined as risk of actual serious
injury/life-threatening) is fundamental to a diagnosis of PTSD. Threat of death or of actual or threatened sexual assault (possibly without physical injury) also qualify under Criterion A of the DSM 5 as “traumatic”. However, sustaining an injury is most relevant to the precipitation of comorbid pain and PTSD and identifying patients most at risk.

**2.1.2.2 Patient experience of pain and trauma-related events.** Self-reported pain location (among the five-axis classification system for pain referred to by Raj, 2007) and extent of pain (diffuse pain, discrete pain, i.e., peripheral or spinal) was selected as an alternative to pain intensity ratings, in accordance with the Joint Commission on Accreditation of Healthcare Organizations (2000) (USA) recommendation that:

> “Changes in pain intensity are valuable when measured for single individuals (for example, before and after a treatment), but they should not be used to compare pain between different individuals. One person's 4/10 might be another's 10/10.” (p 4)

Pain extent was therefore regarded as more objectively confirmable by the clinician and less open to subjective interpretation by participants.

Disrupted memory (“inability to recall key features”) of a traumatic event is also a criterion of the DSM 5 (American Psychiatric Association, 2013) for PTSD. It has been argued that there can be no PTSD without memory of the event, and that it is paradoxical to say there is both PTSD and unconsciousness (no memory) (Harvey, Brewin, Jones, & Kopelman, 2003). The current review therefore also considers PTSD symptoms in patients who have suffered head injury and reported a period of unconsciousness and therefore have no or only partial memory of the traumatic event causing injury. However, memory deficits may not only be the consequence of head
injury or high stress during traumatic events but may also be associated with chronic pain (Mazza, Frot, & Rey, 2018).

2.1.2.3 Patient characteristics. Patient vulnerability factors such as a predisposing sensitivity to pain and anxiety referred to in pain theory (Asmundson, Coons, Taylor, & Katz, 2002; Sharp & Harvey, 2001), were considered by the authors of the current paper to be too broad (influenced by genetic, contextual and societal influences) and reliant on laboratory-based experimental measurement or premorbid assessment. Consequently, they are difficult to be assessed in busy hospital settings, failing the translational criteria. Although the emphasis in this thesis was on injury severity, pain extent, and memory of the traumatic pain event, age and gender were explored in relation to the participants as accessible characteristics likely to influence elements of premorbid context. Of relevance, age and gender are likely to impact vulnerability factors such as coping and self-perception and will interact with social environment in ways that may exacerbate or alleviate posttraumatic stress and pain perception (Törneke, 2010).

2.2. Method

2.2.1 Eligibility and Exclusion of Studies

2.2.1.1 Eligibility criteria. Studies with the following characteristics were considered eligible for review:

(i) published in peer-reviewed journal;

(ii) The studies should assess predictors that were based on models and theories of chronic pain and PTSD\(^5\);

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\(^5\) As discussed in chapter 1 of this thesis
population was adults with chronic pain or traumatic injury (≥3 months with pain) who were admitted to hospital or attended hospital trauma or chronic pain outpatient services;

(iv) outpatient participants’ PTSD, anxiety or depression was attributed to chronic pain or a psychologically traumatic pain event or serious injury (>15 Injury Severity Scale, ISS; Baker, O’Neill, Haddon, & Long, 1974).

(v) results were presented for adults with chronic pain; and

(vi) published and validated quantitative outcome measures for PTSD, anxiety or depression were used.

2.2.1.2 Exclusion criteria. The exclusion criteria applied to articles in this review were:

(i) Participants were not hospital outpatients (e.g., not public surveys; primary care populations were excluded);

(ii) Participants had neither pain nor initial severe injury (<16 ISS, Baker, et al., 1974);

(iii) Participants experienced psychoses;

(iv) Participants were palliative patients;

(v) Participants were children or adolescents <15 years of age;

(vi) Articles were meta-analyses or book reviews.

2.2.1.3 Data extraction. Methodology relating to the selection of studies broadly followed a standardised protocol, namely the PRISMA statement (Moher, Liberati, Tetzlaff, & Altman, 2009) for conducting and reporting literature reviews based on systematic searches (Figure 2). The literature reviewed in relation to these variables included medical, social and psychological databases published between
1990 and 2018. The selected potential predictors based on the theories of pain and PTSD and diagnostic criteria for PTSD were specifically targeted in the literature search for reasons outlined in 1.1-1.2 (see Appendix for full search strategy)\(^6\). In the initial stage of data extraction, study titles and, then abstracts were screened according to the inclusion and exclusion criteria. Then full text articles were obtained, assessed for eligibility and selected articles were finally reviewed. Study screening was initially undertaken by the first author (PK) and then studies deemed eligible by the first author were screened by the second and third authors (CR, HD) who worked independently and consulted where necessary to resolve ambiguous decisions.

The search process is set out in Figure 2.

\(^6\) An alternative process of undertaking a broad search of all studies relating to predictors for pain and PTSD and then selecting the ones that seemed to the author to be most associated with chronic pain and PTSD was not considered a theory-based approach relevant or appropriate to the aims (chapter 1 of this thesis) of the current translational study.
POSTTRAUMATIC STRESS IN CHRONIC PAIN PATIENTS

Records identified through databases MEDLINE (1966 +), PubMed, ProQuest Social Science, PsycINFO (CSA; 1872-), Wiley Interscience (N = 3,369)

Total screened (N = 3,369)

Studies after duplicates, non-pain or PTSD, removed (n = 516)

Titles screened

Studies excluded (n = 2,589)

Abstracts screened (n = 264)

Studies excluded (n = 186)

Full-text articles assessed for eligibility (n = 78)

Full-text articles excluded, with reasons (n = 50)
6= Not primary study
8= Not outpatients
6= Included acute injury/distress
8 = Cohort narrowly defined (e.g., knee replacements, all >65 years only)
4 = Distress predicting patient pain, memory, not vice versa
12 = Main focus on mediating factors for distress unrelated to selected predictors
2=ongoing insurance/legal claimants (potential bias)
4 – Other.

Papers reviewed (Table 1) (N = 28)

Figure 2. Literature Review based on a Systematic Search - Flow Diagram
2.3. Results

Twenty-eight studies are included in the final research (injury severity = 6; injury severity, time in pain, age = 1; injury, age, gender = 1, age = 2, age and gender = 2, gender = 5, pain extent = 2, memory = 8, memory, age = 1). Details from all eligible studies that were extracted are tabulated in Table 1 and include: general study details (author, date, and country), sample size, distress measures and summary of results.
Table 1

*A Summary of Predictors of Psychological Distress in Outpatients Severely Injured or with Chronic Pain*

<table>
<thead>
<tr>
<th>Authors</th>
<th>Predictor</th>
<th>Participants</th>
<th>Country</th>
<th>Design</th>
<th>Distress measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baecher et al. (2018)</td>
<td>Injury severity (ISS, high injury severity was classified as at least one SD above mean, M = 11.17, SD = 8.07, range 1-73).</td>
<td>Patients assessed during hospital admission and 3- and 12-month follow-up. (N = 1,098 followed up at 3 months, n = 932, 86%, and 12 months, n = 715, 71%)</td>
<td>Australia</td>
<td>Prospective</td>
<td></td>
<td>At 3 months: There was a significant main effect of ISS on CAPS, F(1, 1033.91) = 6.83, p = .01. No effect on HADS depression, F(1, 986.17) = 0.55, p = .46, or HADS anxiety, F(1, 978.83) = 1.62, p = .20. 12 months: Interaction analysis (statistics not reported) indicated no significant difference in distress (PTSD, depression) for high injury between 3 months and 12 months</td>
</tr>
<tr>
<td>Boals, Trost, Rainey, Foreman, and Warren (2017)</td>
<td>Injury severity (ISS)</td>
<td>Participants admitted to a large, urban Level 1 Trauma Centre (N = 460)</td>
<td>USA</td>
<td>Prospective</td>
<td></td>
<td>The data for this study is from the Baylor Trauma Outcome Project (BTOP), an ongoing prospective study. Zero-order Pearson correlations ISS and PTSD. No findings statistically significant, p &gt; .05 - baseline; 3 months; 6 months; 12 months: PC-PTSD .07; .09; .07; .07</td>
</tr>
<tr>
<td>Study</td>
<td>Injury severity</td>
<td>Self-report</td>
<td>Country</td>
<td>Study Type</td>
<td>Assessment Tools</td>
<td>Results</td>
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<tr>
<td>van Delft-Schreurs et al. (2014)</td>
<td>Injury severity score (ISS &gt; 15)</td>
<td>Self-report questionnaires were sent by post 15-53 months after their accident. (N= 173).</td>
<td>Netherlands</td>
<td>Retrospective</td>
<td>Hospital Anxiety and Depression Scale (HADS) (Zigmond &amp; Snaith, 1983) Impact of Events Scale (IES) (Horowitz, Wilner, &amp; Alvarez, 1979).</td>
<td>30.1% of the investigated participants had psychological complaints: 11%, IES; 14%, HADS anxiety: 12%, depression; 13%, and/or subjective cognitive complaints. The researchers did not find an association between the severity of the injury (ISS) and psychological complaints (crosstabs chi-square for psychological complaints vs no complaints were not reported, ( p = .51 )).</td>
</tr>
<tr>
<td>O'Donnell et al. (2013)</td>
<td>Injury severity (ISS)</td>
<td>Randomly selected patients with injury who were admitted to four hospitals around Australia were recruited to the study and assessed in the acute care hospital, at 3 months, and at 12 months</td>
<td>Australia</td>
<td>Prospective</td>
<td>Clinician-Administered PTSD Scale for DSM-IV (CAPS)(Blake et al., 1990) The Hospital Anxiety and Depression Scale (HADS) (Zigmond &amp; Snaith, 1983)</td>
<td>At 3 months after the injury, a total of 61 (7%) participants met criteria for PTSD. 9% of participants (( n = 73 )) had PTSD at 12 months, and of these, 53%, (( n = 39 )) did not have subsyndromal PTSD symptoms at 3 months.</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Injury severity (ISS)</th>
<th>Population</th>
<th>Study Design</th>
<th>Measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zatzick, Kang, et al. (2002b)</td>
<td>ISS</td>
<td>Randomly selected survivors of motor vehicle accidents (MVAs) or assaults. ($N=101$).</td>
<td>USA</td>
<td>Prospective</td>
<td>Interviews while hospitalized and 1, 4, and 12 months after injury</td>
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<td>PTSD Checklist—Civilian Version (PCL-C) (Blanchard et al., 1996)</td>
<td>Higher injury severity score was not significantly associated with PCL symptoms: $b = 0.13 (0.17), t(85) = 0.78, p = .44$</td>
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<tr>
<td></td>
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<td>The Center for Epidemiological Studies Depression Scale (Radloff, 1977)</td>
<td></td>
</tr>
<tr>
<td>Dougall, Ursano, Posluszy, Fullerton, and Baum (2001)</td>
<td>ISS</td>
<td>Injured survivors of MVA’s ($N=115$).</td>
<td>USA</td>
<td>Prospective</td>
<td>Structured Clinical Interview for DSM-III-R (SCID) (Spitzer, Williams, &amp; Gibbon, 1990) interview at 1, 6, and 12 months post injury</td>
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<tr>
<td></td>
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<td>ISS was associated with lower SCID at 1 month: $r(99) = -0.22, p &lt; .05$</td>
<td>ISS not associated with SCID at either 6 months: $r(79)= -0.12, p &gt; .05$ or 12 months: $r(69) = .06, p &gt; .05$</td>
</tr>
<tr>
<td>Study Details</td>
<td>Injury Severity</td>
<td>Participants</td>
<td>Norway/USA</td>
<td>Prospective</td>
<td>Structured interviews</td>
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<tr>
<td>Soberg, Bautz-Holter, Roise, and Finset (2010)</td>
<td>Injury Severity Score (NISS &gt; 15)</td>
<td>Patients with multiple trauma treated at a Norwegian trauma centre $(N = 99)$.</td>
<td>Norway</td>
<td>Prospective with a 2-year follow-up period</td>
<td>PTSS-10 (Eid, Thayer, Johnsen, 1999)</td>
</tr>
<tr>
<td>Age</td>
<td>$M$ age 35.3 years $(SD = 14.2)$, 16-67 years</td>
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</tr>
<tr>
<td>Gender</td>
<td>Males =83% Females 17%</td>
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<tr>
<td>Ryb, Dischinger, Read, and Kufera (2009)</td>
<td>Injury severity (ISS)</td>
<td>Patients hospitalised after MVA’s $(N = 317)$</td>
<td>USA</td>
<td>Prospective</td>
<td>Structured interviews - PTSD symptoms</td>
</tr>
<tr>
<td>Gender</td>
<td>56% female, 44% male</td>
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<tr>
<td>Age</td>
<td>$M$ age = 39.8 years $(SD$ and age range not provided)</td>
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<tr>
<td>Memory &amp; Consciousness</td>
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</table>
Age ≥ 30, more likely to have PTSD at 6 months OR = 1.64 95% CI(1.01-2.68), p = .045

Age ≥ 30; One year OR = 1.94 95% CI(1.11-3.39), p = .02

Loss of consciousness with peritraumatic amnesia not associated with PTSD at one-year post trauma. OR = 0.87 95% CI(0.52-1.47), p = 0.6

Of the patients who screened negative for PTSD at 6 months (n=226), 8% (n=18) screened positive at one year, representing 23% of those diagnosed to have PTSD at one year.

Harris, Young, Rae, Jalaludin, and Solomon (2008)

<table>
<thead>
<tr>
<th>Injury Severity (ISS &gt;15)</th>
<th>Participants were consecutive adult patients presenting to one major trauma centre 1 - 6 years after the injury</th>
<th>PTSD Checklist, civilian version (PCL-C) (Blanchard et al., 1996) both at hospital and mailed to patients</th>
<th>Symptoms of PTSD not significantly related to ISS (p = 0.21), r not reported.</th>
<th>PTSD significantly associated with younger age (p &lt; 0.0001) M age = 47.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Age M = 47.8 (SD = not provided) (19–91 years)</td>
<td>Age M = 47.8 (SD = not provided) (19–91 years)</td>
<td>Age M = 47.8 (SD = not provided) (19–91 years)</td>
<td>Age M = 47.8 (SD = not provided) (19–91 years)</td>
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<tr>
<td></td>
<td>(N=355)</td>
<td>(N=355)</td>
<td>(N=355)</td>
<td>(N=355)</td>
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<tr>
<td>Australia</td>
<td>Retrospective</td>
<td>Retrospective</td>
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</table>

Participants were consecutive adult patients presenting to one major trauma centre 1 - 6 years after the injury.
### Patient Characteristics

<table>
<thead>
<tr>
<th>Study</th>
<th>Age</th>
<th>Chronic pain outpatients (age ≥ 65 years, n = 26, age &gt; 19-65 years, n = 24) (Range 19–91)</th>
<th>Australia</th>
<th>Structured medical and psychiatric interview (DSM IV criteria)</th>
<th>None of older (≥ 65 years) reported pain onset before age 50 years. Rates of depression (&lt;65 = 41.7%, ≥ 65 = 34.6%) but there was no significant difference in current depression between the groups $\chi^2(1, N = 50) = 0.01, p = .06$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wijeratne, Shome, Hickie, and Koschera (2001)</td>
<td>Age</td>
<td>Chronic pain outpatients (age ≥ 65 years, n = 26, age &gt; 19-65 years, n = 24) (Range 19–91)</td>
<td>USA</td>
<td>The Impact of Event Scale (IES) (Horowitz, Wilner, &amp; Alvarez, 1979).</td>
<td>Younger age was a predictor of greater IES at 3 months post-discharge ($\beta = -.09, p &lt; .05$)</td>
</tr>
<tr>
<td>Richmond and Kauder (2000)</td>
<td>Age</td>
<td>Survivors of serious physical injury ($M$ ISS = 15.5)</td>
<td>USA</td>
<td>Prospective.</td>
<td>Females were more likely than men to meet diagnostic criteria for PTSD at 6-weeks (19.2% vs. 8.1%, $\chi^2 = 7.46, p = .006$), 6-months (14.1% vs. 2.5%, $p = .002$), and 1-year (14.1% vs. 3.9%, $p = .020$) post-MVA than men.</td>
</tr>
<tr>
<td>Kobayashi, Sledjeski, and Delahanty (2018)</td>
<td>Age and Gender interaction</td>
<td>Outpatients after MVA’s (aged 18-81)</td>
<td>USA</td>
<td>Prospective.</td>
<td>Females were more likely than men to meet diagnostic criteria for PTSD at 6-weeks (19.2% vs. 8.1%, $\chi^2 = 7.46, p = .006$), 6-months (14.1% vs. 2.5%, $p = .002$), and 1-year (14.1% vs. 3.9%, $p = .020$) post-MVA than men.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female age; $M$ = 39.93, $SD = 15.29$</td>
<td></td>
<td>Participants completed clinical interviews 6 weeks, 6 months and/or 1 year after an MVA</td>
<td>Regression analyses for female gender significantly predicted higher CAPS scores at all</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male age; $M$ = 37.41, $SD = 15.0$</td>
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</table>
(N = 287, 164 male, 123 female) assessment points (β = 0.25, p < .001 at 6 weeks; β = 0.34, p < .001 at 6 months; β = 0.19, p < .010 at 1 year)

At the 6-months post-MVA females in the 25–34, 35–44, and 45–54 age groups had significantly higher CAPS scores compared with males [all p values < .004, large effects (η² = .19 - .29)]. However, no gender differences were found in the youngest (< 25 years) and the oldest (≥ 55 years) groups.

At 1-year post-MVA, women scored higher than males on CAPS in the 35–44 age group only [p = .012, large effect (η² = .14)]

In males, age was not associated with PTSD. In females age was curvilinearly associated with PTSD severity at 1-year post-MVA such that middle-aged females reported greater symptom severity than younger and older females.
<table>
<thead>
<tr>
<th>Study</th>
<th>Gender</th>
<th>Patients (age ≥ 18 years) sustaining traffic-related whiplash injury were followed at 6 weeks, 3, 6, 9, and 12 months. Only those who made a claim for a traffic-related injury and who had baseline depression data were included.</th>
<th>Country</th>
<th>Study Design</th>
<th>Depressive Symptom Measurement</th>
<th>Results</th>
</tr>
</thead>
</table>
| Phillips, Carroll, Cassidy, and Cote (2010)        | Gender | Patients (age ≥ 18 years) sustaining traffic-related whiplash injury were followed at 6 weeks, 3, 6, 9, and 12 months. Only those who made a claim for a traffic-related injury and who had baseline depression data were included. | Canada           | Prospective | Centre for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). | As compared to females, Males were at greater risk of persistent depressive symptoms: OR = 0.63, (95% CI) = (0.42–0.95)  
As compared to an 18–23 years age group, individuals over 24 years of age were at greater risk for experiencing persistent depressive symptoms: 
24–29 years; OR = 2.45, 95% CI = (1.11–5.42) 
30–39 years; OR = 2.41, 95% CI = (1.17–3.98) 
40–49 years; OR = 2.80, 95% CI = (1.33–5.88) 
≥50 years; OR = 1.99, 95% CI = (1.47–6.11) |
| Bryant et al. (2015)                              | Gender | Patients admitted to a trauma service and followed up 6 years after. Recruited from four hospitals in three states of Australia                                                                                                                         | Australia        | Prospective | Clinician Administered PTSD Scale (CAPS) (Blake et al., 1990) | Participants classified as resilient (few PTSD symptoms), chronic (no signs of recovery), recovered (initial symptoms eased over time), or worsening (relatively low rates of PTSD symptoms at admission increasing over the subsequent 6 years) 
Female gender overrepresented in: 
Chronic vs resilient OR = 5.47, 95% CI (2.48–12.07), p < .001 
Recovered vs resilient: OR = 2.91, 95% CI = 1.31–6.44, p < .01 |
<table>
<thead>
<tr>
<th>Study</th>
<th>Gender</th>
<th>Patients Enter a Multidisciplinary Program</th>
<th>Sweden</th>
<th>Retrospective</th>
<th>Hospital Anxiety and Depression Scale (HADS) (Zigmond &amp; Snith, 1983)</th>
<th>Similar Rates of HADS Anxiety (&gt;10) for Men (38%) and Women (34%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rovner et al. (2017)</td>
<td>Gender</td>
<td>Patients entering a multidisciplinary rehabilitation programme at a pain clinic</td>
<td>Sweden</td>
<td>Retrospective</td>
<td>Hospital Anxiety and Depression Scale (HADS) (Zigmond &amp; Snith, 1983)</td>
<td>Similar rates of HADS anxiety (&gt;10) for men (38%) and women (34%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$(N = 1,371, \text{ males } n = 433, 31.6%, \text{ females } n = 938 68.4%)$</td>
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<td></td>
<td></td>
<td>$M \text{ Men } = 8.99 (SD = 5.16); M \text{ Females } = 8.62 (SD = 5.01, p = .25)$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Gender</th>
<th>Patients Enter a Multidisciplinary Program</th>
<th>Denmark/Finland</th>
<th>Retrospective</th>
<th>The Harvard Trauma Questionnaire (Mollica et al., 1992)</th>
<th>23% of participants fulfilled criteria for PTSD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andersen, Andersen, Vakkala, and Elkfit (2012)</td>
<td>Gender</td>
<td>Outpatients with chronic pain (&gt;6 months) from two Scandinavian multidisciplinary pain centres (Denmark and Finland).</td>
<td>Denmark/Finland</td>
<td>Retrospective</td>
<td>The Harvard Trauma Questionnaire (Mollica et al., 1992)</td>
<td>23% of participants fulfilled criteria for PTSD.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$(N = 304, \text{ females } n = 188, 61.8%, \text{ males } n = 116, 38.1%)$</td>
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<td></td>
<td></td>
<td>No gender differences in PTSD rates (females = 23.4%, males = 22.5%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Gender</th>
<th>Patients Enter a Multidisciplinary Program</th>
<th>New Zealand</th>
<th>Prospective</th>
<th>Structured questions based on Impact of Event Scale (IES) (Horowitz, Wilner, &amp; Alvarez, 1979).</th>
<th>Female participants were significantly more likely than males to experience depression or PTSD symptoms at 15 months post-accident (OR depression = 2.21, 95% CI 1.18-4.13; OR PTSD = 2.45, 95% CI 0.99-6.08).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Williams, Kool, Robinson, and Ameratunga (2012)</td>
<td>Gender</td>
<td>Participants aged 25-60 who had been hospitalised for injuries sustained in unintentional falls at home</td>
<td>New Zealand</td>
<td>Prospective</td>
<td>Structured questions based on Impact of Event Scale (IES) (Horowitz, Wilner, &amp; Alvarez, 1979).</td>
<td>Female participants were significantly more likely than males to experience depression or PTSD symptoms at 15 months post-accident (OR depression = 2.21, 95% CI 1.18-4.13; OR PTSD = 2.45, 95% CI 0.99-6.08).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$(N = 251)$</td>
<td></td>
<td></td>
<td>2 questions for depression (Whooley, Avins, Miranda, Browner (1997).</td>
<td>Female participants were significantly more likely than males to experience depression or PTSD symptoms at 15 months post-accident (OR depression = 2.21, 95% CI 1.18-4.13; OR PTSD = 2.45, 95% CI 0.99-6.08).</td>
</tr>
<tr>
<td>Study</td>
<td>Methodology</td>
<td>Participants</td>
<td>Data collection</td>
<td>Findings</td>
<td></td>
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</tr>
<tr>
<td>Stalnacke (2012)</td>
<td>Retrospective</td>
<td>Patients (59 women and 27 men, aged 18–65 years) with chronic pain caused by an injury, referred to a Pain Rehabilitation Clinic</td>
<td>Telephone follow-up interview at 15 months post-injury (but 3 participants face to face) standardised structured questionnaire administered by research nurses</td>
<td>A statistically significant association was found between younger age (&lt; 40 years) and moderate-to-severe posttraumatic stress ($p = .004$, OR = 1.088, 95%CI = (1.027–1.152). No gender difference in total IES (men: 19.7 ± 13.3, women: 19.1 ± 15.8) No gender difference in Anxiety (HADS score ≥ 8) (men 40.7% and women 39.0%). A significantly higher proportion of women (47.5%) than men (22.2%) reported Depression (HADS score ≥ 8) ($p = .038$)</td>
<td></td>
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<tr>
<td>Marcus (2003)</td>
<td>Retrospective</td>
<td>Patients with chronic pain attending at a pain clinic</td>
<td>Beck’s Depression Inventory (BDI) (Beck, Ward, Mendelson, Mock, &amp; Erbaugh, 1961)</td>
<td>No significant gender difference in Depression (BDI &gt;21) (Males = 37.6%, $M = 13.8$, $SD$ N/A; females = 34.4%, $M = 13.4$, $SD$ N/A)</td>
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</tbody>
</table>
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(N = 716, females n = 452 (63.1%); males n = 264 (36.9%))

Strait-Trait Anxiety Inventory (STAI)(Spielberger, 1996)

State Anxiety was significantly higher in men (M = 46, cf females M = 43.0) (p < .01) although Trait score (Trait - general anxiety) was similar. Males M = 43.7, SD = N/A; Females M = 42.1, SD N/A

## Patient Experience

<table>
<thead>
<tr>
<th>Study</th>
<th>Pain Extent</th>
<th>Injury Severity (ISS)</th>
<th>Time since injury</th>
<th>Location</th>
<th>Study Type</th>
<th>Measurement Tools</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodruff et al. (2017)</td>
<td>Pain Extent</td>
<td>Individuals wounded in combat enrolled in the Wounded Warrior Recovery Project</td>
<td>(N =1,011)</td>
<td>USA</td>
<td>Retrospective</td>
<td>The PTSD Checklist–Civilian Version (PCL-C), (Blanchard et al., 1996)</td>
<td>Two-step hierarchical linear regressions Step 1. ISS and time since injury did not explain significant variation in PTSD (β = .05, p &gt; .05) or depression scores (β = -.02, p &gt; .05) Step 2. Body region explained significant incremental variation in overall PTSD (R² adj = .02, p &lt; .05) (β = -.09, p &lt; .01) and also, depression scores (R² adj = .04), (β = -.05, p &lt; .001) Injury to the spine was independently related to higher PTSD and depression scores.</td>
</tr>
<tr>
<td>DeCarvalho (2010)</td>
<td>Pain Extent</td>
<td>Outpatients receiving treatment for chronic</td>
<td></td>
<td>USA</td>
<td>Retrospective</td>
<td>Post-traumatic Stress Diagnostic Scale (PDS; Foa et al., 2016)</td>
<td>51% of all patients had clinically significant rates of PTSD symptom</td>
</tr>
</tbody>
</table>
low back pain (CLBP)
from pain clinics.

(N = 161)

severity, ranging between mild and severe

Group 1 = Back pain only, non-traumatic (e.g., arthritis) $M = 22.54, SD = ±14.93$;

Group 2 = non-back, traumatic (e.g., natural disasters) - consisted of CLBP patients who experienced trauma not specifically related to their back pain. $M = 31.57, SD = ±15.20$;

Group 3 = Back pain only, traumatic (e.g., MVA) $M = 29.48, SD = ±14.60$;

Group 4 = pain with combined traumatic (both traumatic non-back-related and traumatic back-related events), $M = 35.67, SD ± 14.76$

$F(3, 160) = 7.401, p < .0001$

24%, 57%, 41%, and 77% of Groups 1, 2, 3, and 4, respectively, evidenced PTSD symptoms at a clinically significant level.

This study also found that CLBP patients with a history of both non-back-related and back-related traumatic events (Group 4)
reported greater pain severity, as well as PTSD symptom severity levels when compared with patients from the other three CLBP groups.

<table>
<thead>
<tr>
<th>Roitman, Gilad, Ankri, and Shalev (2013)</th>
<th>Memory &amp; Consciousness</th>
<th>Road accident survivors admitted to an emergency department. (N = 1,260: n = 115 with loss of consciousness and head injury; n = 287 with head injury; n = 858 neither)</th>
<th>Israel</th>
<th>Prospective</th>
<th>Posttraumatic Stress Symptom Inventory-Interviewer’s version (PSS-I; Foa &amp; Tolin, 2000).</th>
<th>Eight months after the traumatic event, participants meeting DSM-IV criteria for PTSD: Loss of Consciousness group: 42.6%, (n = 49), Head Injury group: 27.2%, (n = 78) No Head Injury group: 22.0% (n = 189) ( \chi^2(2, n = 1,260) = 20.81, p &lt; .001 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bryant et al. (2009)</td>
<td>Memory &amp; Consciousness</td>
<td>Participants had been admissions to four level 1 trauma centres, Assessed for PTSD at hospital admission and 3 months later (i.e. Subacute symptoms). (N = 920)</td>
<td>Australia</td>
<td>Prospective</td>
<td>Clinician Administered PTSD Scale-IV (CAPS-IV; Blake et al., 1998).</td>
<td>Controlling for ISS, patients with Mild Traumatic Brain Injury (MTBI – i.e., sustained impaired consciousness secondary to the brain injury) had higher CAPS scores than those without MTBI at baseline, ( t(1048) = 6.98, p &lt; .01 ), and at follow-up, ( t(918) = 11.91, p &lt; .001 ). At 3-month follow-up, 9.4% (n = 90) of patients met criteria for PTSD, MTBI: 11.8%; n =50, No-TBI: 7.5%; n=40</td>
</tr>
</tbody>
</table>
Pain patients with PTSD were more likely to develop PTSD than no-TBI patients, after controlling for injury severity (adjusted OR = 1.86; 95% CI = (1.78–2.94).

<table>
<thead>
<tr>
<th>Reference</th>
<th>Memory</th>
<th>Chronic Pain</th>
<th>PTSD Scale</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gil, Caspi, Ben-Ari, Koren, and Klein (2005)</td>
<td>Hospitalised patients with minor traumatic brain injury (none unconscious)</td>
<td>Israel</td>
<td>Memory of the traumatic event was evaluated with a nine-item self-report questionnaire, which was specifically developed for the study</td>
<td>Participants with explicit memory of a traumatic event were significantly more likely to develop PTSD than those without a memory (OR = 2.2, 95% CI = (1.0–10.1). (χ²=20.1, df=118, p &lt; .001).</td>
</tr>
<tr>
<td>Duckworth and Iezzi (2005)</td>
<td>Chronic pain patients referred for psychological-legal assessment over a ten-year period (1991-2001).</td>
<td>USA</td>
<td>Minnesota Multiphasic Personality Inventory-2 Posttraumatic Stress Disorder scale (Lyons &amp; Keane, 1992)</td>
<td>High PTSS (n = 78) Low PTSS (n = 74) 72% of the high PTSS group reported loss of consciousness consequent to MVA as compared with 10% of the group reporting low PTSS, χ²(152) =12.3, p = .002. The group reporting low PTSS was significantly older than the group reporting high PTSS, F(1,151) = 7.0, p = .01.</td>
</tr>
<tr>
<td>Glaesser, Neuner, Lutgeheismann,</td>
<td>Patients from a neurological rehabilitation clinic who</td>
<td>Germany</td>
<td>Posttraumatic stress Diagnostic Scale (Foa, 1995)</td>
<td>27% of the sub-sample who were not unconscious for an extended period (&gt;12 hours) but only 3% (1 of 31 patients) who were</td>
</tr>
</tbody>
</table>
| Schmidt, and Elbert (2004) | Suffered a TBI due to an accident 
(N = 46: 
 n = 31 Falling unconscious: 
 Unconscious >12 hrs; 
 n = 6 Unconscious for minutes to 1 hour with partial memory of event; 
 n = 9 No loss of consciousness) | Structured clinical interviews. | Unconscious for more than 12 hours as a result of the accident were diagnosed as having PTSD ($\chi^2 = 5.73, p < .02$). |
|---|---|---|---|
| Mayou, Black, and Bryant (2000) | Attenders at an emergency department after MVA’s who completed a self-report questionnaire at baseline and were followed up at 3 months and 1 year 
Patients who had been unconscious for more than 15 minutes were excluded from the study. 
1.5% of the subjects suffered traumatic brain injury and 21% suffered minor head injury. 
(N = 1,148) | England | Prospective 
Posttraumatic Stress Symptom (PSS) Scale (Foa et al., 1993) 
Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983) | PTSD, anxiety and depression were more common at 3 months in those who had definitely been unconscious ($p < .05$) than in those who had not or had minor head injury, but there were no differences at 1 year ($p > .05$) 
PTSD at one year: 
Definitely unconscious: 33%, (n = 7/21) 
Probably unconscious: 14% (n = 5/37) 
Not unconscious: 17% (n = 116/710) |
<table>
<thead>
<tr>
<th>Bryant and Harvey (1999)</th>
<th>Memory &amp; Consciousness</th>
<th>MVA survivors admitted to a major trauma hospital who sustained a MTBI ($n = 63$) or no TBI ($n = 71$). Assessed at 1 month and 6 months</th>
<th>Australia</th>
<th>Prospective PTSD module from the Composite International Diagnostic Interview (CIDI) (Peters &amp; Andrews, 1995)</th>
<th>Comparable rates of PTSD symptoms at 6-month follow-up in the MTBI and non-TBI patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>($N = 134$)</td>
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</table>
2.3.1 Synthesis of Studies

The review of PTSD, anxiety and depression in hospital outpatients with chronic pain or serious injury indicated that there are two major kinds of design among the reviewed studies – seventeen prospective (longitudinal) and eleven retrospective (cross-sectional) (Koop & Strang, 2002). An inspection of the findings between the two types of design indicated that neither design produced more or less significant findings. There were ten large-scale studies (N > 800) which tended to produce significant results whereas the smaller sized studies were mixed in relation to significant findings, consistent with their lower power.

2.3.1.1 Event characteristic - Injury severity. Injury severity was generally measured by hospital practitioners using the Injury Severity Score (ISS; Baker, O’Neill, Haddon, & Long, 1974). A modified version of the ISS was also used, namely, the New Injury Severity Score (NISS; Osler, Baker, & Long, 1997). Much of the literature relates to the relationship between PTSD and traumatic injury following motor vehicle accidents. The literature (Table 1) is unsupportive of the association between higher ISS and PTSD, depression and anxiety - nine out of ten studies found that higher ISS was not predictive. Only Baecher et al. (2018) found a relationship between higher injury severity and PTSD, but it was noted that “high” injury in this study was classified as at least one SD above mean, (M = 11.17, SD = 8.07, range 1-73) which is lower than the standard categorisations of injury severity (e.g., severe or critical injury, >ISS=15). Two studies found that, although higher ISS did not predict PTSD in the subacute stage (3-6 months), higher ISS was associated with clinically relevant PTSD symptoms in the chronic stage. One study (O'Donnell et al., 2013) found that, of those participants with higher ISS, a total of 61 (7%) met criteria for PTSD at three-months after the injury, but this number
increased to 9% (n = 73) at 12 months. Similarly, another study (Ryb et al., 2009) found that 23% of the patients who screened positive at one year had screened negative for PTSD at six-months).

2.3.1.2 Patient characteristics.

2.3.1.2.1 Age. Nine studies relating to age and posttraumatic stress in injured or chronic pain patients were identified. Five studies found a vulnerability of younger people to PTSD. However, one large prospective study (Ryb et al., 2009) found that participants thirty years of age and older were more vulnerable to PTSD both at six and twelve months.

Two studies relating to age and chronic depression in hospital outpatients with injury or pain were also identified (Phillips, et al., 2010; Wijeratne, et al., 2001). There was some indication of a greater vulnerability to depression in older patients in a study by Phillips et al. (2010), which found that whiplash patients aged 24 and older were more likely to have depression than those in the 18-23 year old age group. However, Phillips et al. still found that those aged over 50 years were less likely than the youngest age group to develop depressive symptomatology. Wijeratne et al. (2001) found no significant difference in depression between those over 65 years age group and a 19-65 age group in outpatients with chronic pain. In short, the findings on age remain unclear.

2.3.1.2.2 Gender.

Ten studies were identified comparing males and females with pain or injury on their PTSD (n = 6) and depression (n = 5) symptoms - one of which investigated PTSD, depression and anxiety (Stalnacke, 2012). Of the six studies relating to PTSD identified in the review, five found that women hospitalized after an injury related accident were significantly more likely to develop PTSD than men (Kobayashi et al.,
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2018; Bryant et al., 2015; Soberg, et al., 2010), and one study (Ryb et al., 2009) found that female gender was associated with PTSD at a subacute stage (six months) but not at the chronic stage (one year).

For depression and anxiety, the results were divided. Williams et al. (2012) and Stalnacke (2012) found that women with injury-related chronic pain were significantly more likely to have depression than men, but Phillips et al., (2010) found that men were more likely to have persistent post-MVA depression. Rovner et al. (2017) found similar rates of anxiety and depression in men and women among chronic pain patients. However, Marcus (2003) found that a greater percentage of men with chronic pain were anxious but no difference in depression.

In sum, the findings on gender are mixed and may suggest different pathways to, and/or expression of, posttraumatic stress in the context of pain following trauma. All studies implicate gender in psychological outcomes but the direction, longevity and nature of the impact is unclear.

2.3.1.3 Subjective patient experience.

2.3.1.3.1 Pain extent. Only two studies were identified which investigated PTSD and pain site. Both were retrospective. Woodruff et al. (2017) found that, although ISS was not associated with PTSD, injury to the head and the spine were independently related to higher PTSD and depression scores. DeCarvalho (2010) also found that 51% of the patients with traumatic chronic non-back pain and 41% with traumatic back pain reported clinically significant PTSD symptoms but this rose to 77% in those patients with combined traumatic back and non-back related pain. In sum, the number of studies investigating pain extent or site and posttraumatic stress symptoms were sparse but based on these two studies, widespread chronic traumatic pain was related to a greater vulnerability to PTSD.
2.3.1.3.2 Consciousness and memory of pain/injury event. Eight studies considered the association between PTSD and memory of a traumatic event after injury. Three studies focused on outpatients who had been conscious at the time of injury. A retrospective study by Glaesser et al. (2004) found that a significantly greater proportion of those conscious patients compared to those who were unconscious for more than 12 hours as a result of the accident had PTSD. Another retrospective study, Duckworth and Iezzi (2005) similarly found among post-hospitalization participants with chronic pain that, at six months, memory of the traumatic event was significantly associated with developing PTSD. A prospective study by Gil et al. (2005) also found in conscious participants with mild traumatic head injury that no memory of the traumatic event was a protective factor.

Two prospective studies are inconsistent with the contention that unconsciousness or no explicit memory of traumatic injury is a protective factor against PTSD. Roitman et al. (2013) found that at eight months post discharge outpatients who had loss of consciousness had a higher prevalence of PTSD than those who were conscious. Mayou et al. (2000) found that PTSD, anxiety and depression was more common in a subacute stage (at 3 months) in those who had been unconscious ($p < .05$) than in those who had no or minor head injury, but there were no differences in distress at the chronic stage (one year) between those who had been unconscious compared to those who were conscious. Similarly, Ryb et al. (2009) found that loss of consciousness or peritraumatic amnesia was not associated with PTSD at one year.

Other studies found differences in the association of PTSD between no memory and partial memory (including mild TBI which may involve loss of consciousness or no loss of consciousness but a state of being dazed, confused or
disoriented). Bryant and Harvey (1999) compared mild TBI (partial memory) and non-TBI (conscious) patients and found comparable rates of PTSD symptoms at 6-month follow-up. However, Bryant et al. (2009) found that mild TBI patients were more likely to develop PTSD than no-TBI patients, after controlling for injury severity.

In summary, the literature was unclear as to whether extent of memory of the traumatic injury or pain event distinguished between those who would develop PTSD or depression. Overall, it appears that complete or partial (disrupted) explicit memory cannot be said conclusively to be associated with PTSD in patients.

2.4. Discussion

In this review of research exploring posttraumatic stress in hospital outpatients attending trauma or pain units, the literature was less clear than expected. This may partly be due to the use of non-comparable and flawed methodologies which prevent findings from being fully synthesised. Effect size were not consistently reported which made it difficult to assess whether different studies are reporting similar rates of psychological distress. Similarly, studies were often univariable or bivariable (rather than multivariable) and used a variety of designs and measures for psychological distress often with different clinical cut-off points which made it difficult to compare results. Andrews et al (2013) emphasize that in translational contexts, given the consequentiality of findings on treatment decisions, poor quality evidence should not be elevated to the status of best practice. Rather, findings should be triangulated with other relevant sources of evidence to provide the strongest available map to guide urgent research to fill these translational ‘gaps’. Specifically, in this discussion, findings from this review are triangulated with (i) data from studies of posttraumatic stress and pain outside of the hospital context and
(ii) theory related to PTSD and pain. Findings relating to the potential predictors are now discussed in turn.

2.4.1. PTSD and Event Characteristics: Injury Severity

One primary factor currently determining access to healthcare in hospital trauma services is severity of injury (ISS; Baker et al., 1974). Assessment of injury severity is primarily to prioritise urgent medical treatment and medical follow-up, but it is also assumed, based on the DSM 5 (American Psychiatric Association, 2013), that serious injury is a likely risk factor for PTSD. Therefore, injury severity influences whether a patient will be assessed for Posttraumatic Stress Disorder (PTSD), anxiety and depression.

The literature reviewed is surprisingly unsupportive of the association between greater severity of injury, and PTSD, anxiety or depression. Only Baecher et al. (2018) found a relationship between greater injury severity and PTSD but it was noted that the standard clinical categorisations of injury (severe or critical injury, >ISS=15) were not used. It is also postulated that the use of telephone to conduct the interviews may have caused participants to over-emphasize their PTSD symptoms in the absence of visual cues. In making sense of these findings, two large prospective studies are of interest. Both found a delayed onset PTSD. O’Donnell et al., 2013 found there was PTSD at twelve months – but not in a subacute stage (three months) which was perhaps indicative that subsequent factors other than initial severe injury contributed to patients’ distress. Similarly, Ryb, Dischinger, Read, and Kufera (2009) found that, of the patients who screened negative for PTSD at six months, 8% (n=18) screened positive at one year (representing 23% of those diagnosed to have PTSD at one year). O’Donnell et al., postulate that delayed-onset PTSD is associated with increased stress sensitivity and
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a progressive failure to adapt to severe stress that occurs in the post-trauma environment. It may be, therefore, that social and life contexts are indirectly but highly relevant to PTSD in chronic pain patients – rather than PTSD being solely a direct consequence of event related factors such as injury severity.

It should also be noted, however, that the range of injury severity scores differed amongst the studies, and most compared ISS as a continuous variable - only Ryb, Dischinger, Read, and Kufera (2009) categorised ISS on the basis of severity cut-off scores. While there may be disadvantages (Baneshi & Talei, 2011) in dichotomising continuous variables (e.g., loss of statistical power), in translational studies it is of great relevance where clinicians (as compared to academic researchers) must determine ‘cut-off’ points for treatment and are less concerned about “normal” or “mild” symptoms - cut-off points have direct clinical relevance to health practitioners in hospital practice. Further, it was noted that no studies were found that distinguished between very serious or life-threatening injury (≥ 24) and serious injury (ISS > 15) despite the fact that threat to life might arguably be expected to have the most profound, and possibly a unique, impact on PTSD.

The question of the relevance of serious injury as a predictor of PTSD and distress (DSM 5, American Psychiatric Society, 2013) thus remains open. It was noted also that in many hospital settings records of ISS may only be available for patients who recently have been discharged from hospital (subacute) or where prospective studies specifically focus on ISS and distress for follow-up. Some patients presenting with chronic traumatic pain may have had pain for many years and ISS will either have been lost, not recorded or will simply not be easily available.
2.4.2. PTSD and Objective Patient Vulnerability Characteristics

The literature pertaining to the association of two secondary potential vulnerability factors, age and gender, on PTSD, was inconsistent. This discussion broadens the interpretive base by considering findings from other populations – the studies discussed below are not drawn from chronic traumatic pain outpatients, but the findings were still considered informative in providing broader based factors which may still impact on the hospital population. Studies with patients in primary care or individuals responding to surveys are briefly explored in the current paper by way of comparison with the outpatient groups.

2.4.2.1 Age. The current review provides some support, although not conclusive, for the argument that younger age may predict increased risk for PTSD among outpatient populations with chronic pain or initial traumatic injury (Asmundson et al., 2002). However, Ryb et al., (2009) still found that participants older than 30 years were more vulnerable to PTSD at both six and twelve months. It was puzzling as to why Ryb et al., differed in their finding. However, the categorization of age groups was not explained in this study, and it may be that other studies included participants in their 30’s as “younger”. It was also noted that interviews assessing PTSD were carried out by telephone, which may have excluded visual cues which could affirm or disaffirm the credibility of answers. Another possible explanation was that all participants were deemed culpable for the MVA’s at a case review and the older participant responses (consciously or unconsciously) may have reflected a greater negative awareness of the consequences of their culpability for the accident, though Ryb et al., indicated that reported age differences in negative associations while significant at six months were not significant at twelve months interview.
The literature was unclear as to whether there was an association between age and depression among outpatients with chronic pain or severe initial injury - only two studies were identified and reported opposing findings. It is likely that the large differences in age categorisation are at least partly responsible for this finding. In particular, the age categories in Wijeratne, et al. (19-65; and 65+) may have been too broad to distinguish between-groups age differences.

For comparison purposes, the general prevalence of mental health disorders among age groups outside of an outpatient population with chronic pain or traumatic injury is of interest. The vulnerability to PTSD in younger pain patients was echoed in, for example, a “Stress in America” survey (American Psychological Association, 2015) of 3,068 adults over the age of 18 years which found that age groups 18-33 years, and 34-47 years reported the highest average stress levels, were not managing their stress well, and had less healthy lifestyles (inadequate exercise, not eating well, inadequate sleep) than older age groups. An Australian survey (Australian Bureau of Statistics, 2010) found, in the general population, that 12-month duration mental health disorders were more prevalent in younger age groups (26% and 25% in the 16-24- and 25-34-years age groups, respectively) than in older groups (6% in the 75-85 years age group).

Notably, general theories in relation to the association between psychological distress and age (not just those confined to comorbid pain and PTSD outpatients, but also pain and anxiety and depression) were, like the research studies reviewed, found to be conflicting. One theory argues that past stressful experiences (which accumulate with age) among older people are associated with an increased vulnerability to recent trauma or stress. Aarts et al. (1996) postulate that older individuals, therefore, could display delayed onset or reoccurrence of PTSD,
frequently coinciding with recent stressful events, such as loss of work or illness. Only one of the studies supported this view (Ryb et al., 2009 who found greater PTSD in participants aged over thirty years). In contrast to the accumulated stress theory, another theory argues that older patients become “inoculated” against stress during their lifetime and that, as people age, motivational attention is increasingly placed on emotionally meaningful activities and goals and more attention is paid to positive events (Eysenck, 1983). Conversely, it is postulated in the present paper that younger person may believe (a “self-rule”, Törneke, 2010), that “young people are healthy” which is contrary to their own pain experience and consequently this dissonance causes them distress.

LaChapelle and Hadjistavropoulos (2005) echoed the stress inoculation theory among adults coping with pain (Eysenck, 1983). The authors integrated a developmental and contextual approach and postulated a Developmental Life-Context Model of age-related coping styles in a pain population. In their study (N = 280) they found support for their theory in that that older adults reported a lower level of pain intensity, and they did not regard their pain experience as particularly stressful or requiring extensive coping efforts. Although the authors did not specifically discuss the effect of pain (whether traumatic or non-traumatic in origin) on rates of distress, they raised the possibility that younger participants appraise their pain situations as more stressful than older participants.

The literature was also unclear as to whether there was an association between age and depression among outpatients with chronic pain or severe initial injury (only two studies were identified in relation to chronic pain or injured patients). Again, in seeking further enlightenment on this topic, the literature in relation to the general population was explored. One general theory suggests that
middle adulthood is a time of greater stress loads (McEwen, 1998), for example, family and work responsibilities. It is argued here that anxiety arising out of an accumulation of stressors can eventually give way to an “exhaustion stage” (Selye, 1950) in this middle age group. It is postulated that, when pain and a traumatic event are combined with the greater responsibilities and stress of patients of this vulnerable age group, this adds to feelings of helplessness and hopelessness and to depression.

Overall, having considered the research literature in relation to hospital outpatients with chronic pain or initial injury, as well as underlying theory about age and vulnerability to PTSD, it may be concluded that there is some evidence that younger age is a vulnerability factor for PTSD as younger individuals have less life experience and a sense of invincibility, but that middle adulthood is a vulnerable time for depression given that this group have generally the greatest environmental stress load.

2.4.2.2 Gender. The current literature review suggested a tendency for females with chronic pain or initial injury to be more vulnerable to PTSD than males (Kobayashi, et al., 2018; Bryant et al., 2015; Williams, et al., 2012; Soberg, et al., 2010). Ryb et al., 2009 found females to be significantly more likely to have PTSD at six months but not at one year. Similarly, two retrospective studies (Andersen, et al., 2012; Stalnacke, 2012) found no significant gender differences for PTSD. Ryb., et al., postulated that the early gender effect may be explained by an overdiagnosis of PTSD among women due to greater insight into their emotional experiences, or an ability to express or share their symptoms more easily than males.

The hospital studies reviewed were compared to findings in studies relating to PTSD in the general non-hospital population. Creamer, Burgess, and McFarlane (2001) analyzed data from the Australian National Survey of Mental Health and
Well-being (Australian Bureau of Statistics, 1998) and found little difference at twelve months in the rates of PTSD between females and males. There was a 1.2% prevalence rate for males and a 1.4% prevalence rate for females (including those who had experienced sexual trauma). The authors referred to contrary findings in a 1997 study by Breslau, Davis, Andreski, Peterson, and Schultz (1997) who found that PTSD is more likely to develop in females than in males after exposure to a traumatic event. The key findings of this study were that lifetime prevalence of exposure to traumatic events did not vary by sex; the risk for PTSD after exposure to traumatic events for women was more than twice the risk for men; pre-existing anxiety disorders or medically diagnosed depression played a small part in the observed sex differences in PTSD after exposure; family history of anxiety disorder and early separation from parents did not play a role in the observed sex differences in PTSD, and sex differences in PTSD were markedly more evident if exposure occurred in childhood than after age fifteen years.

A more recent study (Inslicht et al., 2013) has found that women with PTSD were more reactive to cues signalling threat (there was an enhanced acquisition of fear in women) in that they reacted more strongly (measured using functional magnetic resonance imaging, fMRI, and skin conductance response, SCR) than men to computer-generated coloured circles that had been paired with an aversive electrical stimulus. The researchers postulated that the greater fear conditioning in women was either a pre-existing vulnerability, or an acquired gender-dependent response. This latter postulation is echoed by contextual therapists such as Törneke (2010) who argue that life contexts and experiences may differ between males and females. For example, some individuals may have been reinforced by societal norms into believing a rule that women are more fragile or should be protected and looked
after to a greater extent than men. Females who adopt such views into their concept of self may find that this does not occur, and distress may ensue. In other words, gender contexts may affect the perception or reporting of pain and distress.

However, one study (Zlotnick, Zimmerman, Wolfsdorf, & Mattia, 2001) concluded that it is the nature of the trauma that may account for the differential responses in PTSD. After controlling for sexual assault, they found that male and female patients present with comparable profiles for PTSD. Mccall-Hosenfeld, Winter, Heeren, and Liebschutz (2014) found that, where there was interpersonal trauma (sexual trauma, intimate partner violence, a history of childhood trauma), somatic symptoms were elevated in both men and women although women reported significantly more somatic symptoms. However, the researchers did not find a significant interaction between gender and trauma on somatic symptom severity (the association between trauma and somatic symptoms is amplified in both genders), with the exception of adverse childhood experiences where females reported significantly more severe somatic symptoms than males. Nevertheless, the researchers concluded that interpersonal trauma is more prevalent in females than males.

The current research team separately reviewed gender differences in anxiety and depression in hospital pain and trauma outpatient settings. There was a split in the review findings between prospective and retrospective studies in relation to whether males or females with chronic pain or serious injury in hospital outpatient settings were more anxious or depressed. A prospective study (Phillips, et al., 2010) found males were more prone to depression after traumatic injury, but a retrospective study (Stalnacke, 2012) found that females were significantly more prone to
depression after injury. Yet another retrospective study (Rovner et al., 2017) found no significant differences for gender and depression.

In summary, the current literature review did not indicate consistent difference for anxiety or depression between male and female outpatients with chronic pain or serious precipitating trauma (apart from Phillips, et al., 2010 who found men to be more vulnerable). The reason for this discrepancy between retrospective and prospective studies is not clear – possibly there were sampling differences between males and females in the respective studies relating to the nature of the traumatic injuries and their consequences (e.g., household falls vs MVA’s). It is also possible that the follow-up prospective studies maintained a focus on society’s expectation that female outpatients with traumatic injury would be more distressed after the precipitating event whereas the focus on the event was not maintained in later retrospective studies and distress symptoms became more generalized and part of a larger life context. The relative dearth of studies in this narrowly defined hospital population (outpatients with both traumatic pain and injury) indicates that more research addressing this issue could usefully be undertaken.

In comparison with the studies reviewed in chronic pain or trauma outpatient settings, the general literature (where studies were more plentiful) indicated that females in non-hospital settings are twice as likely (Kessler et al., 2005) to be depressed as males and to report more pain (Wranker, Rennemark, & Berglund, 2016; Shega, Tiedt, Grant, & Dale, 2014). It is possible that in hospital settings only the most distressed and in pain attend regardless of gender, and consequently, the differences between males and females in depression are less extreme. The current research team again turned to the theoretical literature in relation to both biological
and contextual factors (while acknowledging there will be an interaction of these factors) for a better understanding of any differences in gender which predispose pain and trauma patients to anxiety or depression. As with PTSD, contextual rather than inherent biological factors may account for any differences in vulnerability to anxiety or depression. A self-categorization theory proposes that group norms predict behaviour (Terry, Hogg, & McKimmie, 2000) and in Western cultures men are socially expected to be more stoic and women to be more emotionally expressive. Pool, Schwegler, Theodore, and Fuchs (2007) specifically explored this theory among participants reporting pain. In support of this norm, researchers found that men who highly identified with stereotypic male group norms reported significantly higher pain tolerance (and less distress) than high identifying women. There were no significant differences in expected pain tolerance between males and females who did not strongly identify with their gender group norms.

2.4.3 PTSD and Patient Experience

The research literature was also explored in relation to two subjective aspects of the pain experience that may reflect vulnerability factors and predict the development of PTSD in pain and trauma patients, namely, the extent of self-reported pain and the extent of memory of the traumatic event (DSM 5, American Psychiatric Association, 2013).

2.4.3.1 Pain extent. The current review found only two retrospective studies relating to pain extent or site in outpatients with traumatic chronic pain or injury which indicated that pain extent (DeCarvalho, 2010) and location of pain (particularly head and spinal, Woodruff et al., 2017) is associated with PTSD as well as anxiety and depression. What was less clear from the review was whether having a central core injury such as back pain is especially predictive of PTSD (Woodruff et
al., 2017), or whether having diffuse pain is an aggravating factor. A third option is that clinically relevant posttraumatic stress symptoms in hospital outpatients with traumatic chronic pain are confounded by complex life events and anxiety and depression that aggravate or maintain chronic pain and PTSD.

There was some guidance on the association between pain extent or site and psychological distress (at least in relation to anxiety and depression) in the literature outside of hospital outpatient cohort, particularly relating to surveys of patients presenting to general practices or primary care facilities. It was clear that low back pain is prevalent. For example, Walker, Muller, and Grant (2004) undertook a survey of 3000 Australian adults selected from the Electoral Roll. There was a 69% response rate. It was concluded that low back pain (mostly low-intensity and low-disability pain) is a common problem in the Australian adult population (over 10% of participants had been significantly disabled by low back pain in the previous six-months). Several studies specifically selected low back pain in the non-hospital population for investigation (Dunne-Proctor, Kenardy, & Sterling, 2016; Pinheiro et al., 2017). One review of the literature found that generalized anxiety disorder (like other anxiety disorders and depression, often comorbid with PTSD), was frequently accompanied by chronic pain symptoms such as backache (Nutt, Argyropoulos, Hood, and Potokar (2006). The review indicated that depression is common in individuals with low back pain. A United States face-to-face household survey (the National Comorbidity Survey Replication; Von Korff et al., 2005; N= 5692) found that chronic spinal pain rate was about twice as high in respondents with a mental disorder as in those without. Anxiety was as strongly associated with chronic spinal pain as mood disorders. Otis, Keane, and Kerns (2003) reported that in a sample of
PTSD patients, back pain (45%) and headaches (34%) were the most common physical complaints.

The above studies concerned a single pain site. Studies comparing distress by different pain areas were surprisingly few but some literature relating to primary care patients suggests that having multiple pain sites is associated with greater risk of PTSD, depression and anxiety. For example, an English meta-analysis of 45 studies of patients in primary care by Mallen, Peat, Thomas, Dunn, and Croft (2007) found several prognostic factors related to poor outcomes of pain including multiple-site pain. A British postal survey (Carnes et al., 2007) investigated the frequency and health impact of chronic multi-site musculoskeletal pain in a postal questionnaire survey of 16 general practices in UK (60% responded to the survey, N=2445). Forty-five percent reported chronic musculoskeletal pain. Of those with chronic pain, three-quarters had pain in multiple sites. Predictors for multiple pain sites were: being under 55 years of age, anxiety and depression and high pain intensity. It was concluded that multi-site chronic pain is more common than single-site chronic pain and is more commonly associated with psychological problems such as anxiety, depression, anger and fear. The authors of the survey cited a study by Smith, Elliott, Hannafor, Chambers, and Smith (2004) who argued that the extent of pain (number of sites) may be more important than the actual site of the pain in determining the impact on patients’ lives. Smith et al found that single site chronic pain is comparatively uncommon compared to multi-site. Further, that multi-site pain may have more impact on quality of life, health care utilisation, and mental health than single site pain. The authors of the survey concluded that the relationship between multiple pain sites and increased psychological distress is under-researched and an
understanding of this relationship could influence current interventions. They argue that it was therefore self-defeating for clinicians to focus on one pain site.

In summary, chronic pain symptoms are frequently associated with anxiety and depression and, at least in a hospital outpatient setting, with PTSD. It appears from the review that spinal pain is particularly prevalent and is associated with psychological distress. However, here is some indication also that widespread pain, at least in primary care patients, (Carnes et al., 2007) is associated with even greater psychological distress. One view of this may be simply that if many body parts are affected, then pain may be triggered more frequently by daily activities than if just one isolated, peripheral body part is affected.

2.4.3.2 Extent of traumatic memory. PTSD as defined in the DSM 5 (American Psychiatric Association, 2013) involves disturbance of memory including dissociative amnesia (gaps in memory) and inability to recall, either partially or completely some important aspect of the period of exposure to the stressor, intrusive memories, lack of concentration, and conditioned (associative) responses (Sparr & Bremner, 2005). Like pain, memory is an unobservable internal event and relies on subjective report. In the current review, of the eight studies identified in the literature in relation to PTSD and memory disturbance in hospital outpatients, only one retrospective study (Duckworth & Iezzi, 2005) directly investigated memory of the event. The remaining studies investigated memory disruption in relation to mild TBI patients and whether they were conscious or unconscious.

The assumption underlying the studies examining the relation between mild TBI and PTSD is that impaired consciousness precludes memory of the trauma and that PTSD is less likely. However, even with TBI there are degrees of awareness which may range from no awareness to confused awareness to full awareness which
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may relate to degrees of memory loss ranging from no memory, to partial memory to complete memory. Bryant and Harvey (1999) postulate that the limited post-traumatic amnesia associated with mild TBI typically permits individuals to be aware of some aspects of their trauma (partial memory), so that they are as vulnerable to developing PTSD as those who do not sustain a TBI.

In summary, based on the studies analyzed in the current review, there is emerging evidence that posttraumatic stress symptoms may arise in all three cases including even where there was total loss of consciousness (Roitman et al., 2013). Biomedical theories (invoking the amygdala, prefrontal cortex and hippocampus: van der Kolk, 2002a) may provide an explanation for findings that even unconscious patients have PTSD symptoms (including intrusions) which relate to the failure to process implicit memories into explicit consciousness. Researchers (Rothschild, 2002; Van Der Kolk, 1994; Levine, 2005) make the distinction between implicit and explicit memory. Implicit memories refer to changes in behaviour because of past experiences and may involve non-associative learning such as sensitization (and the reverse, habituation), but also associative processes such as operant and respondent conditioning. Explicit memory is the conscious, intentional recollection of previous experiences and information, such as remembering the time of an appointment, or recollecting an event. Levine’s SIBAM dissociation model (Levine, 2005) proposes that an experience of an event is composed of several elements and that complete memory involves integrated recall of all of the elements. He identified the elements as: sensations, images, behaviours, affect and meaning (SIBAM). However, the elements of highly distressing or traumatic events can be dissociated from each other (unprocessed and “free-floating” in time) leading to intrusions. The remaining explicit memory is usually partial, as fewer distressing memories may be available.
for recall. It is also possible that distressing memories have been processed but may simply be avoided (consciously suppressed rather than being unavailable to consciousness), which could also lead to intrusions.

However, it may be difficult to conclude in some cases whether memory problems are solely related to head injury or a traumatic event. There may be alternative physiological and neurological mechanisms even in those with complete loss of consciousness which could result in PTSD-like symptoms such as disrupted memory. An American study by Larson, Zollman, Kondiles, and Starr (2013) examined memory impairment, premorbid cognitive ability, post-concussive complaints, and symptoms of PTSD in 205 military veterans, 135 of whom gave a self-reported history of concussion and exposure to a traumatic life event. They found that memory problems generally (not only for traumatic pain event, e.g., attention, visuospatial) were significantly associated with diagnosis of PTSD but were not associated with history of concussion. In other words, memory disruption may arise from other causes than a life-threatening or catastrophic event when associated with a traumatic brain-injury (TBI) or chronic pain. It remains a possibility that modulation of, or damage to, the hippocampus (Bigler & Maxwell, 2011) or the prefrontal cortex (Bryant, 2011) may interfere with fear reactions and processing of explicit memory leading to posttraumatic stress symptoms.

A major limitation in respect of the reviewed literature is that no uniform or standardised measure of extent of memory was utilised: some relied on structured interview, or questionnaires specifically devised for the individual study, or it was assumed that unconsciousness was associated with no memory of the event. A future protocol for exploring and distinguishing the relationship of disrupted memory to lack of consciousness, and to the processing of events leading to PTSD would be
helpful assessing the direct influence of the pain or injury event. Further, more prospective studies that assess TBI, consciousness, reported memory, and content of memory would assist in determining where the risk for PTSD lies.

2.5. Conclusion

The aim of this review was to ascertain from an existing research base whether PTSD, anxiety or depression specifically in outpatients with chronic pain that was traumatic in origin may be quantitatively predicted from theory-derived factors that also meet the translational criteria of factors that are amenable to being routinely recorded in hospitals. The reviewed studies indicated a need for further research on these predictors, and their association with clinically relevant posttraumatic stress in chronic pain patients - particularly in relation to the patient experience of pain and memory of the event which is for some patients more difficult to measure quantitively. There was also a general limitation in the reviewed studies in that a variety of participant groups, measures, cut-off points, designs and statistical methods were used. This is a significant drawback in the translational potential of these findings as the results cannot be fully synthesised. It also highlights the importance of researchers perhaps agreeing a standardized paradigm and design protocol to guide future research to allow studies from different research groups to be synthesized and confidently translated into clinical guidelines and treatment protocols.

However, there are several tentative conclusions that may be drawn from the literature reviewed, in particular when the findings are triangulated with other related literature. There is some persuasive evidence that objectively determinable predictors (i.e., patient characteristics: younger age, female gender) may be associated with a vulnerability to PTSD in chronic pain and injured outpatients although middle-aged patients may be more prone to depression. However, other selected predictors based
on DSM 5 diagnostic criteria for PTSD (American Psychiatric Association, 2013) namely injury severity (ISS) and disrupted memory of the event, are less supported by the research studies reviewed. Subjective patient self-report of pain site (particularly back) and extent of pain (particularly widespread and including the spine) appear from the review to be predictive of at least anxiety and depression, which models indicate may be related comorbid chronic pain and PTSD (e.g. Sharp & Harvey, 2001).

2.6. Future Research

There is more work to be done in attempting to understand predictors of PTSD, anxiety and depression through statistical modelling of a combination of the selected diagnostic and theory driven factors, to help with treatment decision making for trauma-related pain patients in hospital contexts. Specifically, there are a number of promising potential predictors that include objective event related characteristics, and subjective reported experience of pain and trauma. It is clear that multiple variables must be considered simultaneously to fully understand the complex interplay of premorbid factors, injury-related factors and factors influencing post-trauma adaptation. It is also clear that developing a standardized protocol for study design and measurement is key in developing a synthesisable evidence-base – preferably interrogating complex data from a common sample to maximise comparability of analyses and minimize extraneous variance inherent in comparisons between different samples. Longitudinal designs offer further power of analysis. This more co-ordinated approach to research is particularly critical in translational contexts to more quickly address a gap in the evidence base for guiding treatment resource allocation; and for better understanding the needs of patients with traumatic chronic pain who do not respond to standardized hospital interdisciplinary treatment.
Ethical Issues

Institutional ethics committee approval was granted by Murdoch University in Western Australia to undertake this review which formed part of a PhD thesis. No patients were directly involved in this review of the literature and informed consent was not required.

Conflict of Interest Statement

The authors have no conflicts of interest to declare. Work undertaken on this study was part of an unfunded PhD studentship at Murdoch University, Perth, Western Australia.

Acknowledgements

The authors acknowledge the contribution of previous researchers and participants referenced in this study. This review would not have been possible without their commitment to better understanding chronic pain and distress.
Appendix

Literature Review Search Strategy

All searches were performed on Friday 31st August 2018

With Date range 1997 to 31st August 2018

Database: Ovid MEDLINE(R) ALL &lt;1946 to August 28, 2018&gt; Search Strategy:

1 *chronic pain/ (8319)

2 exp *wounds and injuries*/ and (*pain/ or pain.ti,ab.) (39893)

3 ((ongoing adj pain) or (continu* adj pain) or (chronic adj2 pain) or (persist* adj3 pain) or
((trauma* or serious*
or sever*) adj1 (injur* or accident* or pain))).ti,ab. (105891)

4 1 or 2 or 3 (142040)

5 *anxiety disorders/ or *anxiety/ (54509)

6 *stress disorders, post-traumatic/ (23121)

7 *depression/ or *depressive disorder/ (108379)

8 ((posttraumatic adj stress) or (post adj traumatic adj stress) or PTSD or anxiety or depression or
psychological
distress).ti,ab. (413501)

9 5 or 6 or 7 or 8 (450093)
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10 4 and 9 (10397)

11 risk factors/ or causality/ (748003)

12 exp trauma severity indices/ (30883)

13 Time Factors/ (1130897)

14 Age Factors/ (425126)

15 Sex Factors/ (245971)

16 "Severity of Illness Index"/ (218515)

17 sickness impact profile/ (6942)

18 Life Change Events/ (21847)

19 ((trauma or injury) adj3 severity) or (nature adj3 (event* or inciden*)) or
(&quot;time since&quot; adj3 event or
inciden*)) or ((age or gender) adj3 difference*) or (life adj threatening)).ti,ab,kw.
(170054)

20 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 (2574860)

21 10 and 20 (2883)

22 exp Cohort Studies/ (1775697)

23 "Surveys and Questionnaires"/ (405783)

24 (systematic or ((study or studies) and (sample* or group* or participants))).ti,ab.
(3043075)

25 22 or 23 or 24 (4501816)

26 limit 21 to (comparative study or meta analysis or systematic reviews) (439)

27 21 and 25 (2055)

28 26 or 27 (2156)
29 remove duplicates from 28 (2143)

Database: PsycINFO &lt;1806 to August Week 3 2018&gt; Search Strategy:

1 *chronic pain/ or exp *injuries/ or *traumatic brain injury/ (44459)
2 ((ongoing adj pain) or (continu* adj pain) or (chronic adj pain) or (persist* adj3 pain) or
((trauma* or serious*
or sever*) adj3 (injur* or accident*)).ti,ab. (38104)
3 1 or 2 (58548)
4 *psychological stress/ or *acute stress disorder/ or *generalized anxiety disorder/ (9334)
5 *posttraumatic stress disorder/ (25473)
6 *reactive depression/ (234)
7 *distress/ (14011)
8 ((posttraumatic adj stress) or (post adj traumatic adj stress) or PTSD or anxiety or
depression).ti,ab. (356039)
9 4 or 5 or 6 or 7 or 8 (372014)
10 3 and 9 (9447)
11 near death experiences/ or exp transportation accidents/ (7265)
12 &quot;experiences (events)&quot;/ (16589)
13 episodic memory/ or *memory/ (54189)
14 human sex differences/ (106932)
15 (((trauma* or injur*) adj3 sever*) or &quot;predictive factors&quot; or (nature adj3 (event* or inciden*))

or (&quot;time since&quot;)

adj3 (event or inciden* or accident)) or ((age or gender) adj1 difference*)).ti,ab.

(50333)

16 11 or 12 or 13 or 14 or 15 (210321)

17 10 and 16 (1373)

18 longitudinal studies/ or prospective studies/ or followup studies/ or retrospective studies/

(28597)

19 cohort analysis/ (1270)

20 (systematic or &quot;prospective stud*&quot; or &quot;cohort stud*&quot; or survey* or questionnaire* or study or

studies or sample*

or group* or participant*).ti,ab. (2548959)

21 18 or 19 or 20 (2557152)

22 17 and 21 (1102)

23 remove duplicates from 22 (1101)
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Soberg, H. L., Bautz-Holter, E., Roise, O., & Finset, A. (2010). Mental health and Posttraumatic Stress Symptoms 2 years after severe multiple trauma: Self-
reported disability and psychosocial functioning. *Archives of Physical Medicine and Rehabilitation, 91*(3), 481-488.

doi:10.1016/j.apmr.2009.11.007


Coda

The following hypotheses are relevant to the thesis as a whole, rather than directed at individual journal articles that are potentially to be submitted for publication and where the content may not be relevant. The content is therefore set out as a Coda to the thesis. It is intended to make a connection between the introductory chapters (1 and 2), and subsequent chapters.
Hypotheses

The initial research question addressed in this thesis is whether chronic traumatic pain and comorbid posttraumatic stress, anxiety or depression may be predicted from a handful of translationally relevant, theory-driven or diagnostically driven factors, that could potentially be collected in busy hospital trauma units. Chapter 1 reviewed the general theory of chronic pain, PTSD and anxiety and depression. The more specific review of potential predictors set out in Chapter 2 revealed uncertainty in relation to the two broad categories of potential predictors: Objective event characteristics (Injury severity), and subjective client experience (self-report of pain extent, extent of memory of the pain event). The following summary of hypotheses was made to guide the studies that follow, recognising however the limitations of the evidence base previously reviewed, and drawing upon the triangulation (in Chapter 2) of said evidence with (i) the broader evidence base relating to anxiety, depression and PTSD in pain patients in non-hospital contexts; and (ii) theories of comorbid pain and PTSD and DSM 5 criteria for PTSD outlined in chapter 1 of this thesis. Together the broader research and theories emphasized: a traumatic event, recency of event, younger age, female, disrupted memory, widespread pain. However, it is noted that in some instances the reviewed empirical studies (as distinct from the theory) appeared to be not only contradictory, but even at odds with the theories and DSM criteria for PTSD. This state of play emphasizes the need for the current series of studies, and the points of incongruence between data and theory highlight important areas of investigation. For example, the research reviewed did not support injury severity as a predictor of PTSD although the DSM 5 Criteria A states that serious injury or threatened death (in addition to sexual violence) are associated
with PTSD, indeed are key to diagnosis. Further, “serious” or “threatened death” was not further operationalised. This thesis therefore investigated not only serious injury (ISS > 15), but life-threatening or critical injury (ISS > 24) which was hypothesised on the basis of clinical experience, to be more likely to predict PTSD in chronic pain outpatients. The hypotheses to be investigated in this study are as follows:

Table C1

<table>
<thead>
<tr>
<th>Hypotheses</th>
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<tbody>
<tr>
<td><strong>Hypothesis 1</strong></td>
<td>Participants with chronic pain who attribute their pain to a traumatic event will report higher mean ratings of posttraumatic stress symptoms than both the subacute trauma group and participants in the chronic pain group who attribute their pain to other causes. This reflects the greater impact of indirect stressors and anxiety predispositions on participant’s pre-existing posttraumatic stress symptoms (Keane &amp; Barlow, 2002; Sharp &amp; Harvey, 2001).</td>
</tr>
<tr>
<td><strong>Hypothesis 2</strong></td>
<td>There will be higher levels and a greater prevalence of clinically impactful posttraumatic stress symptoms in participants in the subacute than in the chronic pain groups. This reflects the recency of the event for the subacute group participants and the greater influence of direct and autonomic influences from which the patient has not had time to recover (Flor, 2012; McEwen, 1998; Selye, 1950).</td>
</tr>
<tr>
<td><strong>Hypothesis 3</strong></td>
<td>Participants with “exceptionally severe” or “critical” injury (ISS ≥24, Injury Severity Score, Baker, O’Neil, Haddon, &amp; Long, 1974) will report significantly higher posttraumatic stress</td>
</tr>
</tbody>
</table>
than those participants with ISS rated as “severe” (15 <= ISS < 24). This hypothesis is made given the centrality of a life-threatening event or serious injury for a DSM 5 diagnosis of PTSD (American Psychiatric & American Psychiatric Association, 2013).

**Hypothesis 4**  
**Participants reporting diffuse pain (both back and peripheral) will be more likely to report high anxiety, depression and PTSD symptoms than those participants with discrete back pain or peripheral pain, who will be less psychologically distressed.** This distress may not simply be associated with reduced functioning from pain but may occur where there is hypervigilance to pain symptoms, which can increase central nervous system sensitivity and an increase in pain extent (Clauw, Arnold, & McCarberg, 2011; Vlaeyen & Linton, 2000).

**Hypothesis 5**  
**Participants with partial memory will have significantly higher posttraumatic stress symptoms than participants with complete memory or no memory.** Disrupted memory after a traumatic event can give rise to implicit free-floating thoughts and feelings, which are not integrated into the consciousness and which can lead to distressing intrusions (Rothschild, 2000; van der Kolk, 2002).

A summary of the specific hypotheses in relation to the selected predictors in this thesis is outlined below (Table C2):
Table C2
*Hypothesised Contribution Factors to Posttraumatic Stress*

<table>
<thead>
<tr>
<th>Event Characteristic</th>
<th>Patient experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS(^1) (Subacute)</td>
<td>Pain</td>
</tr>
<tr>
<td>PTSD</td>
<td>Memory</td>
</tr>
<tr>
<td>&gt;24</td>
<td>diffuse</td>
</tr>
<tr>
<td></td>
<td>partial</td>
</tr>
</tbody>
</table>
References

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CHAPTER 3

Study One

Introduction and literature review
Chapter 1
Introduction

Chapter 2
A comprehensive review of potential predictors (IVs) of psychological distress in the context of chronic pain caused by a traumatic event.

Predictors of distress in subacute trauma patients
Chapter 3, Study 1
Outpatients attending a subacute trauma clinic (ISS>15), (early hospital utilization, 3-6 months post-discharge).

Predictors of distress in chronic pain patients with pain of (i) traumatic origin and (ii) non-traumatic origin
Chapter 4, Study 2
Outpatients attending a chronic pain management program (hospital utilization, pain > 1 year.).

A quantitative analysis (profiling) of predictors of levels and incidence of psychological distress in chronic pain patients with pain event of traumatic origin (N = 64). A comparison of findings in Studies 1 and 2: Chronic pain trauma (N=64) Subacute pain trauma (N=77)

Chapter 5, Study 3
Chronic pain trauma (N=64)
Chronic pain no trauma (N=88)
Compare distress and predictors between chronic pain trauma and chronic pain no trauma groups.

Understanding treatment outcomes for chronic pain patients
Chapter 6
A literature review of program contents and outcomes.

Chapter 7, Study 4
(N=92). The association between traumatic and non-traumatic pain and outcomes after a pain management group intervention are explored.

Chapter 8, Study 5
Case studies (N=10) Thematic analysis
A practical application of themes in group setting.

Chapter 9
Discussion

Keywords Pain, trauma, subacute, anxiety, depression, posttraumatic stress, injury severity, memory, age
Predictors of Posttraumatic Stress in Outpatients with Subacute Traumatic Injury

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Summary
Younger age, diffuse pain and partial memory were predictive of posttraumatic stress in outpatients attending a hospital trauma service for review three months post-discharge.
Abstract

**Background and aims.** The psychological and physical recovery process after a traumatic pain event can be long for some patients, with uncertain outcomes, and comorbid chronic pain and PTSD become increasingly difficult to treat. This study sought to evaluate the utility of a set of patient and event variables in predicting PTSD within a subacute outpatient group. Specifically, patient experience (self-report of pain extent and memory of the event) and an event-related characteristic (serious initial injury), were considered as potential early predictors of posttraumatic stress, which may allow treatment to be targeted at a subacute stage to prevent pain and PTSD from becoming chronic.

**Methods.** Participants in the subacute group were 77 outpatients attending a major trauma clinic three months post-discharge. All participants completed a measure of post-traumatic stress (Impact of Event Scale-Revised). Injury severity was assessed by medical doctors on admission on the Injury Severity Scale (ISS) and ISS was extracted from hospital records. Extent of pain and completeness of traumatic memory were recorded at physiotherapy and psychology review, respectively.

**Results.** It was found in the subacute group that partial memory of the traumatic injury event was predictive of greater distress, but pain extent and (despite DSM 5 criteria for PTSD) injury severity even when very severe or critical (ISS > 24), were not predictive of distress.

**Conclusions.** The results indicated that partial memory of the event, is a readily determinable predictor of posttraumatic stress.

**Implications.** Early identification of those at risk will assist in guiding the allocation of limited health treatment resources and prevent or mitigate an escalation into chronicity. Further work is required to confirm whether the selected predictors of
PTSD, at the subacute stage predict chronic pain and clinically relevant symptoms of posttraumatic stress.
3.1. Introduction

Previous research into hospital outpatients with chronic pain arising from a traumatic cause has found high rates of Posttraumatic Stress Disorder (PTSD) (Akhtar, Ballew, Orr, Mayorga, and Khan, 2018; Haagsma et al., 2012); depression (Bair, Robinson, Katon, & Kroenke, 2003; Sullivan-Singh et al., 2014); and anxiety (Asmundson and Katz, 2009; Stalnacke, 2012) and, at least among injured United States war veterans, high rates of triple comorbidity of posttraumatic stress disorder, anxiety and depression (Ginzburg, Ein-Dor, & Solomon, 2010). Given the economic, personal and social implications of chronic pain (Foundation, 2007), identifying and treating outpatients at an early stage and preventing escalation into more difficult to treat chronicity becomes essential - the research literature indicates that while most participants recover from posttraumatic stress symptoms within a year, the symptoms are more difficult to treat in those who do not recover within that time period (Freedman, Brandes, Peri, & Shalev, 1999). Similarly, most pain resolves within three to six months, but once it becomes chronic it becomes more complex and response to standard medical treatments can be poorer (Melzack, & Turk, 2001). Thus, pain and distress may become associated with a cycle of increased sensitization to pain, hypervigilance and possible memory triggers of the traumatic pain event (Sharp & Harvey, 2001).

Research distinguishes physical and psychological differences between acute, subacute and chronic pain (Flor, 2012; Melzack & Wall, 1996). This paper seeks to investigate whether early predictors relating to the traumatic pain event can be identified at a subacute stage (three months post-discharge from hospital after serious traumatic injury). The subacute period is regarded as the stage at which...
clinicians become increasingly concerned at symptoms which are not remitting spontaneously or responding to standard treatments. It was also recognised in the current study that not all of the participants who sustained serious traumatic injury would necessarily report an ongoing experience of pain or distress at three months post discharge. These resilient patients potentially form a useful comparison group in exploring the extent and location of patients’ pain and their distress.

Two major categories of predictors were investigated. (i) Patients experience (self-report of pain extent and extent of memory of the traumatic event) were investigated. Both pain and memory are subjective internal events and health practitioners rely heavily patient self-report of their experience. The current authors also investigated a more objective measurement, namely (ii) the event related characteristic, an initial traumatic injury severity. This is a factor relevant to mental health practitioners assessing a pain event as “traumatic” (involving the threat of death or serious injury: Criterion A, DSM 5, American Psychiatric Association, 2013). The majority of the research reviewed in the preliminary stages of this study indicated that ISS was not strongly associated with PTSD (Boals, Trost, Rainey, Foreman, & Warren, 2017; Dougall, Ursano, Poslusny, Fullerton, & Baum (2001); van Delft-Schreurs et al. (2014); Zatzick, Kang, et al. (2002b). However, studies reviewed did not make a distinction between serious injury and very severe or life-threatening injury. It is postulated in the current paper that only the latter level of seriousness would be sufficient to fulfil the DSM 5 criterion for PTSD.

Importantly, the current study sought to explore not only univariate effects but the combined impact of this set of variables on clinically relevant distress. Comorbid pain and PTSD is a complex experience. It was, therefore, expected that a combination of the selected factors rather than any one specific factor would be most
likely to be most predictive of PTSD.

3.2. Method

3.2.1 Participants

Participants comprised 77 outpatients who attended a major trauma clinic at Royal Perth Hospital, Western Australia, during the subacute phase of recovery from serious injuries (Injury Severity Score, ISS ≥ 16) (Baker, O'Neill, Haddon, & Long, 1974) including road accidents, assaults, falls, fire, or chemicals. None in this cohort reported sexual interpersonal trauma directly related to their traumatic pain. Participants were categorised as having been either severely injured (15 ≤ ISS < 24) or very severely injured (ISS ≥ 24) in accordance with American College of Surgeons (2005) recommendations. Overall, 40 participants were rated as severely and 37 as very severely or critically injured.

Age of participants was categorised to facilitate analysis with other discrete variables such as pain extent and memory of event. The mean age of participants was 41.32 years. Sixty (78%) participants were males and 17 females (22%). The smaller number of females presenting at the three-month review was reflective of the fact that males attending the major trauma service invariably outnumber females in all age groups except for the elderly age groups (over 75 years) (Royal Perth Hospital, 2011)

3.2.2 Measures

The general hospital chart was drawn upon to provide the following archival information:

---

Appendix to this Chapter 3, Study 1, describes the measures and dependent and independent variables more fully. Full explanation was considered not required to be incorporated into this paper as not compliant with concise publication requirements.
The Impact of Event Scale Revised (IES-R) (Weiss & Marmar, 1997) is a screening tool that measures symptoms of posttraumatic stress on a scale of 0 (not at all) to 4 (extremely): Avoidance (eight items); Hyperarousal (six items) and Intrusions (eight items) and provides a total symptom score. In this study, the total IES-R score was categorised dichotomously where a cut-off total raw score of 33 (IES-R Total mean of subscales = 1.5) and above would indicate probable PTSD (Creamer, Bell, & Failla, 2003).

Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983) targets symptoms of depression and anxiety other than those that might be explained by physical illness or disability alone – an important differentiating feature in pain studies. This scale was used in the preliminary analysis to compare the comorbidity of posttraumatic stress symptoms with anxiety and depression symptoms among the participants (which collectively is termed “psychological distress” in this paper). The participant is asked to circle a response on an ordinal scale of 0 (not at all) to 3 (extremely). Seven items measure anxiety and seven items measure depression, with a total score of 11 or greater on either subscale being regarded as clinically significant (Snaith, 2003).

3.2.3 Procedure

Institutional ethics committee approval was granted (Royal Perth Hospital, and Murdoch University in Western Australia) to obtain and process data from outpatient reviews. Participants were asked to complete psychometric measures of distress on arrival at the hospital. All participant paper and pencil data were finally transferred into SPSS for Windows 17.0 (SPSS Inc., 2009) for analysis.
3.3. Results

3.3.1 Data Screening

Data for the 77 participants were examined for accuracy of data entry, missing values and fit between their distributions and the assumptions of multivariate analysis. Missing values were coded and excluded from the analysis (Tabachnick & Fidell, 2007).

3.3.1.1 Missing values. Four missing values were found randomly dispersed across the “memory” variable, leaving 73 patients that were available for analysis in the memory category. All 77 cases had complete data on the other independent variables, ISS and pain extent. Values missing across the dependent variable IES-R sub-scales were also excluded on a variable by variable basis.

3.3.1.2 Assumptions logistic regressions. The data were screened for any deviations from the assumptions related to the logistic regression method: (i) the dependent variables were binary (grouped: mild/ moderate or severe IES-R) and all observations to be independent of each other i.e., not repeated measurements; (ii) the independent variables were not multicollinear; (iii) the assumption of linearity of independent variables and log odds was met. Peduzzi, Concato, Kemper, Holford, and Feinstein (1996) found that a ratio of 10 or more cases to variables was adequate for a logistic regression analysis. The number of events is 37 (IES-R higher than the cutoff were 48% of 77), the number of variables was 5 (ISS 16-24 vs ISS>24, discrete pain (back or peripheral) vs no pain, diffuse (both back and peripheral) pain vs no pain, partial vs none memory, complete vs no memory. So, 50 cases instead of 37 should have been included according to Peduzzi et al.’s rule of thumb. However, Vittinghoff & McCulloch (2007) argue that this rule of ten cases to number of variables is too conservative and that less than ten events per variable (5 to 9 events -
as low as 25 cases) was acceptable. It was therefore considered that the sample was suitable for such analysis.

### 3.3.2 Preliminary Analyses

Before commencing the main analyses, preliminary analysis was made of the frequencies of distress, and the relationship between the independent predictor variables, and the dependent variables of distress.

#### 3.3.2.1 Frequency of distress

A summary of the frequency of reported moderate or severe distress on the IES-R and HADS among the participants is set out in Table 1 and compared with 12-month prevalence in the general population. Notably, in this subacute pain group, the findings are about three times higher for anxiety, six times higher for depression, and sixteen times for posttraumatic stress symptoms than in the general population.

**Table 1**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Distress</th>
<th>3 months post</th>
<th>General population</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS*</td>
<td>Anxiety</td>
<td>44%</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td>35%</td>
<td>6%</td>
</tr>
<tr>
<td>IES-R**</td>
<td>Total</td>
<td>48%</td>
<td>3%</td>
</tr>
</tbody>
</table>

* A score of 11 or greater on HADS is regarded as clinically significant
**A raw score of 33 (equivalent to 1.5 total mean subscale scores) or higher was used for the IES-R and indicates probable PTSD.
3.3.2.2 The relationship between the independent variables. Preliminary exploration was made of the relationship between the independent variables ISS, pain extent, and memory of event, as well as for the participant characteristics, age and gender (Table 2). The associations between the IVs was used as a preliminary analysis to describe the composition of the participant groups and to indicate for example, that no memory of the traumatic event was not related to serious injury, and that older participants had more pain sites but lower PTSD.

Table 2

<table>
<thead>
<tr>
<th></th>
<th>( \chi^2 )</th>
<th>N</th>
<th>df</th>
<th>Sig</th>
<th>Cramer’s V</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>2.37</td>
<td>77</td>
<td>3</td>
<td>.50</td>
<td>18</td>
</tr>
<tr>
<td>Memory</td>
<td>4.92</td>
<td>77</td>
<td>2</td>
<td>.09</td>
<td>.25</td>
</tr>
<tr>
<td>Age</td>
<td>4.92</td>
<td>77</td>
<td>2</td>
<td>.09</td>
<td>.25</td>
</tr>
<tr>
<td>Gender</td>
<td>.03</td>
<td>77</td>
<td>1</td>
<td>.86</td>
<td>.05</td>
</tr>
<tr>
<td>Pain extent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>7.1</td>
<td>73</td>
<td>6</td>
<td>.61</td>
<td>.22</td>
</tr>
<tr>
<td>Age</td>
<td>13.77</td>
<td>77</td>
<td>6</td>
<td>.03</td>
<td>.30</td>
</tr>
<tr>
<td>Gender</td>
<td>2.19</td>
<td>77</td>
<td>2</td>
<td>.34</td>
<td>.17</td>
</tr>
<tr>
<td>Memory event</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>2.69</td>
<td>73</td>
<td>4</td>
<td>.61</td>
<td>.14</td>
</tr>
<tr>
<td>Gender</td>
<td>2.19</td>
<td>73</td>
<td>2</td>
<td>.34</td>
<td>.1</td>
</tr>
</tbody>
</table>

Significance at the \( p < .05 \) level

The chi-squared tests of the variables indicated that they were largely unrelated (confirming an assumption for logistic regression analysis of low multicollinerity between independent variables pain extent and memory). The only significant association being between age and self-reported extent of pain (Table 3).
Table 3

Crosstabulations Age and Pain Extent

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>No pain</th>
<th>Peripheral</th>
<th>Back</th>
<th>Diffuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-32yrs</td>
<td>n</td>
<td>1</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>5.0%</td>
<td>40.9%</td>
<td>50.0%</td>
</tr>
<tr>
<td>33-48yrs</td>
<td>n</td>
<td>8</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>40.0%</td>
<td>22.7%</td>
<td>27.3%</td>
</tr>
<tr>
<td>49-77yrs</td>
<td>n</td>
<td>11</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>55.0%</td>
<td>36.4%</td>
<td>22.7%</td>
</tr>
<tr>
<td>Total</td>
<td>n</td>
<td>20</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>26.0%</td>
<td>28.6%</td>
<td>28.6%</td>
</tr>
</tbody>
</table>

The highest percentage of participants who reported back pain at the trauma clinic review fell within the 15-32 year-old age group. The greatest proportion of those participants reporting diffuse pain fell within the 33-48 age group (46%). Notably, 26% of participants reported no pain at the time of presentation (they may have had at other times), and the majority of this group were 49-77 years of age.

Fifty per cent of the participants who had 15<ISS<24 reported clinically relevant posttraumatic stress symptoms (IES-R > 33) as compared to 45.9% of those who had ISS≥24. As a preliminary exploration, the research team investigated whether there was an association between pain extent and ISS. A Chi-square test for independence found that there was no association between self-reported pain extent and even very severe injury (ISS ≥ 24), and some very severely injured participants reported that they had no pain at the three-month review (30%, n = 11). Pain extent for those very severely injured was as follows: back pain alone (32%, n = 12); peripheral pain alone (27%, n = 10), diffuse pain (37%, n = 13).
In the very severely injured group (ISS > 24, n = 35), 40% of participants had no memory of the traumatic event, 31% reported complete memory and 29% had partial memory. A Chi-square test for independence did not reveal a significant association between self-reported pain extent and memory of the incident. However, 53% of those participants reporting no pain at the three-month review also reported having no memory of the pain event (data on whether they were conscious or unconscious at the time of the injury was unavailable to the current research team). The participants with no pain may be compared to participants with diffuse pain, where 54% of participants reported partial memory, and to discrete back pain, where 43% reported partial memory.

3.3.2.3 Relationship between measures of PTSD, anxiety and depression.

The bivariate associations among the DVs are simply presented as a preliminary descriptive analysis of the nature of participants’ distress. There were significant correlations between IES-R scores and the HADS, indicative of comorbidities (Table 4).

Table 4

*Pearson Correlations between HADS, IES-R (N = 74)*

<table>
<thead>
<tr>
<th></th>
<th>HADS Anxiety</th>
<th>HADS Depression</th>
<th>IES-R Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>.68**</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

| IES-R Total | .77** | .77** | 1 |

*Significance at the p < .001 level*

The particularly high correlations between anxiety, depression and posttraumatic stress symptoms were notable which gives some weight to an
argument that they could be grouped together under a single category of “psychological distress”. However, in this paper only posttraumatic stress symptoms (IES-R) were investigated as that is the emphasis of theorists into comorbid pain related to a traumatic event (e.g., Sharp & Harvey, 2001)

3.3.3 The Relationship between Posttraumatic Stress Symptoms and the Independent Variables: Event-related Characteristics and Perception of Pain

Logistic regression was used to examine relationships between the independent variables and posttraumatic stress symptoms. Logistic regression can accommodate categorical variables and is therefore of particular utility where exploring categories of clinical significance or non-significance. An additional strength of logistic regression is that it allows the exploration of the combined and individual effects of the selected range of predictors in the same patient group. A full model analysis was undertaken, and if variables did not contribute significantly to the model, a further logistic analysis was undertaken in which those non-significant variables were dropped from the model that turned out not to be significant.

3.3.3.1 IES-R Total. A full logistic regression (Table 5) was undertaken to quantify the effect of the independent variables together on IES-R Total score: ISS severe injury, >ISS15 <ISS24, and very severe or critical, ≥ ISS24; pain site i.e., no pain at time of presentation at the clinic, discrete (back or peripheral pain only), and ”diffuse”, (both back and peripheral pain); or memory of event, (no memory, partial memory, complete memory). The full model was significant \( \chi^2 (5, N = 73) = 15.76, \) \( p = .008 \), correctly predicting 71.2% cases overall. The model correctly identified 65.7% of participants in the moderate or severe category of PTSD, and 76.3% in the mild or none category. The model as a whole explained between 19.4% (Cox and Snell R square) and 25.9% (Nagelkerke R squared) of the variance in IES-R Total.
As shown in Table 5, only partial memory of the event made a unique statistical contribution to the model.

Table 5

*Full Logistic Regression: Contributors to IES-R Total*

<table>
<thead>
<tr>
<th>Regressor</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95% C.I. for Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-24</td>
<td>-.08</td>
<td>.54</td>
<td>.02</td>
<td>1</td>
<td>.89</td>
<td>.93</td>
<td>.32</td>
</tr>
<tr>
<td>&gt;24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory (cf none)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial</td>
<td>1.65</td>
<td>.63</td>
<td>6.79</td>
<td>1</td>
<td>.01</td>
<td>5.21</td>
<td>1.51</td>
</tr>
<tr>
<td>Complete</td>
<td>.067</td>
<td>.65</td>
<td>.010</td>
<td>1</td>
<td>.92</td>
<td>1.07</td>
<td>.30</td>
</tr>
<tr>
<td>Pain extent (cf no pain)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discrete</td>
<td>.90</td>
<td>.65</td>
<td>1.90</td>
<td>1</td>
<td>.17</td>
<td>2.45</td>
<td>.68</td>
</tr>
<tr>
<td>Diffuse</td>
<td>1.50</td>
<td>.86</td>
<td>3.07</td>
<td>1</td>
<td>.08</td>
<td>4.48</td>
<td>.84</td>
</tr>
</tbody>
</table>

It was considered on the data that ISS contributed little to the model and could be excluded, and that the “discrete” pain category could usefully be broadened to investigate discrete back (considered potentially the most incapacitating) separately from discrete peripheral (pain outside of the spinal area). These revisions to the full model added little to the predictive value of the model and found again that only memory was significant, confirming the contribution of the factors to IES-R Total, $\chi^2 = 17.57 (5, N = 73)$, $p < .004$, and predicted 68.6% of participants in the moderate or severe category of PTSD, and 73.7% in the mild or none category. Overall the model correctly predicted 71.2% of participants with moderate or severe posttraumatic stress symptoms. The model as a whole explained between 21.4% (Cox and Snell R square) and 28.5% (Nagelkerke R squared) of the variance in IES-R Total.
Table 6
Second Full Logistic Regression: Contributors to IES-R Total

A crosstabulation of memory and IES-R Total scores examined the frequencies in each category. Amongst the subgroup with partial memory, the majority (74%) reported moderate or severe symptoms. In contrast, 35% of participants with complete memory and 31% with no memory of the traumatic event reported moderate or severe posttraumatic stress symptoms. Overall, the differences between groups was significant $\chi^2 (2, N=73) =11.80, p = .003$, Cramer $V = .40$.

The effect of memory alone on IES-R Total was examined using a direct logistic regression, $\chi^2 (2, N = 73) = 12.18, p =.002$ and correctly predicted 57% of the clinically relevant posttraumatic stress scores. Under this model, participants with partial memory were 6.4 times more likely to report significant posttraumatic stress symptoms than those with no memory. The model explained between 15.4% (Cox and Snell R square) and 20.5 % (Nagelkerke R squared) of the variance in IES-R Total.

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Frequency</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Ratio</th>
<th>95% C.I. for Odds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory (cf no memory)</td>
<td>30.8%</td>
<td>8.52</td>
<td>.92</td>
<td>2</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial</td>
<td>74.1%</td>
<td>1.74</td>
<td>.64</td>
<td>7.28</td>
<td>1</td>
<td>.01</td>
<td>5.69</td>
<td>1.61 20.1</td>
</tr>
<tr>
<td>Complete</td>
<td>35.0%</td>
<td>.23</td>
<td>.67</td>
<td>.12</td>
<td>1</td>
<td>.73</td>
<td>1.26</td>
<td>.34 4.72</td>
</tr>
<tr>
<td>Pain (cf no pain)</td>
<td>30.0%</td>
<td>5.15</td>
<td>.75</td>
<td>3</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent Peripheral</td>
<td>40.9%</td>
<td>.40</td>
<td>.75</td>
<td>.29</td>
<td>1</td>
<td>.59</td>
<td>1.49</td>
<td>.34 6.50</td>
</tr>
<tr>
<td>Diffuse</td>
<td>59.1%</td>
<td>1.50</td>
<td>.85</td>
<td>3.08</td>
<td>1</td>
<td>.08</td>
<td>4.46</td>
<td>.84 23.68</td>
</tr>
<tr>
<td>Back</td>
<td>69.2%</td>
<td>1.34</td>
<td>.73</td>
<td>3.33</td>
<td>1</td>
<td>.07</td>
<td>3.81</td>
<td>.91 16.07</td>
</tr>
</tbody>
</table>

$^+\text{IES-R Total} \geq \text{raw score 33}$
3.3.3.2 Summary of results. In the subacute recovery phase following trauma-related pain, clinically relevant posttraumatic stress symptoms were not predicted by injury severity (ISS) nor pain extent. Partial memory was a particularly good predictor of PTSD symptoms.

3.4. Discussion

There were significant correlations between symptoms of PTSD, depression and anxiety (Table 4), consistent with the comorbidity commonly reported in the literature (e.g., Ginzburg, Ein-Dor, & Solomon’s, 2009, assessment of war veterans). We sought to predict clinically relevant posttraumatic stress symptoms in this subacute trauma group from (i) event-related characteristics: specifically, injury severity scores (ISS) and (ii) patient experience: specifically, the extent of reported pain or extent of memory of the event.

3.4.1 Posttraumatic Stress Symptoms and Event Characteristics: Injury Severity

Injury severity score did not predict clinically relevant posttraumatic stress on the IES-R. This accords with the majority of previous studies seeking to predict PTSD (Boals, et al., 2017; Dougall, et al., 2001; van Delft-Schreurs et al. (2014); Zatzick, Kang, et al., 2002b). However, previous studies did not make a distinction between serious injury and very severe or life-threatening injury, which was argued to be relevant to the diagnosis of PTSD. Thus, the present study did distinguish between these levels of severity but still found no evidence for the usefulness of the variable as a predictor, even when the effects of other predictors (age, gender, pain or memory extent) were controlled. This is difficult to reconcile with the DSM 5 (American Psychiatric Association, 2013) criteria for PTSD relating to direct exposure to threatened or actual serious injury, as clinically relevant PTSD
symptoms were unrelated to severity of injury. It is postulated that it may not be the seriousness of injury (determined by clinicians) that determines PTSD, but rather the patient’s subsequent interpretation of that event.

3.4.2 Posttraumatic Stress Symptoms and Patient Experience

3.4.2.1 Extent of pain. In the current study it was found that diffuse pain was not significantly associated with clinically relevant rates of PTSD symptoms. Previous studies comparing distress associated with different pain areas were surprising few but some literature relating to primary care patients suggests that having multiple pain sites is associated with PTSD, depression and anxiety. DeCarvalho (2010) found that 51% of the patients with traumatic chronic non-back pain and 41% with traumatic back pain reported clinically significant PTSD symptoms but this rose to 77% in those patients with combined traumatic back and non-back related pain. An English meta-analysis (Mallen, Peat, Thomas, Dunn, & Croft, 2007) of patients in primary care found several prognostic factors related to poor outcomes of pain, including multiple-site pain. It has been argued (Smith, Elliott, Hannaford, Chambers, & Smith, 2004) that the extent (number of sites) of pain may be more important than the actual site of the pain in determining the impact on quality of life, and mental health than single site pain.

3.4.2.2 Memory. Partial memory of the traumatic injury event was predictive of posttraumatic stress in the current subacute group. This finding supports the hypothesis that participants with partial memory of the pain event would report greater posttraumatic stress symptoms than those with no or complete memory, supporting theories relating to fragmented memories and the neurobiological underpinnings of post-traumatic stress as postulated by van der Kolk (2002) and Levine (2005).
The research literature overall was, however, unclear in relation to the issue of disrupted memory and PTSD in that relevant studies included mild traumatic brain injury (TBI), as well as self-reported memory deficits that were not the result of head injury, and their potential association with PTSD. The underlying assumption in the DSM 5 (American Psychiatric Association, 2013) is that to be diagnosed with PTSD, the traumatic event must have been experienced by the patient (either explicitly or implicitly) - rather PTSD-like symptoms arising as a physiological consequence of TBI. However, studies have found that even patients who were unconscious at the time of their initial injury could report higher rates of PTSD than those who were conscious (Bryant & Harvey, 1999; Duckworth & Iezzi, 2005; Mayou, Black, & Bryant, 2000; Roitman, Gilad, Ankri, & Shalev, 2013). Overall, the studies reviewed were contradictory as other studies reported that patients who were conscious or had complete memory were significantly more likely to have clinically significant PTSD symptoms at least in a chronic stage (Gil, Caspi, Ben-Ari, Koren, & Klein, 2005; Glaesser, Neuner, Lutgahetmann, Schmidt, & Elbert, 2004; Ryb et al., 2009). Still another study found comparable rates of PTSD between conscious and mild TBI patients (Bryant & Harvey, 1999).

No previous study has compared complete memory, partial memory and no memory of the traumatic injury event. Given the large risk for PTSD symptoms associated specifically with partial subjective memory, and apparent even in at the subacute stage, we suggest that this simple screening question may have considerable utility in clinical practice.

3.4.2.3 Multivariable predictors. Direct logistic regression analyses were used to assess the impact of the range of factors (based on patient experience and
event characteristics) on the likelihood that they would predict PTSD in outpatients after physical trauma.

It was expected at the outset of this study that a combination of variables rather than a single factor would be most predictive. The full logistic regression models (both factors together) was a more effective predictors of clinically relevant posttraumatic stress than simplified models for all variables, and the moderately high level of accuracy suggests clinical utility, especially given the very low time and resource cost associated with this set of measures.

3.5. Summary and Conclusion

This study aimed to identify predictors of PTSD, in a subacute trauma setting so as to enable early intervention before progression into a chronic stage. The study aimed to translate theories of risk into in a set of predictor variables that would be of practical benefit to busy health practitioners in outpatient settings. The results indicated that partial memory rather than pain extent was as predictor of PTSD.

3.6. Limitations of the Study

It was beyond the scope of the current study to explore levels of unconsciousness at the time of injury, and whether this was directly related to PTSD and memory or no memory of the trauma event, or whether it was a physiological consequence unrelated to explicit (or even implicit) memory but having PTSD-like symptoms. A further limitation was that data were only available to the researchers for individuals who elected to attend outpatient services, and not those who either recovered or chose not to seek treatment.
3.7. Recommendations for Future Research

Further research is required to follow-up this research into the chronic traumatic pain phase. Replication would be necessary to ascertain whether the findings in this study generalize in their utility. It would also be valuable to extend on this study of distress at the subacute stage to test whether the same predictors (memory of traumatic pain event and pain extent) can identify patients presenting in a chronic outpatient setting with clinically relevant posttraumatic stress symptoms. This would, in turn, help prioritise resource allocation for treatment of those whose pain in most likely to persist.

Conflict of Interest Statement
The authors have no conflicts of interest to declare. Work undertaken on this study was part of an unfunded PhD studentship at Murdoch University, Perth, Western Australia.

Acknowledgments
The authors thank the ethics committees and clinical staff at Royal Perth and Fremantle Hospitals.
Appendix

Measures

Injury Severity Score (ISS, Baker, O’Neill, Haddon, 1974)

The Injury Severity Score (ISS) (Baker, O’Neill, Haddon, 1974) is an international scoring system for assessing traumatic injury in humans. Each injury is assigned a numerical value according to an Abbreviated injury score (AIS) (Association for the Advancement of Automotive Medicine, 2005). The Abbreviated Injury Scale (AIS) is an anatomical scoring system first introduced in 1969 and is currently on its fifth revision. It was originally developed by a consortium of the American Association of Automotive Medicine, the American Medical Association and the Society of Automotive Engineers to uniformly quantify motor vehicle accident injuries. The ICD-10 has been modified to accommodate AIS designations.

The AIS (Association for the Advancement of Automotive Medicine, 2005) scoring is based on severity and body region (six regions, namely: head or neck, face, chest, abdomen, extremities and bony pelvis, and external structures –e.g. contusions, burns). Injuries are ranked on a scale of 1 to 6, with 1 being minor, 5 severe and 6 a non-survivable injury. ISS is derived from the AIS and is defined as the sum of the squares of the single highest Abbreviated Injury Score (AIS) in each of the three most severely injured body regions. ISS ranges from 1 to 75, where an ISS of 75 is assigned to anyone with AIS of 6 (unsurvivable injury). The American College of Surgeons (2005) categorises ISS (Baker, O’Neill, Haddon, 1974) 1- 9 as Minor; 10-15 as Moderate; 16-24 as Severe; greater than 24 as Very Severe. As stated in the introduction section to study one, only participants with an ISS greater
than 16 (severe) were invited to attend at the trauma services for review after discharge.

**The Impact of Event Scale-Revised (IES-R) (Weiss & Marmar, 1997)**

The IES-R was developed by Weiss and Marmar in 1997 to parallel the DSM-IV criteria for PTSD. It is a 22 item, five-point scale (0 = not at all, 1 = a little bit, 2 = moderately; 3 = quite a bit, 4 = extremely), self-report instrument that aims to measure intrusive thoughts, avoidance behaviour and hyperarousal which are related to the traumatic event. Baumert, Simon, Gundel, Schmitt and Ladwig (2005) examined the reliability and validity of the IES-R with special emphasis on the evaluation of the hyperarousal subscale against a standardized psychophysiological measurement (a psychophysiological acoustic startle reflex, ASR, paradigm). They concluded that the reliability and construct validity for the intrusion and avoidance subscale was high but was only sufficient for the hyperarousal subscale. Moreover, the criterion validity of the IES-R hyperarousal subscale regarding psychophysiological measurements was arguable.

**Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983)**

The HADS is a self-report instrument which was developed to detect clinically significant depression and anxiety. To avoid the confounding effect of symptoms of physical illness, the HADS excludes somatic items (e.g. dizziness, headaches, insomnia, anergia and fatigue). The role of the scale is dimensional rather than categorical; it is best used in identifying general hospital patients who need further clinical assessment, rather than to make diagnoses of psychiatric disorders (Bjelland, Dahl, Haug and Neckelmann, 2002 citing Herrmann 1997; Snaith 2003).
The HADS consists of 14 items (7 items on each of the depression and anxiety sub-scales) each item rated on a four-point scale (0 to 3 where 0 is the absence of a difficulty, and 3 is severe difficulty). Each sub-scale is summed and the score on each sub-scale can range from 0 to 21. The scores are then interpreted on the basis that a score of 11 and above indicates moderate or severe depression or anxiety respectively, scores of 8 - 10 on the HADS represents “borderline” depression, and 0-7 “normal” (Snaith, 2003).

Bjelland, Dahl, Haug and Neckelmann, (2002) undertook a review of the literature (747 papers identified) on the validity of the HADS. The authors concluded that the studies supported the two-factor structure of the HADS, and the HADS had good internal consistency (all studies Cronbach’s coefficient greater that .60), and with a cut-off score of 8 plus gave sensitivities and specificities for both sub-scale of approximately 0.80. The HADS performed well in assessing symptom severity and probable presence (“caseness”) of anxiety and depressive disorders in “somatic, psychiatric and primary care patients and in the general population”. Compared to other questionnaires of anxiety and depression (e.g., the BDI, STAI, CAS, SCL-90) the correlation to HADS depression and HADS anxiety sub-scales were between .60 and .80 and the authors concluded that the concurrent validity of HADS was good to very good. Similarly, Cameron, Crawford, Lawton, and Reid (2008) found that the HADS depression sub-scale demonstrated high internal consistency at baseline and at end of treatment (α = 0.84 and 0.89).

**Location of Pain**

The physiotherapist recorded whether or not the patient was experiencing pain according to location (back, peripheral, back and peripheral, or none); severity of
pain is not recorded.

**Memory of Event Causing Injury**

As part of a pre-intervention clinical interview with the Clinical Psychologist, patients’ recall of peri-traumatic events was explored. If patients had no recall of the event they were categorised as having no memory (‘none’); if they could recall part of the event (e.g., of losing control of the car but not of hitting the tree) they were categorised as having ‘partial’ memory. If they could recall all peri-traumatic events they were categorised as having ‘full’ memory. The measurement of memory in this way was clearly subjective, being based only on patients’ explicit recall, and does not, for example, purport to assess amnestic symptoms.

**The General Hospital File**

Data in the general hospital file included trauma details for the subacute cohort (RPH trauma service) (e.g., ISS) and demographic and inpatient details (e.g., age and gender) for both the subacute and chronic groups.
Variables used in the empirical analysis are summarised in Table 1.

**Table A1**

*Summary of Independent and Dependent Variables considered in this study.*

<table>
<thead>
<tr>
<th>Dependent Variables (Mild or no symptoms = 0; Moderate to Severe = 1)</th>
<th>Variable Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IES-R (Total)</td>
<td>The posttraumatic stress scores of the sub-scales on the Impact of Event Scale questionnaire (Intrusions, Hyperarousal and Avoidance):</td>
</tr>
<tr>
<td>HADS-D</td>
<td>The Hospital and Anxiety subscale for Depression.</td>
</tr>
<tr>
<td>HADS-A</td>
<td>The Hospital and Anxiety subscale for Anxiety</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury Severity Score (ISS) 0= 16-24 Severe injury; 1=25-75 Very severe/critical injury</td>
<td></td>
</tr>
<tr>
<td>Pain 0= No pain noted, 1=Peripheral, 2=Back and Peripheral, 3= Back</td>
<td></td>
</tr>
<tr>
<td>Memory 0= No memory, 1=Partial memory, 2 = Complete memory</td>
<td></td>
</tr>
<tr>
<td>Age 0 = 49-77 years, 1=33-48 years; 2 =15-32 years.</td>
<td></td>
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</tbody>
</table>
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POSTTRAUMATIC STRESS IN CHRONIC PAIN PATIENTS


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Manuscript submitted for publication.


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CHAPTER 4
Study 2

Keywords
Pain, distress, chronic, anxiety, depression, posttraumatic stress, memory, traumatic event, stressors, diffuse pain, age, gender.
Predictors of Posttraumatic Stress in Chronic Pain Outpatients
attributing Pain to a Traumatic Event: Event Characteristics, or Pain Perception?

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Abstract

Background and aims. A previous study demonstrated that clinically relevant posttraumatic stress could be predicted moderately well in a subacute trauma sample by self-reported memory of a traumatic injury event. The present study aimed to test whether this result could be replicated in a chronic pain outpatient group whose pain was precipitated by a traumatic event.

Methods. Participants were outpatients (N = 64) presenting at chronic pain management groups. Anxiety and depression were self-reported on the Hospital Anxiety and Depression Scale and Posttraumatic stress symptoms were measured on the Impact of Event Scale-Revised. Self-reported extent of pain was recorded from physiotherapy review, and extent of traumatic memory from clinical psychology review. The results from the chronic traumatic pain group were compared to the subacute trauma outpatient group (N = 77).

Results. Unlike the earlier subacute study where partial memory was found to be particularly significant predictors of posttraumatic stress, none of the proposed variables predicted posttraumatic stress in the chronic group, singly or in combination. Compared to the subacute group, the chronic traumatic pain group was more anxious and depressed, older, contained more females, and reported more cases of diffuse pain, and complete memory of the precipitating event.

Conclusions. These findings emphasize the differences between the chronic traumatic pain and subacute stages in predicting distress from patient and experience. It is likely that the inputs into posttraumatic stress in chronic traumatic pain patients are more complex than directly event related factors (length of time in pain or the traumatic event alone) whereas the subacute group at three months post hospital discharge still remained directly affected by the traumatic pain event.
Implications. The comparison of the chronic traumatic pain group with the subacute trauma group indicates the importance but limitations of early assessment and intervention. It is postulated that comorbid subacute psychological and physical trauma pain may become chronic where aggravated by indirect stressors and life context not necessarily associated with historical traumatic events.
4.1. Introduction

Posttraumatic Stress Disorder (PTSD) in chronic pain hospital outpatients with pain of traumatic origin is often difficult to treat. Although most pain patients affected by symptoms of Posttraumatic Stress Disorder (PTSD) recover within a year, those whose symptoms remain unresolved for over a year rarely recover completely (Freedman, Brandes, Peri, & Shalev, 1999; Zatzick et al., 2002). Incidence of PTSD after traumatic injury has been found to range from 17% at four months post-discharge (Zatzick et al., 2002) to 30% to 40% PTSD at twelve months post-discharge (Kessler et al., 2005). Similarly, patients with pain who wait longer than six months from referral to access treatment worsen in terms of psychological health (Lynch et al., 2008). An early intervention, therefore, is advisable to help the majority of patients avoid the escalation of their pain and distress into chronicity. However, delayed onset PTSD is sometimes observed indicating that assessment only in an early stage may not suffice to capture all cases. For example, one study (O'Donnell et al., 2013) found that, of those participants who had been severely injured a total of 61 (7%) met criteria for PTSD at three-months after the injury, but at 12 months this number increased to 9% \( (n = 73) \). Another study (Ryb et al., 2009) found that 23% of the patients who screened positive at one year had screened negative for PTSD at six- months. The reasons that some patients do not recover from pain, or become more distressed over time is not clear - a review of the empirical research literature did not support a direct relationship between length of time in chronic pain and the development of, or an increase in, PTSD symptoms (Harris, Young, Rae, Jalaludin, & Solomon, 2008; Woodruff et al., 2017). It remains a possibility that for those patients who remain affected by chronic pain and distress other, more complex, perhaps indirect factors contribute to maintaining and
aggravating both these conditions as there may be everyday psychosocial stressors related to pain (Boris-Karpel, 2010; McEwen, 1998). It may also be that, once a patient has entered into a cycle of chronic pain and comorbid posttraumatic stress, those conditions become mutually maintaining (Sharp & Harvey, 2001) as chronic pain can act as a reminder of a traumatic event, and traumatic intrusions can act as a reminder of the pain, thus mutually maintaining and even aggravating each condition – potentially without regard to the passing of time or to added stressors.

A study of subacute trauma outpatients (at three months post-hospital discharge after serious injury) by the authors of the current paper (Knight, Reid, Davis, & French, 2019, manuscript in preparation) found high rates of Posttraumatic Stress Disorder (PTSD) and depression and anxiety in the subacute group. A combination of carefully selected variables in the subacute group across two categories: an event characteristic (serious injury as measured in the Injury Severity Score, ISS: Baker, O’Neill, Haddon, Long, 1974); and patient experience (extent and location of pain, and extent of memory of the traumatic pain event) were investigated. The researchers found that only partial memory (of the traumatic injury event) was significantly associated with clinically relevant PTSD symptoms.

Despite DSM 5 criteria for PTSD, injury severity was not predictive of clinically significant posttraumatic stress. Similarly, pain extent was not predictive. The question in this paper is whether findings from the subacute trauma group are replicable in a chronic traumatic pain group. Replication of findings in a chronic pain traumatic sample would strengthen an argument that partial memory of a traumatic serious injury is also a valid predictor of chronic traumatic pain and allow early identification and treatment of those most at risk. This study will not, however, include the event characteristic, injury severity as a predictor. Despite being a
criterion for PTSD in the Diagnostic and Statistical Manual for Mental Disorders (DSM 5, American Psychiatric Association, 2013), neither the study of subacute patients, nor previous literature (Boals, Trost, Rainey, Foreman, & Warren, 2017; van Delft-Schreurs et al., 2014) supports its utility, and pragmatically, this information was not generally available for the chronic pain patients, given the considerable passage of time since the traumatic event occurred. The research literature in relation to potential predictors is discussed briefly below.

4.1.1 Patient Experience

The patients’ pain and traumatic memory is an internal subjective experience and as such health practitioners must to a large extent rely on patient self-report.

4.1.1.1 Pain extent and Distress. The theory of chronic pain and PTSD (Sharp & Harvey, 2001; Vlaeyen & Linton, 2000) argues that hypervigilant individuals give particular attention to pain symptoms, which is associated with chronicity of pain. Additionally, increased attention to pain can result in a diffuse pain experience (Clauw, Arnold, & McCarberg, 2011). Empirical studies exploring pain site and extent in relation to distress in hospital outpatients with traumatic pain were surprisingly few but Woodruff et al. (2017) found head and the spine were related to higher PTSD and depression scores and DeCarvalho (2010) also found that, whereas 41% of patients with traumatic back pain reported clinically significant PTSD symptoms, this rose to 77% in those patients with combined traumatic back and non-back related pain. Studies and surveys among primary care patients were considered for further guidance and suggested that having multiple pain sites is associated with PTSD, as well as depression and anxiety (Carnes et al., 2007b; Mallen, Peat, Thomas, Dunn, & Croft, 2007). It has been argued that the extent of pain may be more important in determining the impact on patients’ lives than the
actual site of the pain (Smith, Elliott, Hannaford, Chambers, & Smith, 2004) and that single site chronic pain is comparatively uncommon compared to multi-site. Further, Smith et al. argue that, as compared to single site pain, that multi-site pain may have more impact on quality of life, health care utilisation, and mental health. They concluded that the relationship between multiple pain sites and increased psychological distress is under-researched. Based on the literature and theory reviewed it was hypothesized that participants in a chronic stage reporting diffuse pain (both back and outside of spine “peripheral”) will be more likely to report PTSD symptoms than those participants with discrete back pain or peripheral pain.

4.1.1.2 Memory and Distress. Disrupted or incomplete memory after a traumatic event (Criteria D, DSM 5, American Psychiatric Association, 2013), has also been argued to be associated with PTSD (Rothschild, 2000; van der Kolk, 2002). Conversely, a complete absence of memory may be protective against PTSD (Gil, Caspi, Ben-Ari, Koren, & Klein, 2005; King, 2008). Other researchers found that loss of consciousness was not associated with PTSD at one year (Ryb, Dischinger, Read, & Kufera, 2009). However, even patients who had been assessed as unconscious (and therefore presumably had no explicit memory of the event) have been found to have clinically relevant PTSD symptoms. For example, Roitman, Gilad, Ankri, and Shalev (2013) found that at eight months post discharge, outpatients who had loss of consciousness had a higher prevalence of PTSD than those who were conscious. Still other contradictory studies found that conscious patients with full memory were more likely to have PTSD than those who had been unconscious and without a memory (Glaesser, Neuner, Lutgehetmann, Schmidt, & Elbert, 2004). Duckworth and Iezzi (2005) also found that, at six months post-hospitalization, participants assessed with memory of a traumatic event were
significantly more likely to develop PTSD than those without a memory. Bryant et al. (2009) found that mild TBI patients were more likely to develop PTSD than no-TBI patients, after controlling for injury severity. It is noted that memory in patients with a mild TBI may range from good memory, to a state of confusion, to partial memory or no memory. However, in terms of the literature reviewed, a state of full or partial unconsciousness was considered relevant in discussion of the patient’s extent of memory. No studies were found in a review of the literature (other than the earlier subacute trauma study, Knight, Reid Davis, & French, 2019, manuscript in preparation) which compared the relationship of clinically relevant PTSD symptoms to complete, partial and no explicit memory of the traumatic pain event and found elevated symptoms among patients with partial memory.

In summary, the literature relating to memory extent and PTSD symptoms was unclear, particularly as no memory or partial memory was often inferred to be associated with mild TBI, rather than directly assessed (Bigler & Maxwell, 2011; Bryant, Marosszeky, Crooks, Baguley, & Gurka, 2001). However, based on the reviewed theory (Rothschild, 2000; van der Kolk, 2002) which argues that memory processing may be interfered with during a traumatic event, leading to fragmented memory which is associated with PTSD, it was hypothesised that participants with partial memory would have significantly higher posttraumatic stress symptoms than participants with complete memory or no memory.

4.1.2 Summary of Hypothesized Predictors of Posttraumatic Stress

In this study, partial memory of a chronic traumatic pain event and diffuse pain were hypothesised to be contributing factors for posttraumatic stress at time of outpatient presentation).
The current study also aimed to compare overall clinically relevant distress between chronic and subacute outpatient traumatic pain groups. It is postulated that the relative recency of a traumatic injury (as compared to a chronic cohort) would be associated with a greater influence of direct and autonomic influences (Flor, 2012; McEwen, 1998; Selye, 1950) which will not contribute as directly to distress in those in a chronic stage. In consequence of this, it was hypothesized that between the subacute and chronic pain and trauma groups there would be a greater prevalence of clinically impactful anxiety and posttraumatic stress symptoms in participants in the subacute group. Conversely, it was hypothesized there would be a greater influence of the stressful sequelae of pain leading to a sense of helplessness and hopelessness (Bach & Moran, 2008; McEwen, 1998; Robinson et al., 2009; Selye, 1950) in those participants in the chronic stage than in the subacute pain group and overall the mean depression scores for the chronic pain groups will be higher.

4.2. Method

4.2.1 Ethical Considerations

Institutional ethics committee approval was granted by Fremantle Hospital, and Murdoch University in Western Australia to obtain and process data from outpatient reviews.

4.2.2 Participants

The 64 participants comprised outpatients who attended the chronic pain management group programme at Fremantle Hospital, Western Australia. The mean length of time in pain in the group was 13.77 years ($SD = 11.51$) with a range of 1-48 years in pain at time of presentation. Twenty-four (38%) participants were males and 40 females (62%). The mean age of participants was 47.72 years ($SD = 12.11$),
with an age range of 15 to 80 years. Seven (11%) of the participants reported discrete peripheral pain (outside of spine) eleven (17%) reported back pain only, and forty-six participants (72%) reported both peripheral and back pain. Forty-two (66%) participants reported complete memory of the traumatic pain event, 22 (34%) reported partial memory, and no participant reported “no memory” of the event.

A secondary analysis will be undertaken comparing the findings in the chronic traumatic pain group with the subacute sample who attended an outpatient trauma clinic three-months post hospital discharge (referred to in the introduction to this study) after sustaining serious injury (N = 77, Knight, et al 2019, manuscript in preparation). This sample will be described more fully at the point of analysis.

4.2.3 The Traumatic Pain Event

Criterion A of the DSM-5 (American Psychiatric & American Psychiatric Association, 2013) tightened the definition of a “traumatic event”.

“A life-threatening illness or debilitating medical condition is not necessarily considered a traumatic event. Medical incidents that qualify as traumatic events involve sudden, catastrophic events” (DSM 5, p. 275).

This restriction was taken into account in determining whether pain was “traumatic”, and the event had to have this element of suddenness and catastrophe. In other words, neither pain of gradual onset (no matter how severe nor how ultimately life-threatening the disease), was not considered “traumatic” and was excluded from this study. Pain was therefore assessed by the researchers as having to occur under sudden, catastrophic circumstances involving the real threat of death or actual serious injury, which was determined by accessing patient histories and review of
participants’ current medical conditions. As such, and despite the guidelines in the DSM 5, there remained an element of clinical subjectivity in making this assessment.

All participants attributed their pain to a traumatic event (involving risk of serious injury or death) and almost all were related to road and serious work accidents, catastrophic medical negligence, falls, or combat. No participants in this sample attributed pain to sexual assault, which is thought to be a qualitatively different kind of trauma from other forms of physical trauma, and to follow different outcome trajectories (Steenkamp, Dickstein, Salters-Pedneault, Hofmann, & Litz, 2012).

The current study also aimed to compare overall clinically relevant distress between chronic and subacute outpatient traumatic pain groups. It is postulated that the relative recency of a traumatic injury (as compared to a chronic cohort) will be associated with a greater influence of direct and autonomic influences (Flor, 2012; McEwen, 1998; Selye, 1950 which will not as directly contribute to distress in those in a chronic stage. Thus, it was hypothesized that there would be a greater prevalence of clinically impactful anxiety and posttraumatic stress symptoms in the subacute group. Conversely, it was hypothesized there would be a greater influence of the stressful sequelae of pain leading to a sense of helplessness and hopelessness (Bach & Moran, 2008; McEwen, 1998; Robinson et al., 2009; Selye, 1950) in those participants in the chronic stage than in the subacute pain group and overall the mean depression scores for the chronic pain groups will be higher.

4.2.4 Measures

*Length of time since pain event.* Length of time in pain was ascertained from participants in the initial clinical interviews both by the psychologist and physiotherapist pain group facilitators and, wherever possible, checked
against the hospital records and records given precedence if a discrepancy.

However, where hospital files were silent on when the pain started or not available, patient account was accepted. Participants in the subacute group presented at three months post-discharge from hospital for interdisciplinary review and three months was, therefore, taken as the length of time in pain. *Age and gender* were derived from the general hospital chart. Age was categorised into three groups to facilitate analysis with other discrete variables, such as pain extent and memory of event: 20-32 years (14.5% of total participants); 33-48 years (43.6%) and over 48 years (41.8%). For comparability, the age categories were based on those selected in a similar study by these current authors into subacute pain (Knight et al., 2019, manuscript submitted for publication) where approximately a third of participants were allocated to each of the three categories. The youngest age in the chronic traumatic pain group was 20 years as compared to 15 years of age in the subacute group in the earlier study by Knight et al., 2019.

*Memory extent.* As part of the clinical psychology interview, participants’ recall of peri-traumatic events was explored. If participants had no recall of the event they were categorised as having no memory; if they recalled part of the event (e.g., immediately before or immediately after but not during), they were categorised as having partial memory. If they could recall all peri-traumatic events, they were categorised as having complete memory.

*Pain extent.* The physiotherapist recorded whether the participant was reporting pain according to its location (“back”, i.e., back only; “peripheral” – includes all areas outside of spine including head; “diffuse” - back and peripheral). The reported pain sites were not necessarily the site of original
injury, or tissue damage.

Further, participants were invited to complete the following measures:

The Impact of Event Scale Revised (IES-R) (Weiss & Marmar, 1997): a screening tool which measures symptoms of posttraumatic stress: Avoidance (8 items); Hyperarousal (6 items) and Intrusions (8 items) and provides a total symptom score. In this study, the total IES-R score and subscales were categorised dichotomously, with a score of 2 or higher for the subscales being regarded as of clinical relevance (Wu & Chan, 2003). The authors of the instrument recommended that IES-R Total be based on the sum of the means (where a total of 6 or more would be of clinical relevance) but cautioned that the instrument should not be used as a diagnostic tool (Weiss & Marmar, 1997). However, it has been recommended in a subsequent study of the IES-R (Creamer, Bell, & Failla, 2003) that a cut-off total raw score of 33 (IES-R Total mean = 1.5) and above would better indicate probable PTSD. This cut-off was adopted in the current study in respect of dichotomously categorising the total IES-R score.

Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983) targets symptoms of depression and anxiety other than those that might be explained by physical illness or disability. Seven items measure anxiety and seven items measure depression with a score of 11 or greater on either subscale being regarded as clinically significant (Snaith, 2003).

4.2.5 Procedure

Self-report measures were handed out and patients were individually assessed by the Fremantle Hospital, Pain Medicine Unit psychologist and physiotherapist on

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8 More fully described in an Appendix to Chapter Three of this thesis
the first day of their attendance at a pain self-management group outpatient programme. All participant data were collated on the paper and pencil data collection forms and entered into PASW for Windows 18.0 (SPSS Inc., 2009) for analysis.

Logistic regression analyses were used to examine relationships between the categorised independent variables and the dependent variables. As stated in Study One, Logistic regression analyses have the advantage of providing information upon variables (for example, how many participants are correctly diagnosed as having moderate or severe anxiety?) but also are robust to violations of the assumption of normality, linearity, or of equal variance between groups (Tabachnick & Fidel, 1996).

Descriptive statistics of the independent variables, Age (15-32, 33-48 and over 49) Pain site (back only, peripheral, both back and peripheral), and memory of event (complete, partial) were considered and the frequencies, means and medians for the IES-R were compared to Study One.

Chi-squared tests for independence (to determine whether two categorical variables were related) were used to examine the independent variables (pain extent, memory) for the long-term pain group and the dependent variable posttraumatic stress symptom. These results were compared to the subacute group in Study One.

4.3. Results

4.3.1 Data Screening

Prior to analysis, data were examined for accuracy of data entry, missing values and fit between their distributions and the assumptions of multivariable analysis and logistic regressions.

4.3.1.1 Missing values. Two missing values were found across the dependent variable IES-R Total and subscales. Missing values were coded and excluded from
the analysis on a variable by variable basis (Tabachnick & Fidell, 2007). There were no missing values on the HADS Depression or Anxiety subscales.

4.3.1.2 Assumptions logistic regressions. The data was screened for any deviations from the assumptions related to the logistic regression method: (i) The dependent variables were binary (grouped: mild/ moderate or severe IES-R) and all observations to be independent of each other i.e., not repeated measurements. (ii) There was little multicollinearity among the independent variables (independent variables were not be highly correlated with each other). (iii) The assumption of linearity of independent variables and log odds was met. (iv) The number of participants in this exploratory study was considered small but adequate. Peduzzi, Concato, Kemper, Holford, and Feinstein, (1996) and Agresti (2013) suggest that the minimum ratio of valid cases to independent variables for logistic regression is 10 to 1. However, Bergtold, Yeager, and Featherstone (2018) found that marginal effects estimates are relatively robust to small sample size, although sample size can affect parameter estimates and inferences in the presence of multicollinearity and nonlinear predictor functions. Similarly, Vittinghoff and McCulloch (2007) argue that this rule of thumb is too conservative and that less than ten events per variable (5 to 9 events per variable) was acceptable. In the present study, (with two missing values for memory) there were 39 valid cases for clinically relevant posttraumatic stress symptoms (IES-R ≥ 33) and 23 cases non clinically relevant (IES-R < 33). There were three independent variables (complete memory vs partial memory; diffuse pain vs peripheral pain, and back pain vs peripheral pain). The ratio of valid cases to independent variables did therefore met the ideal ratio of 10 to 1. It was therefore considered that the sample was suitable for such analysis.
4.3.1.3 Outliers. Distributions for the raw data were assessed for extreme outliers (i.e., three or more box lengths from the upper or lower edge of the boxplots; Coakes, 2013) Box and whisker plots were examined and no extreme outliers were found.

4.3.1.4 Assumptions of normality. An inspection of the data for the continuous variables, IES-R and HADS and age, did not reveal any deviations from the assumptions of normality (all Shapiro-Wilk’s W test >.05). Razali and Wah (2011) concluded that Shapiro–Wilk has the best power for a given significance, when comparing the Shapiro–Wilk, Kolmogorov–Smirnov, Lilliefors, and Anderson-Darling tests.

4.3.2 Preliminary Analyses

Before commencing the main analyses, a preliminary analysis was made of the frequencies of distress, and the relationship between the independent predictor variables, and the dependent distress variables.

4.3.2.1 Frequency of distress. A summary of the frequency of reported moderate or severe distress on the IES-R and HADS among the participants appears in Table 1.

An Australian survey (Australian Bureau of Statistics, 2010) estimated twelve-month prevalence of anxiety disorders at 14.4% and affective disorders at 6.2%. The prevalence of symptoms potentially diagnosable as PTSD was estimated at 3.4%. Notably, in this chronic pain group as compared to general population, these figures are about four times higher for anxiety, seven times higher for depression, and thirteen times higher for posttraumatic stress symptoms.
Table 1

Frequency of Psychological Distress in Chronic Traumatic Chronic Pain Patients

<table>
<thead>
<tr>
<th>Measure</th>
<th>Distress</th>
<th>% of participants</th>
<th>% General population</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS(^1)</td>
<td>Anxiety</td>
<td>59</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td>52</td>
<td>6</td>
</tr>
<tr>
<td>IES-R(^2)</td>
<td>Total</td>
<td>40</td>
<td>3</td>
</tr>
</tbody>
</table>

\(^1\)Distress: A score of 11 or greater on HADS regarded as clinically significant;  
\(^2\)A raw score of 33 or higher for the IES-R Total indicates probable PTSD

4.3.2.2 Correlations for time since traumatic event and distress. An analysis (Table 2) was made of the relationship between psychological distress (anxiety, depression, PTSD) and years in pain (at presentation) as well as for the continuous variables age at presentation and age of onset of pain (Age – Years in Pain). Caution is to be exercised in respect of age of onset in that this was mostly reliant on participant self-report. All were statistically significant indicating the length of time in pain, older at time of presentation, but younger age of onset was related to higher posttraumatic stress symptoms. Age at presentation to the outpatient services between the groups is explored more fully below (section 3.4).
Table 2

*Pearson Correlations between Psychological Distress and Years in Pain, Age, Age at Onset for Chronic Pain Patients*

<table>
<thead>
<tr>
<th></th>
<th>HADS Anxiety</th>
<th>HADS Depression</th>
<th>IES-R Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years in pain</td>
<td>.139</td>
<td>-.101</td>
<td>.045</td>
</tr>
<tr>
<td>Age in years</td>
<td>-.031</td>
<td>-.261*</td>
<td>.039</td>
</tr>
<tr>
<td>Age at onset of pain</td>
<td>-.151</td>
<td>-.152</td>
<td>-.003</td>
</tr>
</tbody>
</table>

*significant at the 0.05 level, two-tailed

4.3.2.3 The relationship between the independent variables. Exploration was made of the relationship between the independent variables: pain extent; and memory of event presented in Table 3 (frequencies for pain and memory extent are presented more fully in section 4.3.4, Tables 7 and 8 below - the assumption that all cells have greater than five cases was met). All chi-squared tests for independence fulfilled the assumption of independent observations (Tabachnick & Fidell, 2007) namely that there is no relationship between the participants in each group and the categorical variables are not "paired" in any way (e.g., pre-test/post-test observations).
Table 3

Chi-squared Test: Pain Extent, Memory of Event (N = 64)

<table>
<thead>
<tr>
<th></th>
<th>$\chi^2$</th>
<th>df</th>
<th>p</th>
<th>Cramer’s V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain Extent</td>
<td>Memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.89</td>
<td>2</td>
<td>.09</td>
<td>.28</td>
</tr>
</tbody>
</table>

*p < .05 level

There was low association between the predictor variables, pain extent and memory of the pain event—satisfying the assumption required of low multicollinearity between the independent variables for logistic regression analysis. The great majority of participants in this study reported diffuse pain (72%), and the fewest discrete peripheral pain (11%). The high rate of diffuse pain among the participants in this study attending a hospital outpatient pain management group can be compared to the results of a postal questionnaire survey of 16 general practices in UK (N = 2445), which found that 12% of total respondents in the general population had pain in two or more sites (Carnes et al., 2007a). In the current study, the highest percentage of diffuse pain fell within the over 48 years age group (84% compared to 50% in the youngest group). In contrast, the 20-32 years age group reported the highest percentage of discrete back pain (50%) but none reported discrete peripheral pain.

It was notable that 65.6% of the participants reported complete memory of the pain event, and 34.4% partial memory. No participants reported a complete absence of memory, even though the mean length of time since the traumatic pain event was 13.77 years ($SD = 11.51$). Only partial memory and complete memory were, therefore, included in the remainder of the analyses. An independent samples $t$-test was conducted to compare length of time in pain for complete and partial memory. There was no significant difference in the length of time in pain between
the complete memory group ($M = 11.45, SD = 9.13$) and the partial memory group ($M = 18.18, SD = 14.28$); $t (30) = 201, p = .054$.

4.3.3 The Relationship between Patient Experience and Posttraumatic Stress

Having completed the above preliminary analysis, I then investigated the first main aim of this study whether, namely whether pain extent or memory of the pain event contributed significantly to clinically relevant posttraumatic stress. A full logistic regression (Table 4) was undertaken to the collective impact of the two independent variables (pain extent and memory of event) together on IES-R Total score. The full model was not statistically significant, $\chi^2 (3, N = 62) = 1.21, p = .75$ indicating that neither pain extent nor memory of the traumatic pain event was able to distinguish between clinically relevant and not clinically relevant posttraumatic stress symptoms on the IES-R.

Table 4

*Full Logistic Regression: Contributors to IES-R Total*

<table>
<thead>
<tr>
<th>Regressor</th>
<th>% PTSD</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Odds Ratio</th>
<th>95% C.I. for Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>68</td>
<td>-</td>
<td>.59</td>
<td>.68</td>
<td>1</td>
<td>.41</td>
<td>.62</td>
<td>.20</td>
</tr>
<tr>
<td>Partial</td>
<td>55</td>
<td>.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cf Peripheral</td>
<td>67</td>
<td>.23</td>
<td></td>
<td></td>
<td>2</td>
<td>.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back</td>
<td>72</td>
<td>-.05</td>
<td>1.03</td>
<td>1.00</td>
<td>1</td>
<td>.96</td>
<td>.95</td>
<td>.13</td>
</tr>
<tr>
<td>Diffuse</td>
<td>60</td>
<td>-</td>
<td>.91</td>
<td>.12</td>
<td>1</td>
<td>.73</td>
<td>.73</td>
<td>.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IES-R Total ≥ raw score 33

The second part of this study now investigated the differences between this chronic traumatic pain group and the subacute trauma group which was the subject of the previous study (Knight et al., 2019, manuscript in preparation).
4.3.4 A Comparison of between Subacute and Chronic Traumatic Pain Groups

The prevalence of the variables age and gender (client characteristics) and pain extent and memory of the pain event (patient experience) were compared between the chronic traumatic pain group recovery outpatients and findings from a subacute trauma group (Knight et al., 2019, manuscript in preparation).

4.3.4.1 Client characteristics

Age. Means for presenting age and frequencies for the age groups in the chronic traumatic pain and subacute trauma groups are set out in Table 5.

Table 5
Age Groups in Subacute and Chronic Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>SD</th>
<th>15-40 years</th>
<th>40-48 years</th>
<th>&gt; 48 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subacute</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Chronic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>25</td>
<td>31</td>
</tr>
</tbody>
</table>

A chi-squared test for independence was undertaken to compare the age of the subacute and chronic pain group and a significant difference for age groups was found between the subacute group and the chronic pain group, \( \chi^2 (2, N = 141) = 8.85, p = .012 \), Cramér’s V = .25. The subacute group was significantly younger than the chronic pain group.

Gender. The frequencies of males and females in the subacute and chronic pain groups are set out in Table 6.
Table 6  
*Frequencies of Male and Female Participants in Subacute and Chronic Groups*

<table>
<thead>
<tr>
<th>Trauma Group</th>
<th>Gender</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subacute</td>
<td>N</td>
<td>17</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>22%</td>
<td>78%</td>
</tr>
<tr>
<td>Chronic</td>
<td>N</td>
<td>40</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>63%</td>
<td>37%</td>
</tr>
</tbody>
</table>

A Chi-square test for independence (with Yate’s Continuity Correction) indicated that there was a significant association between gender and membership of the subacute and whole chronic pain groups, $\chi^2 (1, \text{N}=141), = 22.06, p < .0005, \phi = -.41$ (medium effect size). Whereas males clearly outnumbered females in the subacute group, females outnumbered males in the chronic pain group.

### 4.3.4.2 Patient experience

**Pain extent.** Chi-squared tests for independence were undertaken to compare pain extent between the subacute and chronic pain groups (Table 7).

Table 7  
*Pain Extent in Subacute and Chronic Groups*

<table>
<thead>
<tr>
<th>Trauma Group</th>
<th>Pain site</th>
<th>Back</th>
<th>Peripheral</th>
<th>Diffuse</th>
<th>No pain*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subacute</td>
<td>N</td>
<td>22</td>
<td>22</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>29%</td>
<td>29%</td>
<td>17%</td>
<td>26%</td>
</tr>
<tr>
<td>Chronic</td>
<td>N</td>
<td>11</td>
<td>7</td>
<td>46</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>17%</td>
<td>11%</td>
<td>72%</td>
<td>-</td>
</tr>
</tbody>
</table>

* By definition, the entire chronic pain group had pain

The frequency analysis indicated that the majority of participants in the current chronic pain group reported diffuse pain, as compared to the subacute group.
where most reported discrete back or peripheral pain. A Chi-squared test for independence confirmed there were significant differences in reported pain site between the two groups, $\chi^2 (3, n = 141) = 49.10, p < .0005$, Cramer’s V = .59 (large effect size). A similar analysis was undertaken in which those participants reporting no “no pain” at the time of investigation (all in the subacute group) were excluded. The Chi-squared test for independence confirmed the significant differences between the subacute and chronic groups, $\chi^2 (2, n = 121) = 29.58, p < .0005$, Cramer’s V = .49 (large effect size).

**Memory of pain event.** Partial memory was found to be a significant predictor of posttraumatic stress symptoms in the subacute group (Knight et al., 2019, manuscript in preparation), but not in the current chronic group. The percentages of participants with complete, partial or no memory for the type of pain event is set out in Table 8.

Table 8

*Frequency Memory in Subacute and Chronic Groups*

<table>
<thead>
<tr>
<th>Trauma Group</th>
<th>Memory of event</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Complete</td>
<td>Partial</td>
<td>No Memory</td>
</tr>
<tr>
<td>Subacute</td>
<td>N</td>
<td>20</td>
<td>27</td>
</tr>
<tr>
<td>%</td>
<td>27%</td>
<td>37%</td>
<td>36%</td>
</tr>
<tr>
<td><em>Chronic</em></td>
<td>N</td>
<td>42</td>
<td>22</td>
</tr>
<tr>
<td>%</td>
<td>66%</td>
<td>34%</td>
<td>0%</td>
</tr>
</tbody>
</table>

* Only complete and partial memory were compared in the chronic subgroup

Chi-squared tests for independence confirmed that there was a significant difference between the subacute and chronic pain groups in their frequencies of membership of the complete, partial and no memory, $\chi^2 (2, N = 137) = 33.87, p < .0005$, Cramer’s V = .50. A significantly greater number in the chronic group
reported complete memory as compared to the subacute group (large effect size), and no-one reported a complete absence of memory.

4.3.5 Means and Frequencies of Distress Between the Groups

The overall levels and clinically relevant rates of posttraumatic stress between the chronic group (Knight et al., 2019, manuscript in preparation) and the subacute group were also compared. The means and standard deviations for the subacute and chronic groups are set out in Table 9.

Table 9
Means and Standard Deviations for HADS Anxiety and Depression and IES-R Total

<table>
<thead>
<tr>
<th>Subacute or Chronic Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subacute</td>
<td>77</td>
<td>9.36</td>
<td>5.160</td>
</tr>
<tr>
<td>Chronic</td>
<td>64</td>
<td>11.34</td>
<td>3.622</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subacute</td>
<td>77</td>
<td>8.29</td>
<td>4.806</td>
</tr>
<tr>
<td>Chronic</td>
<td>64</td>
<td>10.30</td>
<td>3.845</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subacute</td>
<td>77</td>
<td>32.60</td>
<td>21.100</td>
</tr>
<tr>
<td>Chronic</td>
<td>62</td>
<td>38.47</td>
<td>19.776</td>
</tr>
</tbody>
</table>

Independent samples t-tests were conducted to compare the distress on the HADS and IES-R scores between the subacute and chronic groups. There were significant differences for anxiety and depression, with the chronic pain group more distressed on both measures than the subacute group. The findings are set out in Table 10.
Table 10

Independent Samples t-tests for Equality of Means between the Subacute and Chronic Groups

<table>
<thead>
<tr>
<th></th>
<th>t</th>
<th>df</th>
<th>P (2-tailed)</th>
<th>Mean Difference</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>IES-R Total</td>
<td>-1.64</td>
<td>137</td>
<td>.104</td>
<td>-5.87</td>
<td>-12.969 - 1.228</td>
</tr>
<tr>
<td>HADS Anxiety</td>
<td>-2.67</td>
<td>135</td>
<td>.009**</td>
<td>-1.98</td>
<td>-3.448 - 0.512</td>
</tr>
<tr>
<td>HADS Depression</td>
<td>-2.70</td>
<td>139</td>
<td>.008**</td>
<td>-2.011</td>
<td>-3.482 - 0.541</td>
</tr>
</tbody>
</table>

Rates of clinically significant posttraumatic stress, anxiety and depression were also compared (Table 11).

Table 11

Frequencies and Chi-squared tests for Independence for Distress and Subacute and Chronic Trauma Groups.

<table>
<thead>
<tr>
<th>% Group</th>
<th>Chi-squared (with Yate’s correction)</th>
<th>Phi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subacute</td>
<td>Chronic</td>
<td></td>
</tr>
<tr>
<td>IES-R Total</td>
<td>36%</td>
<td>40%</td>
</tr>
<tr>
<td>HADS Anxiety</td>
<td>44%</td>
<td>59%</td>
</tr>
<tr>
<td>Depression</td>
<td>35%</td>
<td>52%</td>
</tr>
</tbody>
</table>

** A raw score of 33 or higher on the IES-R Total indicates investigate PTSD

Chi-squared tests indicated that the significant difference between the mean distress levels in the subacute (Knight, et al., 2019, manuscript in preparation) and chronic
group did not generalize into different rates of clinical relevance. The statistics in Table 11 may be compared to far lower estimates in the general population: anxiety, 18.1%; depression, 6.7%; and 3.5% PTSD (Kessler et al., 2005).

4.4. Discussion

The literature reviewed in the initial stages of this retrospective research in respect of comorbid traumatic chronic pain and PTSD proved methodologically diverse, which made clear conclusions elusive. The current study set out to explore psychological distress (posttraumatic stress, anxiety and depression) in this cohort in a more systematic and theory-informed way and ultimately to translate the theory and DSM 5 criteria into a clinical outpatient setting which would assist hospital practitioners to identify vulnerable patients at an early stage. Statistical analyses of measures were therefore on a categorical basis (cf continuous approach which may have more statistical power) as clinical cut-off points (e.g., mild or moderate/severe distress) are directly relevant to clinicians in their assessment and treatment of hospital outpatient patients. The nature and extent of posttraumatic stress symptoms was considered in light of differences in objective event characteristics, and subjective client experience. Chronic traumatic pain is complex, and this study aimed to test for multiple variables at once.

However, there is also an overlap of symptoms between chronic pain and PTSD (e.g., hyperarousal, avoidance, unhelpful cognitions). This makes it difficult for a researcher (and the patient) to ascertain if posttraumatic stress is a trauma response, or primarily a pain response confused with traumatic symptoms, or whether more general factors unrelated to the traumatic pain cause a sense of hopelessness or a more generalized worry, or a mixture of all these. If related to a traumatic pain event then potential predictors such as disrupted memory and a
historical traumatic event, may have more validity. If, however, posttraumatic stress
like symptoms arises primarily out of unrelenting pain then a myriad of everyday
stressors and life hurdles could determine distress, along with loss of
function. Contrary to the earlier study into a subacute trauma group (Knight et al.,
2019, manuscript in preparation) there were a lack of expected findings in the
chronic traumatic pain group. However, despite the lack of findings in the present
study there were some interesting outcomes which are discussed below.

4.4.1 Patient Experience

4.4.1.1 Pain extent. Models of Vlaeyen and Linton (2000, fear avoidance (of
movement and injury) model and Sharp and Harvey (2001, mutual mainanince of
chronic pain and PTSD) both emphasize an anxious predisposition as a vulnerability
factor for chronic pain generally. It is argued in the current study that diffuse pain
among chronic traumatic pain outpatients is, at least in some cases, precipitated and
also maintained and aggravated by hyperarousal and hypervigilance to pain and
more so than in outpatients with discrete back pain or peripheral pain. This may be
explained by theories related to the effect of stress on neural plasticity and increased
central sensitization (Flor, 2012; Melzack & Turk, 2001) as it is postulated that the
hypervigilant brain seeks out and magnifies pain areas. It is argued that such
hyperarousal and hypervigilance particularly in the diffuse pain subgroup is reflected
in higher rates of clinically relevant PTSD. As stated in the Introduction to this
study, empirical research studies in the traumatic pain outpatient population in
relation to the association of pain extent and PTSD were few, although Woodruff et
al. (2017) found that pain related to the head and the spine was significantly
associated with higher PTSD and depression scores.

However, despite the prevalence of diffuse pain in the chronic group in the
current study, there was a lack of a finding in the chronic traumatic pain cohort in relation to an association between diffuse pain and PTSD. However, the difference in prevalence of diffuse pain between the subacute group study (17%) (Knight et al., 2019, manuscript in preparation) and the current chronic traumatic pain group study (72%) was significantly striking. However, again, it was not able to be determined in this retrospective study whether participants with diffuse pain were simply more likely to attend at a chronic pain unit than those with discrete pain.

4.4.1.2 Memory of the traumatic event. It was hypothesised that participants with partial memory of their traumatic pain event would have higher rates of clinically significant PTSD symptoms than participants with complete memory or no memory. This hypothesis was based on theories of PTSD which argue that memory processing can be disrupted after a traumatic event which gives rise to implicit free-floating thoughts and feelings, and distress (Rothschild, 2000; van der Kolk, 2002). As discussed in the introduction, there is some confusion in the reviewed literature in that a clear distinction is not always made between mild TBI, unconsciousness, and no memory or partial memory and the research is contradictory in its findings. Some studies argue that no memory (Gil et al., 2005) or unconsciousness (Roitman et al., 2013) is a protective factor whereas others found that those with a complete memory (Duckworth & Iezzi, 2005) or were fully conscious during the event (Glaesser et al., 2004) were more likely to have PTSD.

The earlier subacute trauma study (Knight et al., 2019, manuscript in preparation) found, as hypothesised, that partial memory contributed to clinically relevant rates of PTSD. However, contrary to the hypothesis, there was no significant difference in clinically significant posttraumatic stress symptoms between those with partial memory or complete memory in the chronic group. What was
notable, however, was the unexpectedly high prevalence of complete memory particularly given the passing of time and in comparison, to the subacute group. It is postulated that a focus on the pain event may give rise to a gradual emergence of a new personal narrative of the traumatic event with the consequence that partial memory becomes complete over time (McNally, 2003; Rubin, Berntsen, & Bohni, 2008).

4.4.1.3 Multivariable predictors. As in the earlier subacute trauma study (Knight et al., 2019, manuscript in preparation) direct logistic regression analyses were used to assess the combined and individual contribution of the range of factors (based on patient experience and event characteristics) to clinically relevant symptoms of posttraumatic stress. In the subacute study, a model with partial memory (after controlling for injury severity, pain extent) was found to make uniquely significant contributions to clinically relevant PTSD symptoms.

In contrast to the subacute group, the models utilising memory of the traumatic event or pain extent was not successful in identifying clinically relevant posttraumatic stress – indicating the complexity of chronic pain and the likelihood that the experiences of distress in outpatients is highly complex and likely to be associated with numerous factors perhaps only indirectly relating to historical incidence of a precipitating traumatic pain event, and too unique to be categorised by common characteristics.

4.4.2 Differences in Overall Posttraumatic Stress Between Subacute and Chronic Traumatic Pain Groups

A comparison of overall PTSD, as well as anxiety and depression symptoms, between the subacute trauma and chronic traumatic pain groups was also investigated. Rates of significant psychological distress at clinically significant level
were high in both groups (Table 11) but there was little significant difference in clinically impactful distress between the groups.

4.5. Conclusion

This group of chronic pain patients with pain of traumatic origin presented as surprisingly homogeneous compared to the subacute trauma group, with a high prevalence of diffuse pain, “complete” (possibly reconstructed) memory of their traumatic pain event, and high rates of complex psychological distress (anxiety, depression, and posttraumatic stress symptoms). This finding emphasizes the potential importance of these factors in progressing to a chronic pain presentation.

In this chronic outpatient group, unlike in the subacute group (Knight et al., 2019, manuscript in preparation), not even a combination of memory of event or pain extent could predict PTSD at clinically relevant levels. It seemed plausible that the homogeneity of this group may mean that there was too little variance for predictors to be meaningful – however the variability in treatment outcomes in psychological therapy (mainly CBT) programme suggests that there are differences in need within groups of chronic pain patients but that the current predictors did not capture that. Perhaps the relationship between chronic pain, a traumatic event and posttraumatic stress is simply too complex to be gauged by a handful of predictors. It may also be argued that, where the chronic pain-PTSD cycle becomes self-maintaining (Sharp & Harvey, 2000), the utility of event-related variables as predictors of distress decreases over time (as compared to a subacute traumatic pain group). For example, in contrast to the chronic group, it is likely that the subacute trauma group at three months post hospital discharge still remained directly affected by the traumatic pain event (Flor, 2012). However, the research literature indicates
that most will recover from both pain and PTSD in a year (Freedman, Brandes, Peri, & Shalev, 1999; Melzack & Turk, 2001).

The current study provides clinical guidance about how to assess and attend to extent of memory and pain between the subacute and chronic traumatic pain stages. Participants in the chronic traumatic pain group, in contrast to the subacute trauma group, may require an intervention for their distress which recognises not only factors directly related to the pain event, but also possible influences of current and premorbid factors on their response to pain, trauma and psychological distress.

4.6. Limitations

A limitation in this study was the small sample sizes however, logistic regression analyses have been found to be robust to small sample sizes (Bergtold, Yeager, and Featherstone, 2018). Another limitation is in the retrospective nature of the chronic traumatic pain and subacute trauma studies. Thus, the development of pain or memory extent, or of distress over time generally was not able to be followed and it could not be gauged, for example, whether pain was widespread from its onset, or became increasingly diffuse. Similarly, it could not be determined whether memory that was partial or non-existent became complete over time.

Finally records of precipitating injury severity measured on the Injury Severity Scale, (ISS, Baker, O'Neill, Haddon, & Long, 1974) were not available to the researchers in the chronic group, and therefore could not be compared to the subacute trauma group in this study. In any event, the subacute trauma group (Knight et al., 2019, manuscript in preparation) did not show a significant association between ISS and clinically relevant symptoms of posttraumatic stress, and nor was it a contributor to distress in any statistical analyses of the multivariable models.
4.7. Future Research

The results of this study provide only one piece of the puzzle in understanding the very significant psychological needs of chronic pain patients where pain is of traumatic origin. Findings from this very selective, self-referring group were only marginally informative in identifying readily accessible predictors of clinically relevant posttraumatic stress in chronic pain patients that could assist clinicians in differentiating client need. A further comparison of the chronic traumatic pain group with a sample whose pain was non-traumatic in origin (e.g., a gradual disease process, minor accident) may reveal more subtle differences, or cumulative impacts, of pain as opposed to trauma, in evoking and maintaining posttraumatic stress.
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Keywords
Pain, distress, chronic, anxiety, depression, posttraumatic stress, memory, traumatic event, stressors, diffuse pain, age, gender.
A Comparison of the Nature and Extent of Posttraumatic Stress out of Traumatic and Non-traumatic Pain Events in Hospital Outpatients.

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Summary
No significant difference was found in posttraumatic stress symptoms, anxiety and depression between patients reporting chronic pain from either traumatic or non-traumatic events.
Abstract

Background and aims. This study aimed to better inform clinical understanding and treatment of chronic pain by comparing posttraumatic stress that is attributable to a traumatic compared with a non-traumatic pain event. Specifically, exploring whether: (i) chronic pain is associated with higher posttraumatic stress, in the chronic traumatic pain group than in the non-traumatic pain group and; (ii) patient reported experience (pain extent and memory of event) are comparable between the groups.

Methods. Participants were outpatients drawn from a hospital-based chronic pain management group and divided into two subgroups (N=152: traumatic pain n=64; non-traumatic pain, n= 88). The Impact of Event Scale- Revised (IES-R) was used to assess posttraumatic stress symptoms, and the Hospital Anxiety and Depression Scale (HADS) to assess anxiety and depression.

Results. There were high rates of clinically elevated scores on all measures in both subgroups. No significant difference was found in posttraumatic stress symptoms, between the subgroups. The subgroups were comparable in age and gender and in pain extent and location. There was a high prevalence of diffuse pain and complete memory of the pain event in both subgroups. The incidence of partial (rather than complete) memory of the precipitating pain event was significantly higher in the traumatic pain group, consistent with theories involving memory disruption after trauma, but this was not associated with greater posttraumatic stress than in the non-traumatic pain group.

Conclusions. Outpatients with chronic pain, whether traumatic or non-traumatic in origin, demonstrate comparable rates of high posttraumatic stress. The high prevalence of diffuse pain and complete memory of the pain event may indicate a
strong focus on pain and its origins and possibly the development of PTSD-like symptoms in the non-traumatic pain subgroup

**Implications.** Theories of comorbid chronic pain and PTSD could be expanded to outpatients where adverse life experiences influence the development of a pain event narrative such that a non-traumatic pain event becomes subjectively “traumatic” and reflected in posttraumatic stress-like symptoms.
5.1. Introduction

A previous study by this research team (Knight, Reid, & Davis, 2019b) found elevated rates of posttraumatic stress symptoms in hospital outpatients with chronic pain that was traumatic in origin, but did not identify any predictors of posttraumatic stress from a range of selected factors (patient experience of pain and memory of traumatic event). In seeking to further understand the experiences specific to chronic traumatic pain patients, the current study takes another point of comparison, chronic pain patients whose pain was non-traumatic in origin.

Chronic pain that is comorbid with Posttraumatic Stress Disorder (PTSD) is said to be difficult to treat, particularly as the two conditions can be aggravating to each other or at least self-maintaining in that there is a cycle whereby the pain reminds of the traumatic pain event which in turn exacerbates pain (Sharp & Harvey, 2001). Rates of PTSD have been found in previous study to be high among pain patients (e.g., 28%, Akhtar, Ballew, Orr, Mayorga, & Khan, 2018). It was therefore expected in the current study that there would be higher rates of clinically relevant PTSD symptoms in the chronic traumatic pain group, than in the non-traumatic pain group. Chronic pain that is non-traumatic in origin can in itself can be highly distressing and this subgroup were asked to refer to their non-traumatic pain event and their symptoms assessed for PTSD as if it were “traumatic”.

Although the focus of this study was on clinically relevant posttraumatic stress symptoms, it was thought by this research team that anxiety and depression would be more relevant to distress in the non-traumatic chronic pain group than posttraumatic stress and this was also explored. High rates of anxiety (e.g., 39-44%, Ahman & Stalnacke, 2008; Stalnacke, 2012) and depression (e.g., 52%, Bair, Robinson, Katon, & Kroenke, 2003) have been reported in the chronic pain
population. It was expected therefore, that similarly high rates of clinically relevant symptoms of anxiety and depression would be found the current study in the participant outpatients - both with non-traumatic and traumatic pain. However, the question arose as to whether patients who have experienced a traumatic pain event will not be even more anxious and depressed, than the non-traumatic pain cohort. A review of the theory on comorbid chronic pain and PTSD indicated that anxiety and depression are predisposing vulnerabilities to both conditions (Asmundson, Coons, Taylor, & Katz, 2002; Sharp & Harvey, 2001). It was, therefore, hypothesised that the chronic traumatic pain group would have higher rates of clinically relevant anxiety and depression scores than the non-traumatic pain group.

The current study also investigated whether there was a difference between the groups in patient characteristics (age and gender), or client experience (extent of pain and of memory of pain event) that might otherwise account for differences in reported distress. It was expected that participants would be of comparable age and equivalent number of males and females between the traumatic and non-traumatic groups would attend the chronic pain management programme. However, it was anticipated that patient experience would differ. It was hypothesised that, compared to the non-traumatic pain group, the chronic traumatic pain group would have a greater focus (hypervigilance) on the traumatic pain symptoms and event (Asmundson et al., 2002; Sharp & Harvey, 2001; Vlaeyen & Linton, 2000) leading to increased hyperarousal and central sensitization expressing itself as a higher prevalence of diffuse pain (Clauw, Arnold, & McCarberg, 2011). It was also hypothesised, based on theory of PTSD (Levine, 2005; Rothschild, 2000; van der Kolk, 2002) and the Diagnostic and Statistical Manual (DSM 5, PTSD criterion D, American Psychiatric Association, 2013) that there would be higher rates of self-
reported partial memory for the traumatic pain event, as an event involving the risk of death, or actual or threatened serious injury can lead to fragmented or disrupted memory.

5.2. Method

5.2.1 Ethical Considerations

Institutional ethics committee approval was granted (Fremantle Hospital and Murdoch University in Western Australia) to obtain and process data from outpatient reviews.

5.2.2 Design

A cross-sectional between groups design was used to compare the traumatic pain and non-traumatic pain patient groups.

5.2.3 Participants

Participants (N = 152) were patients with chronic pain referred by their general practitioner or specialist hospital doctors to the Pain Medicine Unit at Fremantle Hospital and were drawn from successive groups attending at an inter-disciplinary chronic pain management programme at Fremantle Hospital, Western Australia.

5.2.4 The Traumatic or Non-traumatic Event

The decision as to whether the pain event was traumatic or non-traumatic was made by the researchers in accordance with the guidelines set out in the DSM 5 (American Psychiatric Association, 2013). PTSD in the DSM 5 is defined (Criterion A.1) as “exposure to actual or threatened death, serious injury or sexual violation”. Here clinicians (rather than patients) determine what constitutes a serious injury that threatens death. The DSM 5 tightened the definition of a “traumatic event” in relation to symptoms arising out of illness:
“A life-threatening illness or debilitating medical condition is not necessarily considered a traumatic event. Medical incidents that qualify as traumatic events involve sudden, catastrophic events” (p. 275).

In other words, pain of gradual onset, or disease not considered sudden or catastrophic is considered a “non-traumatic” experience under the DSM 5 guideline. Other examples of pain events assessed by researchers to be non-traumatic included cases of minor injury arising out of work, home or recreational incidents, or slips on floors in public places. None of the patients in the chronic non-traumatic subgroup reported having experienced a traumatic event which was unrelated to the origin of their pain. In answering the IES-R the participants in the no-trauma group were asked to answer the questionnaire in relation either to their initial non-traumatic pain event or experience (where gradual onset), or in relation to the most stressful pain event they had experienced (e.g., being unable to move because of pain in a public place).

The same sixty-four participants (62.5% female, 37.5% male) as participated in a previous study of chronic traumatic pain by this research team (Knight et al., 2019a, manuscript submitted for publication) were included in a “traumatic pain” subgroup” – this was not for convenience but rather to provide some degree of comparability of broad demographic factors, as all patients attended the same hospital. Eighty-eight participants (51.1% female, 48.9% male), whose pain was attributed to non-traumatic events, were identified for a “non-traumatic” pain group. In the trauma group the length of time in pain ranged between 1 year to 48 years ($M = 13.77$ years, $SD = 11.51$). For participants in the no trauma group, the mean length of time in pain was between 1 year and 58 years ($M = 10.87$, $SD = 11.71$).
5.2.5 Measures

*Age and gender.* Details about age and gender were derived from a pre-programme demographic questionnaire and medical records. For comparability, the age of participants was categorised as per the previous study undertaken by this team (Knight et al., 2019b; Knight, Reid, French, & Davis, 2019) into three groups: 15–32 years; 33–48 years; and over 48 years.

*Pain extent.* The group physiotherapist recorded the sites of pain the participant was experiencing. Pain extent was categorised for the purposes of this study into back, peripheral (outside of spine), diffuse (back and peripheral), or none.

*Memory.* The group psychologist asked participants to recall the event that they believed to have caused their pain, and to report whether they had a relatively clear recollection of what occurred (1) immediately before, (2) during and (3) immediately after the event. Memory was coded as “complete” where recollections of all three components were present; “partial” where any one to two of these components was absent; and as “no memory” where all three were absent. Where the pain was of gradual onset (i.e., a non-traumatic experience rather than one identifiable event) the participants were asked if they could remember when the pain first started, what was happening in their life shortly before the pain started, and in general terms the progression of their pain. If the answer to any one of these components was “no” then memory was rated as “partial” and otherwise as “complete”.

On arrival at a pain management group programme, participants were asked to complete two well-validated and reliable measures of distress:

The *Hospital Anxiety and Depression Scale* (HADS) (Zigmond & Snaith, 1983). This is a 14 item scale (7 items measuring anxiety and seven items measuring depression). Snaith and Zigmond (1994) proposed that, on the HADS, a score of 8 -10 was mild, 11 and above indicate moderate and 16 severe. The questions target symptoms other than those that might be explained by physical illness or disability.

The *Impact of Event Scale Revised* (IES-R; Weiss & Marmar, 1997). This is a twenty-two item instrument, which screens for symptoms of posttraumatic stress (Avoidance, 8 items; Intrusions, 8 items, Hyperarousal, 6 items) and produces total symptoms score (IES-R Total). In this study the total IES-R score and subscales were categorised dichotomously, with a mean score of 2 or higher for the subscales being regarded as of clinical relevance (Wu & Chan, 2003). Weiss & Marmar, (1997) recommended that IES-R Total be based on the sum of the means and a total mean score of 6 or more was considered as indicating probable PTSD. Participants who did not attribute their pain to a traumatic event (a criterion for diagnosing PTSD, DSM 5) were asked when completing the questionnaire to refer to their pain event (e.g., a non-traumatic incident such as slipping, or disease or degeneration).

### 5.3. Results

#### 5.3.1 Data Screening

Data were examined for accuracy of data entry, missing values and fit between their distributions and the assumptions of multivariable analysis.
5.3.1.1 Missing values. Missing values were coded and excluded from the analysis on a variable by variable (Tabachnick & Fidell, 2007). Only one participant (in the no trauma group) reported no memory of the event causing pain and, therefore, only complete and partial memory categories were considered in this study. For the 64 trauma participants, two missing values were found across the dependent variable IES-R Total and subscales. There were no missing values on the HADS Depression or Anxiety subscales. For the 88 no trauma participants, seven missing values were found across the dependent variable, IES-R Total and subscales. There were no missing values on the HADS Depression or Anxiety subscales.

5.3.1.2 Outliers. Distributions were assessed for extreme outliers, (i.e. three or more box lengths from the upper or lower edge of the box and whisker plots (Coakes, 2013). No extreme outliers were found in the trauma group.

For the no trauma group, one extreme outlier was found for years in pain (58 years). There was, however, little difference between the mean and the 5% trimmed mean value (where SPSS removes the top and bottom 5 per cent of cases and calculates a new mean (Pallant, 2016) - Ms = 12.80 and 13.77 respectively), so it was decided not to delete the outlier.

5.3.1.3 Patient characteristics

Age. Means for presenting age at the outpatient pain management group programme and frequencies for the 15-32, 33-48, and 48-80 years age groups in the chronic trauma and no trauma groups are set out in Table 1.
POSTTRAUMATIC STRESS IN CHRONIC PAIN PATIENTS

Table 1

Frequency of Age Group Membership by Trauma Grouping

<table>
<thead>
<tr>
<th>Chronic Group</th>
<th>Age groups (n,%)</th>
<th>15-32 years</th>
<th>33-48 years</th>
<th>&gt;48 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Trauma</td>
<td>20</td>
<td>80</td>
<td>47.72</td>
<td>12.11</td>
</tr>
<tr>
<td>No trauma</td>
<td>23</td>
<td>75</td>
<td>47.45</td>
<td>12.27</td>
</tr>
</tbody>
</table>

Mean age was not significantly different between the trauma and no trauma groups, \(t\) (150) = .13, \(p = 0.90\), (two tailed). A chi-squared test for independence also indicated no significant difference in age group frequencies between the trauma and no trauma group, \(\chi^2\) (2, \(N = 152\)) = .35, \(p = .84\), Cramer’s \(V = .05\).

Gender. The frequencies of males and females in the trauma and no trauma pain groups are set out in Table 2.

Table 2

Frequencies Male and Females by Trauma Grouping

<table>
<thead>
<tr>
<th>Chronic Group</th>
<th>Gender (%)</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trauma</td>
<td>n</td>
<td>40</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>62.5%</td>
<td>37.5%</td>
</tr>
<tr>
<td>No trauma</td>
<td>n</td>
<td>45</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>51.1%</td>
<td>48.9%</td>
</tr>
</tbody>
</table>

Females outnumbered males to a slightly greater extent in the trauma group than the no trauma group. However, Chi-square test for independence (with Yate’s
Continuity Correction) indicated that the association between gender and membership of the chronic trauma and non-traumatic groups was not significant, \( \chi^2 (1, n = 152), = 1.51, p = .22, \phi = .11. \)

### 5.3.2 Distress in the Trauma and No trauma Groups

The first research question in this study inquired as to whether there were higher posttraumatic stress, anxiety, and depression rates in the trauma group than in the no trauma group. Rates of clinically significant scores for HADS Anxiety and Depression and IES-R posttraumatic stress for the two groups are shown in Table 3.

**Table 3**

*Frequency and Chi-squared Tests for Independence for Clinically Significant Distress in Trauma and No trauma Groups*

<table>
<thead>
<tr>
<th>% Chronic Pain Group</th>
<th>Chi-squared (with Yate’s correction)</th>
<th>Phi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trauma</strong></td>
<td><strong>No trauma</strong></td>
<td></td>
</tr>
<tr>
<td>IES-R Total*</td>
<td>40%</td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HADS** Anxiety</td>
<td>59%</td>
<td>58%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>52%</td>
<td>52%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* A raw score of 33 or higher on the IES-R Total indicates investigate PTSD  
** A score of 11 or greater on HADS regarded as clinically significant

There were no significant differences in rates of clinically relevant posttraumatic stress, anxiety, depression categories between the trauma and no trauma groups.
5.3.3 A Comparison of Predictors of Distress between the Trauma and No trauma Groups

The second research question related to whether the two subgroups were equivalent in terms of patient experience (self-reports of pain extent and location, extent of memory of the pain event). The aim was to explore these factors could distinguish psychological distress between those participants whose pain was either traumatic or non-traumatic in origin.

5.3.3.1 Pain extent. Chi-squared tests for independence were undertaken to compare pain extent between the groups (Table 4).

Table 4

<table>
<thead>
<tr>
<th>Group</th>
<th>Pain Extent (%)</th>
<th>Peripheral</th>
<th>Back</th>
<th>Diffuse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trauma</td>
<td>n</td>
<td>7</td>
<td>11</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>10.9%</td>
<td>17.2%</td>
<td>71.9%</td>
</tr>
<tr>
<td>No trauma</td>
<td>n</td>
<td>11</td>
<td>18</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>12.5%</td>
<td>20.5%</td>
<td>67.0%</td>
</tr>
</tbody>
</table>

A Chi-squared test for independence of the pain extent categorisation and trauma grouping indicated similar frequencies of extent of pain in the two pain groups, $\chi^2 (2, N = 152) = .41, p = .82$, Cramer’s $V = .05$.

5.3.3.2 Memory of Pain Event. The percentages of participants with complete, partial or no memory for the type of pain event is set out in Table 5.
Table 5

*Frequency of Memory of Event by Trauma Grouping*

<table>
<thead>
<tr>
<th>Group</th>
<th>Memory of event (%)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Complete</td>
<td>Partial</td>
<td>No Memory</td>
</tr>
<tr>
<td>Trauma</td>
<td>42</td>
<td>22</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>65.6%</td>
<td>34.4%</td>
<td>.0%</td>
</tr>
<tr>
<td>No trauma</td>
<td>73</td>
<td>14</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>83.0%</td>
<td>15.9%</td>
<td>1.1%</td>
<td></td>
</tr>
</tbody>
</table>

As only one participant (in the chronic no trauma group) reported no memory, it was decided to exclude this participant from further analysis and only partial memory and complete memory were considered. It was noted from Table 5 that, although the majority of participants in both groups reported complete memory, there was a greater percentage of participants in the trauma group with partial memory. A Chi-squared test for independence (with Yates Continuity Correction) for Group and memory of event indicated that this difference between the trauma and no trauma groups was significant, \( \chi^2 (1, N = 152) = 5.14, p = .023, \phi = -.20 \) (small effect size). This finding was consistent with the hypothesis that participants in the traumatic pain group would report a greater prevalence of partial memory than in the chronic trauma group (because of lesser focus on the non-traumatic event and natural forgetting).

An analysis was made of anxiety, depression and posttraumatic stress scores between the subgroups. Mean distress scores for trauma and no trauma groups reporting complete and partial memory are set out in Table 6.
Table 6

Mean (SD) Distress for Memory of Pain Event by Trauma Grouping

<table>
<thead>
<tr>
<th>Distress</th>
<th>Chronic group</th>
<th>Memory of Pain Event</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Partial</td>
<td>Complete</td>
</tr>
<tr>
<td>IES-R Total</td>
<td>Trauma</td>
<td>M (SD)</td>
<td>39.59 (19.71)</td>
<td>37.85 (20.04)</td>
</tr>
<tr>
<td></td>
<td>No trauma</td>
<td>M (SD)</td>
<td>41.53 (21.09)</td>
<td>33.82 (15.63)</td>
</tr>
<tr>
<td>HADS Anxiety</td>
<td>Trauma</td>
<td>M (SD)</td>
<td>11.59 (3.70)</td>
<td>11.21 (3.62)</td>
</tr>
<tr>
<td></td>
<td>No trauma</td>
<td>M (SD)</td>
<td>11.27 (3.90)</td>
<td>10.73 (3.95)</td>
</tr>
<tr>
<td>Depression</td>
<td>Trauma</td>
<td>M (SD)</td>
<td>9.73 (3.43)</td>
<td>10.60 (4.06)</td>
</tr>
<tr>
<td></td>
<td>No trauma</td>
<td>M (SD)</td>
<td>10.80 (4.25)</td>
<td>10.49 (4.49)</td>
</tr>
</tbody>
</table>

A 2(trauma) x 2(memory) ANOVA was conducted to explore the impact on distress of complete or partial memory in the trauma group compared to the no trauma group (Table 7).

Table 7

Two-way Analysis of Variance for Distress by Memory and Group

<table>
<thead>
<tr>
<th>Distress</th>
<th>Source</th>
<th>df</th>
<th>F</th>
<th>p</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>IES-R Total</td>
<td>Memory</td>
<td>(1,93)</td>
<td>1.97</td>
<td>.16</td>
<td>.014</td>
</tr>
<tr>
<td></td>
<td>Group</td>
<td>(1,93)</td>
<td>.133</td>
<td>.72</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Memory*Group</td>
<td>(1,93)</td>
<td>.83</td>
<td>.36</td>
<td>.006</td>
</tr>
<tr>
<td>HADS Anxiety</td>
<td>Memory</td>
<td>(1,148)</td>
<td>.39</td>
<td>.54</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td>Group</td>
<td>(1,148)</td>
<td>.30</td>
<td>.58</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>Memory*Group</td>
<td>(1,148)</td>
<td>.01</td>
<td>.91</td>
<td>.000</td>
</tr>
<tr>
<td>Depression</td>
<td>Memory</td>
<td>(1,148)</td>
<td>.12</td>
<td>.73</td>
<td>.011</td>
</tr>
<tr>
<td></td>
<td>Group</td>
<td>(1,148)</td>
<td>.36</td>
<td>.55</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>Memory*Group</td>
<td>(1,148)</td>
<td>.52</td>
<td>.47</td>
<td>.003</td>
</tr>
</tbody>
</table>

There were no interactions between memory of event and trauma grouping for posttraumatic stress symptoms. The findings indicated that participants with
partial memory who attributed their pain to a traumatic event did not have significantly higher levels of distress than participants with complete or partial memory who attributed their pain to non-traumatic events.

5.4. Discussion

This study investigated whether (i) chronic traumatic pain is associated with higher posttraumatic stress, anxiety and depression rates in the chronic traumatic pain group than in the non-traumatic pain subgroup; (ii) patient characteristics (age and gender) patient reported experience (pain extent and memory of event) are comparable between the groups.

5.4.1 Distress between Chronic Traumatic Pain and Non-Traumatic Pain Groups

As stated in the Introduction to this paper, comorbid chronic pain and PTSD after a traumatic event is theorized to arise out vulnerability to anxiety and depression, and the conditions are thought to be mutually maintaining and even aggravating (Asmundson, Coons, Taylor, & Katz, 2002; Sharp & Harvey, 2001). It was, therefore, predicted that the traumatic pain outpatient group would have not only greater posttraumatic stress symptoms, but higher rates of anxiety and depression than the non-traumatic pain group.

In the current study, significant numbers of participants in both subgroups reported clinically relevant anxiety, depression, posttraumatic stress symptoms, but contrary to predictions, no significant differences in clinically significant rates of posttraumatic stress symptoms, anxiety, or depression were found between the traumatic chronic pain and non-traumatic pain groups. This finding lends support to researchers (Bodkin, Pope, Detke, & Hudson, 2006) who have argued that many events that may not be labelled “traumatic” under diagnostic criteria, can give rise to
psychological distress including posttraumatic stress-like symptoms. It is argued that non-traumatic unresolved pain in itself may potentially give rise to not only significant rates of anxiety and depression, but also become so overwhelming to the patient that they develop posttraumatic stress-like symptoms.

5.4.2 Comparison of Personal Characteristics and Patient Experience between Chronic Trauma and No Trauma

In the previous study in a chronic traumatic pain outpatient group by the authors of this paper (Knight et al., 2019b, manuscript in preparation) there were no significant findings in relation to association between posttraumatic stress, and (i) the personal characteristics of participants nor (ii) their reported experience of pain extent, or extent of memory of the traumatic event. The chronic non-traumatic pain subgroup in the current study was found to be comparable to the traumatic pain group in terms of age and gender composition. There was also no significant difference between the subgroups in terms of pain bodily location and extent (which and in the earlier study with the same chronic traumatic pain group not been found to be associated with distress, Knight et al., 2019b).

It was also predicted that there would be higher rates of self-reported partial memory in the traumatic pain subgroup as an event involving the risk of death, or actual or threatened serious injury can lead to fragmented or disrupted memory (Levine, 2005; Rothschild, 2000; van der Kolk, 2002; DSM 5, American Psychiatric Association, 2013). Consistent with this hypothesis, it was found that there was a significantly greater prevalence of participants in the traumatic pain group with partial memory than in the no trauma group. This finding lends support to theorists who argue that disrupted memory after a traumatic event was a key factor in posttraumatic stress. Despite this prevalence, there was no significant difference in
distress ratings between participants with complete and partial memory in either of the subgroups.

However, it was notable the earlier study by the authors of this paper (Knight et al., 2019c) comparing a subacute trauma group (three months post hospital discharge) to the chronic traumatic pain subgroup found there was a significant difference between the subacute trauma group and the chronic traumatic pain group in frequencies groupings for memory (subacute group: 27% complete memory; 37% partial and 36%, no memory, $\chi^2(2, N= 137) = 33.87, p < .0005$, Cramer’s $V = .50$). In the subacute trauma group (unlike in the chronic traumatic pain group, Knight et al., 2019b, manuscript submitted for publication) partial memory significantly contributed to clinically significant PTSD symptoms. This can be compared to the current chronic pain groups (Table 5) where only one participant reported no memory of the pain event, and the majority reported complete memory of the pain event. It is argued that this difference in prevalence supports an argument that memory is not a “snapshot in time” in time but is malleable (McNally, 2003; Rubin, Berntsen, & Bohni, 2008) and can be altered and supplemented by directly or indirectly associated current and past life experiences (Törneke, 2010). It is argued that in some patients with chronic pain, thoughts and feelings associated with adverse life experiences can merge with memory of the pain event to the extent that memory is reconstructed (McNally, 2003; Rubin, Berntsen, & Bohni, 2008) and in some cases leads to “complete” memory where previously there had been a confused memory, or even no memory. In this way even a “non-traumatic” pain event may become so associated with negative life experiences that memory of the event becomes subjectively expanded to a “traumatic” narrative (and “complete” memory) leading to posttraumatic stress-like symptoms. This postulate, if correct, may extend
models such as that of Sharp and Harvey (2001, which argue that comorbid traumatic chronic pain and PTSD are mutually maintaining or even aggravating to each other) to patients who are highly distressed after a pain event that may be assessed by health practitioners as “non-traumatic”. It is argued in the current paper that, in chronic outpatients, comorbid chronic pain and PTSD models could usefully add that the subjectively reported traumatic memory (whether true or reconstructed through pain and the influence of stressors) can also mutually maintain and aggravate both conditions. In other words, the subjective memory experience of the pain event as “traumatic” and the influence of life context on PTSD-like symptoms are also relevant in understanding chronic pain and PTSD.

5.5. Conclusion

The findings in the current study indicate that caution should be exercised in a chronic pain outpatient setting in too readily assuming that symptoms reflective of PTSD are associated with an historic traumatic pain event. The current study indicates that unresolved pain in itself, even in pain that is not traumatic in origin, potentially can give rise to significant posttraumatic stress-like symptoms (e.g., hyperaousal, avoidance: Melzack & Katz, 2013; Norton & Asmundson, 2003) which are in addition to significant rates of anxiety and depression. There is a growing body of research which acknowledges the influence of social and environment context on patients’ distress and their behaviours (e.g., (Törneke, 2010) and it is postulated that it is this whole life context which can exacerbated pain and its repercussion to such an extent that it becomes “traumatic” (extremely stressful) to the patient. Nevertheless, this study also showed that a significantly greater number of participants in the chronic trauma group reported partial memory of the pain event
than in the no trauma group (although memory did not distinguish between rates of distress).

5.6. Implications

Theories, such as that of Sharp and Harvey (2001), which argue that comorbid traumatic chronic pain and PTSD are mutually maintaining or even aggravating to each other, could usefully be extended to incorporate the concept of a malleable memory (Rubin et al., 2008) influenced by life context and stressful life experiences which can give rise to a “traumatic” memory and PTSD symptoms. The findings in the current study will have ramifications for treatment in that traditional CBT interventions for chronic pain could usefully emphasize that complete memory of a pain event is fallible, changing and unreliable (Rubin et al., 2008), and may be highly distressing to the patient. However, therapy for those patients with partial memory may involve more specific approaches to treating unprocessed “free-floating” symptoms (e.g., EMDR; Shapiro, 2002). In both cases, the aim should be the attainment of an explicit, coherent and less traumatic “story” (Törneke, 2010) of the pain event and the self as a person in pain which focuses on attainable valued life goals rather than on misfortune and disability.

5.7. Limitations

Under the current diagnostic guidelines for PTSD it is not always easy to determine whether a pain event is traumatic or non-traumatic, for example, under the DSM 5 (American Psychiatric Association, 2013), a life-threatening or debilitating medical condition is required to be “sudden or catastrophic” to be traumatic, which is not always easy to determine objectively. Here, health practitioners must sometimes rely on either the patient or other third-party accounts to supplement their assessment of what actually occurred. However, it can also be argued that pain and distress is an
internal process, and that in some cases it is the patients’ subjective account which is of more utility in assessing and treating distress than that of independent clinicians.

It can be argued that there is a further limitation in this study as only the most distressed patients are referred to and attend at hospital chronic pain outpatient settings, and any differences between the chronic traumatic and non-traumatic pain subgroups be less distinguishable than for example, in primary care or in the general population. Similarly, any differences found may not apply outside of a hospital population.

5.8. Future Research

Where time and cost are not restricting factors, longitudinal research would give valuable additional insight into the development of chronic pain and the maintenance of PTSD, particularly into the role of possible changes in client memory of the initiating event and changing perception of pain with time. Further, a simple screening method of assessing memory (complete, partial or none) was adopted in this study, and a more exhaustive exploration of memory may reveal more subtle internal processing factors influencing distress. Qualitative methodologies may also facilitate deeper understanding of these aspects of the client’s subjective experience of pain. It would be helpful to know why some patients presenting at a chronic pain management programme are so distressed whereas other patients with similar pain conditions are not. In-depth qualitative case studies could closely explore the impact of life histories and social context on vulnerability or resilience to pain, and whether such life factors indirectly maintain or aggravate pain and distress. This may assist in identifying which individuals are so influenced by broader life factors that they may not benefit from traditional hospital interventions targeting chronic pain.
References


CHAPTER 6

Literature Review of Contents and Outcomes of Chronic Pain Management Group Programme

(This paper is not intended for publication but is solely preparatory to Chapters 7 and 8 of this thesis).

Introduction and literature review
Chapter 1
Introduction

Chapter 2
A comprehensive review of potential predictors (IVs) of psychological distress in the context of chronic pain caused by a traumatic event.

Predictors of distress in subacute trauma patients
Chapter 3, Study 1
Outpatients attending a subacute trauma clinic (ISS>15), (early hospital utilization, 3-6 months post-discharge).

Predictors of distress in chronic pain patients with pain of (i) traumatic origin and (ii) non-traumatic origin
Chapter 4, Study 2
Outpatients attending a chronic pain management program (hospital utilization, pain > 1 year).

A quantitative analysis (profiling) of predictors of levels and incidence of psychological distress in chronic pain patients with pain event of traumatic origin (N=64).

A comparison of findings in Studies 1 and 2: Chronic pain trauma (N=64)
Subacute pain trauma (N=77)

Chapter 5, Study 3
Chronic pain trauma (N=64)
Chronic pain no trauma (N=88)

Compare distress and predictors between chronic pain trauma and chronic pain no trauma groups.

Understanding treatment outcomes for chronic pain patients

Chapter 6,
A literature review of program contents and outcomes of chronic pain management groups.

Chapter 7, Study 4
(N=92). The association between traumatic and non-traumatic pain and outcomes after a pain management group intervention are explored.

Chapter 8, Study 5
Case studies (N=10)
Thematic analysis of structured interviews seeking themes relating to pain attributions, patient behavioral patterns, and most useful self-management strategies from CBT program utilised, motivations to self-manage pain.

A practical application: Triangulation of informal observations of behavioural patterns in group setting with measures and thematic categories.
6.1 Introduction

As set out in the introductory chapter (chapter 1 section 4.1) to this thesis, the first primary aim was to examine in depth chronic pain patients whose pain was traumatic in origin (and compare to a subacute trauma group and chronic non-traumatic pain group) and attempt to predict PTSD with the translational rationale of informing the direction of hospital resources at an early stage to those outpatients most likely to need them and to identify ways in which intervention could be personalized to increase chances of success. It was concluded from the lack of findings in the previous chronic pain studies undertaken in this thesis that there is a complexity in the environmental and social influences on chronic pain which makes it unlikely that vulnerable patients can be mechanistically identified pre-intervention in studies using a set of even theory based predictors available in outpatient settings. The pain experience (specifically the extent of patients’ pain and extent of patients’ memory of the pain event) and clinically relevant posttraumatic stress symptoms in those individuals presenting as outpatients in a chronic pain stage was simply more complex and unique to the individual than in a subacute setting three months after a trauma.

I am now turning my attention to the second central aim of this translational thesis – seeking to understand why many patients with chronic pain and distress do not benefit from interdisciplinary psychological interventions based on the most evidenced based and utilised psychological therapy, namely cognitive behavioural therapy (CBT; e.g., Morley, Williams, and Hussain, 2008). Potentially, identifying barriers to clinical improvements in psychological distress, particularly posttraumatic stress, among chronic pain outpatients may open possibilities for more targeted and personalized interventions, including group programme to be to improve outcomes,
and which could assist in developing an understanding of the psychological recovery trajectory. In pursuance of these aims, the current chapter (chapter 6) seeks to lay the background for chapters 7 and 8 (the mixed quantitative and qualitative case study) of this thesis. The current chapter therefore seeks to briefly review the research literature in respect of the content and outcomes of chronic pain management group programmes, and to assess what constitutes a “typical” programme. Specifically, this review (along with chapter 7 of this thesis investigating the outcomes of a selected pain management group) served the function of evaluating whether the treatment program used in the study in Chapter 8 was typical of other programmes in the research literature.

This chapter is not intended to be an in-depth analysis of the different forms of pain management therapies which take place in multidisciplinary hospital outpatient departments. The review seeks primarily to allow an assessment of whether the contents and quantitative outcomes of the selected outpatient pain management programme (chapter 7, study 4) are reflective of other pain management groups in the literature (and whether CBT-based). However, in addition chapter 7 explores whether pain event characteristics (traumatic, non-traumatic) affect post-intervention outcomes.

In chapter 8, ten case studies were then drawn from this cohort of outpatients for in-depth analysis of individual contexts and experiences of the pain management programme and their relation to engagement with the programme and personal outcomes.
6.2. Literature Review

The general search of the literature was carried out to explore the content and approaches of CBT-based interdisciplinary group approaches for chronic pain and PTSD and comorbid disorders with the aim of ensuring the selected pain management group in Chapters 7 and 8 did not fall outside of the range of other groups (the review was not intended to be a full critique of the interventions). The other subsidiary purpose of this review was to identify the relevance of their components to the elements of the pain models in chapter 1.

The literature reviewed included studies published between 2001 and 2018, which was considered a reasonable period to capture clinically relevant and up-to-date information relating to the contents and effectiveness of CBT-based pain management programme. Searches were conducted using MEDLINE (1966+), ProQuest Social Science Journals, PsycINFO (CSA) (1872- ), Cochrane, Pubmed and Wiley Interscience data bases as well as the Google and Yahoo.com search engines. The words “chronic pain”, “distress”, “posttraumatic”, “depression” and “anxiety” were used in the searches plus a number of key words including: “acceptance”, “cognitive”, “behavioural”, “treatments”, “interventions”, “efficacy”, “group interventions”.

The review revealed a number of inter-related psychological therapies for chronic pain management. Sturgeon (2014) reviewed the therapies and found they fell into one of four categories: operant-behavioural therapy (citing Fordyce, 1976); cognitive-behavioural therapy, (CBT) (citing Day, Thorn & Burns, 2012); mindfulness-based therapy, (citing Kabat-Zinn, 1982); acceptance and commitment therapy (ACT) (citing Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Sturgeon concluded that all these therapies can play important roles in improving individuals’
self-management of chronic pain. Nevertheless, the literature reviewed indicates that Cognitive Behavioural Therapy (CBT) has been the primary psychological intervention for chronic pain (Ehde, Dillworth, & Turner, 2014) and for psychological distress (such as PTSD, anxiety, depression).

CBT aims to change negative feelings and thoughts and has behavioural goals such as reducing passive coping behaviour (e.g., taking pills, lying down) and increasing active coping behaviour (e.g., exercising; Dahl, Wilson, Luciano, & Hayes, 2005). CBT is defined by (Eccleston, 2001a) as:

“A compound term for the selected combination and integration of treatments aimed at reducing or extinguishing the influence of the factors that maintain patients’ maladaptive behaviours, beliefs and patterns of thought” (p.149).

The literature reviewed below also indicated a growing evidence base for a relatively new, empirically based psychological intervention which has grown out of the traditional CBT, namely Acceptance and Commitment Therapy (ACT). Hayes (2016) listed 152 randomised control studies between 2000 and August 2016 that supported the use of ACT for a range of health, psychological and behavioural conditions. ACT is grouped with such therapies as Dialectical Behavioural Therapy, Functional Analytic Psychotherapy and Mindfulness Based Cognitive Therapy as the “third wave of cognitive and behavioural therapy” (Bach & Moran, 2008; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). ACT involves engendering a willingness to accept pain and/or distress without responding to it. In other words, ACT has a general goal of increasing “psychological flexibility” (Hayes & Duckworth, 2006; Hayes et al., 2006), that is, the “ability to contact the present moment more fully as a conscious human being, and to change or persist in behaviour when doing so serves
valued ends” (p. 8). Hayes et al. (2006) stated that the primary objective of ACT, psychological flexibility, is achieved through six essential ACT processes:

1. Acceptance
2. Defusion (making contact with an inner experience “as it is” without evaluation)
3. Contact with the present moment (mindfulness)
4. Self as context (distinguishing between the self and one’s own flow of experiences without attachment or investment in them)
5. Chosen values
6. Committed action (in the direction of the chosen values)

Hayes, Strosahl, and Wilson (2012) further reduced these six processes to three response styles, which reflected the close association between the items:

“Open”: Defusion/Acceptance
“Centred”: Contact with moment/Self as context
“Engaged”: Chosen values/Committed action

In contrast to CBT programme, ACT does not seek directly to eliminate emotion or change unhelpful thoughts (although this may be a consequence) - the emphasis is on striving towards valued goals rather than directly reducing distress.

6.2.1 The Content of CBT and ACT Group Programme

The current review sought to establish, firstly, the specific content, and secondly, the effectiveness of CBT and ACT interventions.

6.2.1.1 Contents of traditional CBT programme. McCracken and Turk (2002) set out common components of CBT treatment for chronic pain:

1. Promotion of self-management perspective (psychoeducation)
2. Relaxation skills training
3. Cognitive therapy (also known as “cognitive restructuring”)
4. Goal setting and pacing strategies
5. Problem-solving skills training
6. Other interventions to change perception or emotional response to pain, such as guided imagery, desensitization, hypnosis, or attention control exercises (destressing)
7. Communication skills training or family interventions
8. Habit reversal

CBT treatments for PTSD usually have an added component in that they directly address trauma memories (Ehlers et al., 2010). Andrews et al. (2002) set out the stages for CBT treatment of PTSD as:

1. Stabilisation and engagement
2. Psychoeducation
3. Anxiety management (including relaxation skills training)
4. Exposure to the traumatic memories
5. Cognitive restructuring
6. Relapse prevention and maintenance.

The Australian Centre for Posttraumatic Mental Health (Forbes et al., 2007), in its guidelines for the treatment of PTSD, also confirms that interventions will usually take the form of CBT (but also Eye movement desensitization and reprocessing, EMDR: Shapiro, 2002; 2016). The guidelines recommend that psychological treatment include:

1. Confronting the traumatic memory in a controlled and safe environment (imaginal exposure)
Identifying, challenging and modifying biased or distorted thoughts and interpretations about the event and its meaning (cognitive restructuring)

Confronting avoided situations, people or places in a graded and systematic manner (in-vivo exposure)

Only one study was found relating to a specific treatment for comorbid chronic and PTSD. Shipherd, Beck, Hamblen, Lackner, and Freeman (2003) undertook a small case study (N = 6 females after motor vehicle accidents) with both chronic pain and PTSD who attended a pain treatment centre. The treatment included:

1. Imaginal and in vivo exposure (specifically for PTSD symptoms and traumatic memories)
2. Cognitive restructuring
3. Relaxation techniques
4. Social support
5. Anger management
6. Pleasant event scheduling.

Otis, Keane, Kerns, Monson, and Scioli (2009) in another small case study (N = 6) investigated the possibility of an integrated treatment for returned war veterans with chronic pain and PTSD using cognitive processing therapy for PTSD and CBT for chronic pain. It consisted of individual sessions once a week for twelve weeks. Only 3 of the 6 participants completed the pilot study but they reported that they liked the format of the programme. The intervention consisted of:

1. Interoceptive exposure exercises in which participants experienced anxiety and PTSD symptoms (e.g., spinning in a chair; breathing through a straw)
2. Reducing avoidance related to pain by setting behavioural goals which typically included engagement in reinforcing and pleasant activities, writing an “impact statement” of their traumatic experience followed by a verbal account

3. A cognitive component in which participants identified unhelpful thoughts, and beliefs (cognitive restructuring).

6.2.1.2 Contents of ACT programme. Vowles and Sorrell (2007) listed the following suggested eight sessions for a chronic pain programme.

1. Introductions and basic foundations of treatment (orientation and use of creative hopelessness – Highlighting the long-term futility of previous passive treatments and thereby shifting an agenda of pain control to a more functional goal).

2. Behaviour change and mindfulness

3. Acceptance and values

4. Values clarification and goals

5. Defusion

6. Committed action

7. Willingness

8. Wrap-up and conclusions.

Generally, in the use of ACT for PTSD, Thompson, Luoma, and LeJeune (2013) point to prolonged exposure as an effective treatment. The authors argue that ACT is an exposure-based treatment but, unlike traditional behaviour therapy and CBT, ACT is constructionist, moving towards valued goals. They argue that ACT is particularly suited to addressing avoidance behaviours, as it is designed to reduce general experiential avoidance and bring about behavioural change.
Gallo and Matthews (2012) described an eleven session ACT programme for PTSD. The sessions focused on increasing valued living in the presence of a trauma story. Practical exercises included reading their personal trauma story daily, and addressing problems that maintain PTSD, such as living in the past, escape behaviours, fusion with thoughts. The programme addressed the following six objects:

1. Flexible attention
2. Self as context
3. Acceptance
4. Defusion
5. Values
6. Committed action

No published research literature on the content of an ACT programme specifically treating comorbid PTSD and chronic pain was found. It is postulated, however, that an ACT group programme would emphasize sessions based on the general ACT principles outlined above (Hayes et al., 2006) with an added emphasis on mindful exposure (imaginal and in vivo) to participants’ trauma story.

### 6.2.2 The Dropout Rates in CBT and ACT Interventions

Prior to exploring the effectiveness of CBT and ACT groups in improving psychological distress outcomes, an initial question arose as to whether group therapy for chronic pain in itself was more or less effective than individual therapy and what was the dropout rate from such groups. Meta-analyses and studies comparing the effectiveness of group and individual chronic pain management interventions showed that group therapy is as beneficial as individual therapy and more economical (e.g., Thorn & Kuhajda, 2006, citing: Frettloh & Kroner-Herwig, 1999, Johnson & Thorn, 1989, Spence, 1989, 1991, Turner-Stokes et al., 2003).
There is commonly a drop-out rate for group programme which is problematic as it can mean that patients’ health needs are not being met. One small study of a CBT group for chronic back pain (Glombiewski, Hartwich-Tersek, & Rief, 2010) (N = 128) found a drop-out rate of 18%. Another review of randomised controlled trials of CBT with patients with fibromyalgia (N studies = 23; N patients in CBT groups = 1,073, N control groups = 958) found no difference in dropout rates between CBT patients and control interventions (both 15% dropout) (Bernardy, Klose, Busch, Choy, & Häuser, 2013). However, the drop-out rate appears to be particularly high for those patients with PTSD (Thompson, et al., 2013). Thompson et al. (2013) point out that studies of patient groups involving exposure therapy for PTSD have a dropout rate of between 20.5 to 32 percent (citing Hembree et al., 2003; van Minnen, Arntz, & Keijsers, 2002), though this is often overlooked or not reported in the literature when reporting successful outcomes. Another systematic review of the literature revealed twenty studies involving 1,191 individuals (Goetter et al., 2015) found dropout rates among war veterans diagnosed with PTSD ranged from 5.0% to 78.2%, and the overall pooled dropout rate was a high (36%).

Yet another meta-analysis (Imel, Laska, Jakupcak, & Simpson, 2013) of dropout rates among active treatments for PTSD (42 studies) found a lower average dropout rate of 18%. Interestingly, the authors found that no significant differences in dropout rates between interventions that were trauma focused or no trauma focused in the same studies. However, an exception was found in that trauma-focused treatments resulted in higher dropout compared with present-centred therapy (PCT) which is focused on current issues and maladaptive behaviours rather than trauma focused treatment (Classen et al., 2011; McDonagh et al., 2005 – both these studies related to survivors of childhood sexual abuse; Schnurr et al., 2003 – related
to Vietnam veterans). It was noted by the authors of this paper that the ACT approach in its pure form does not directly focus on past trauma, but is a present, client-centred approach emphasising cognitive defusion and mindfulness and focusing on finding and committing to a life beyond trauma that has value (McLean & Follette, 2016).

Dropout rates in ACT-based programme were discussed by Feliu-Soler et al. (2018). A 15.8% dropout rate in randomised controlled trials of ACT has been reported (citing Fernández, Salem, Swift, & Ramtahal, 2015). More relevant in relation to this thesis, a dropout rate of 12.1% in chronic pain and fibromyalgia which is slightly better than 25.3% in the comparisons CBT cohort in the same meta-analysis (citing Ong, Lee, & Twohig, 2018). No studies were found in the current review which contrasted the dropout rates for ACT between outpatients with traumatic and non-traumatic chronic pain and distress.

The diverse finding in the studies outlined above make it difficult to conclude whether the dropout rate was higher or lower between CBT or ACT interventions, although, based on Feliu-Soler et al. (2018), it appears that there is some indication that it is marginally lower for ACT. However, there are contingencies other than the type of therapy that may contribute to dropout – length of programme, participants’ alliance with therapists, therapists’ experience, whether individual or group therapy, group dynamics etc. There was some indication in the studies reviewed above that there was a higher dropout rate for participants with PTSD (Goetter et al., 2015) or where therapy involved exposure (Thompson et al., 2013) but there was no evidence in the literature reviewed that event characteristics (e.g., a traumatic pain event cf non-traumatic pain event) was associated with drop-out rate or non-engagement in therapy.
6.2.3 The Effectiveness of CBT and ACT Outcomes

A summary is provided of a review of the literature in relation to post-intervention outcomes, focusing on meta-analyses, is set out in Table 1.
Table 1

*A Summary of Effectiveness of CBT/ACT*

<table>
<thead>
<tr>
<th>Authors</th>
<th>Meta-analyses</th>
<th>Results*</th>
</tr>
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<tbody>
<tr>
<td><strong>CBT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hofmann, Asnaani, Vonk, Sawyer, &amp; Fang (2012)</td>
<td>Quantitative reviews of CBT studies across a range of problem areas (e.g., substance use disorder, schizophrenia and other psychotic and personality disorders) but including populations with depression, anxiety, PTSD, chronic pain.</td>
<td>The efficacy of CBT for anxiety disorders was consistently strong (medium to large effects). There were at least medium effect sizes for posttraumatic stress disorder. CBT for depression was more effective than control conditions such as waiting list or no treatment, with a medium effect size. However, studies that compared CBT to other active treatments, such as psychodynamic treatment, problem-solving therapy, and interpersonal psychotherapy, found mixed results. CBT treatments for chronic pain intensity were consistently in the small to medium effect size range.</td>
</tr>
<tr>
<td>Williams, Eccelston, &amp; Morely, (2012)</td>
<td>Randomised controlled trials evaluating the effectiveness of psychological therapies for chronic pain compared with an active treatment, waiting list or treatment as usual. Exclusions - headache, or malignant disease.</td>
<td>Small to medium effect sizes post-intervention for CBT (pain, disability, mood, catastrophizing) in chronic pain patients but only relative to waitlist or treatment as usual controls. Compared to active control (e.g., physiotherapy, education, and medical regime) CBT had only had small effects on disability and catastrophizing, but not on pain or mood.</td>
</tr>
</tbody>
</table>
Table 1 (cont)

A Summary of Effectiveness of CBT/ACT

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td><strong>Randomised controlled trial of participants with chronic pain.</strong></td>
<td>Randomised controlled trial of participants with chronic pain. Purely mindfulness-based interventions were excluded</td>
<td>Studies that reported effects of ACT and Mindful-based therapies on the mental and physical health of chronic pain patients. Randomised controlled trial comparing acceptance and mindfulness based (MB) interventions to the waitlist, medical treatment as usual, and education or support control groups</td>
<td>A systematic review of the literature examined controlled trials of ACT-based chronic pain treatment studies, and also summarizes evidence for efficacy. Excluded non-randomised controlled clinical trial design, or the study sample included children/adolescents or headache patients</td>
</tr>
<tr>
<td><strong>Significant small to medium effect sizes were found pre-to post-intervention for measures of functioning, anxiety and depression. Generally, effect sizes were smaller at follow-up.</strong></td>
<td></td>
<td></td>
<td>A review of outcome results suggests that ACT is efficacious particularly for enhancing general, mostly physical functioning, and for decreasing distress, in comparison to inactive treatment comparisons. Significant small to large effects for measures of anxiety, depression, or general emotional distress</td>
</tr>
<tr>
<td><strong>N= 11 studies, (10 studies, 1 thesis)</strong></td>
<td></td>
<td>N = 25 studies</td>
<td>ACT was not more effective than CBT on most outcomes</td>
</tr>
</tbody>
</table>

- Effect sizes, small, medium and large were based on Cohen, 1988.
6.2.3.1 The effectiveness of CBT in reducing psychological distress. The two meta-analyses (Table 1) indicated that CBT currently has published evidence relating to the positive efficacy in treatment of PTSD, depression and anxiety in chronic pain patients. Hofmann, Asnaani, Vonk, Sawyer, and Fang (2012) undertook a comprehensive review of meta-analyses (N meta-analyses = 106) examining the efficacy of CBT for distress in a number of problem areas including chronic pain, depression, anxiety and PTSD. The authors noted that the reviewed meta-analyses employed different methodologies and effect size estimates and used the designation “small”, “medium”, and “large” (citing Cohen, 1988) for the magnitude of effect sizes in their review of the representative meta-analyses. The efficacy of CBT for anxiety was consistently strong (medium to large effects) and there were at least medium effect sizes for posttraumatic stress disorder. The review indicated that CBT for depression was more effective than control conditions such as waiting list or no treatment, with a medium effect size. However, results were mixed and inconclusive in studies where CBT was compared to other active types of treatments, such as psychodynamic treatment, problem-solving therapy, and interpersonal psychotherapy.

Another systematic literature review by Williams, Eccleston and Morely (2012) (N randomised control studies = 35) found small to medium effect sizes post-intervention for CBT (pain, disability, mood, catastrophizing) in chronic pain patients but only relative to waitlist or treatment as usual controls. However, when compared to active control (e.g., physiotherapy, education, and medical regime) CBT had only had small effects on disability and catastrophizing, but not on pain or
mood. The authors comment that there is a need to identify which components of CBT work for which type of patient.

Several individual studies were more directed at distress in chronic pain outpatients, were not referenced in either of the metanalyses, and indicated at least some positive efficacy of group treatment of chronic pain and PTSD, depression and anxiety (e.g., Douglas, Graham, Anderson, & Rogerson, 2004; Jensen, Turner, & Romano, 2007; McCracken & Turk, 2002). A more recent Canadian study (Boschen et al., 2016) of an interdisciplinary CBT programme (N = 311, 214 completed programme) found significant improvements between pre- and post-intervention in depression (Depression Inventory-II, BDI; Beck, Steer, & Brown, 1996) and anxiety (Beck Anxiety Inventory, BAI; Beck & Steer, 1990). In addition, there was a significant improvement pre- to post- intervention for pain disability (the degree to which chronic pain interferes with daily activities) (Pain and Disability Index (PDI, Tait, Chibnall, & Krause, 1990).

Of note also, in that it was concerned clinically significant change (CSC) after treatment, was a study by Morley et al. (2008) which investigated a CBT programme for patients with chronic pain (N = 600) at pre-intervention and one-month post-intervention. Although there were overall improvements, the researchers found a CSC of only about 1 in 4 (25%) for HADS depression, and just over 1 in 5 (18%) for the HADS anxiety scale. A considerably smaller number (6%, or 1 in 17) achieved a clinically significant change on a measure of behavioural activity, the 5-minute walk test. There was also evidence that a small percentage of patients (1-2%) reliably deteriorated during the period of treatment.

Only one study was found relating to treatment specifically for comorbid chronic pain and PTSD. Shipherd, Beck, Hamblen, Lackner, and Freeman (2003)
undertook a small case study of six female motor vehicle accident (MVA) patients with both chronic pain and PTSD who attended a pain treatment centre and who had not responded to standard pain treatment (e.g., surgery, physiotherapy). The patients underwent a twelve-week trauma focused CBT treatment. There were no dropouts. The researchers found that a manualised CBT intervention for PTSD was effective in significantly reducing PTSD symptoms for 5 of the 6 participants (although the sixth also improved). There were no changes in subjective pain but there were pain-related functional improvements: 3 of 4 participants, originally on disability pension, were working post-treatment, and all were spending less time in bed.

6.2.3.2 The effectiveness of ACT in reducing psychological distress.

Three systematic literature reviews of the effectiveness of ACT interventions were found, (and all three were discussed by Feliu-Soler et al., 2018). Hughes, Clark, Colclough, Dale, and McMillan (2017) conducted a review of randomised controlled trials of ACT interventions (N=11) (not only groups but also individuals, guided internet, manual self-help) of the clinical effectiveness of ACT for chronic pain when compared to controls (e.g., expressive writing; waitlist; applied relaxation). The authors, while also noting the scarcity of studies comparing ACT to other active treatments, found that ACT was generally more clinically effective than controls with significant small to medium effect sizes for measures of functioning, anxiety and depression.

The metanalysis by Veehof et al., 2016 included twenty-five randomised controlled trial studies, totalling 1,285 patients with chronic pain. The researchers compared acceptance- and mindfulness-based interventions to the waitlist, (medical) treatment as usual, and education or support control groups. Effect sizes were moderate for anxiety and pain interference at post-treatment and ranged from small
(on pain intensity and disability) to large (on pain interference) at follow-up. Significantly higher effects for ACT showed on depression and anxiety than Mindfully Based Stress Reduction and Mindfully Based Cognitive therapy. The researchers found that acceptance- and mindfulness-based interventions were not superior to traditional cognitive behavioural treatments (e.g., Wetherell et al., 2011). Of interest was a subsequent analysis by Wetherell et al. (2016) (N = 114, not in metanalyses), which found older adults (46-89 years) were more likely to respond to ACT, and younger adults (18-45 years) to CBT, both immediately following treatment (OR 1.07, 95% CI [1.00, 1.16]) and at six-month follow-up (OR = 1.08, 95% CI [1.01, 1.17]).

A review of the literature found no research on the efficacy of ACT interventions for comorbid chronic pain and PTSD. Generally, it can be said from the current review that evidence has begun to accumulate for the use of ACT as an effective treatment for pain and distress but there was little evidence to indicate that it was better than traditional CBT.

6.2.4 Summary of CBT and ACT

The review of the content of traditional CBT and “third wave” ACT chronic pain management programme indicated a difference in focus of the interventions, but based on the literature reviewed, not necessarily in outcomes. Overall, the research literature indicated that both CBT and “third wave” ACT programme may assist patients to some extent with managing their chronic pain, although in terms of outcomes discussed in section 2.3 above, a significant number of patients still remained clinically distressed with no increase in behavioural functioning even post-intervention (e.g., Morley et al., 2008).
Both CBT and ACT ultimately seek to address the consequences of pain and adverse events, (thoughts, feelings and behaviours). At a definitional level, CBT is more concerned with changing cognitions to bring about behavioural change, and ACT in promoting striving towards valued goals despite unhelpful cognitions and feelings. However, I argue that both CBT and ACT processes ultimately aim to bring about similar outcomes, specifically to increase physical functioning and improve rates and levels of distress even in the presence of pain. Further, it can be argued that “acceptance and commitment” is also a behavioural goal of CBT, and the importance of pain-related “acceptance” as a mediating factor in improving functioning and reducing distress is acknowledged by at least some CBT proponents although perhaps implicitly rather than explicitly targeted during treatment (e.g., Åkerblom, Perrin, Rivano Fischer, & McCracken, 2015). Similarly, “acceptance” in ACT involves an element of thought challenging and “cognitive restructuring” (a CBT emphasis).

The review of the contents and efficaciousness of CBT and ACT indicated that the interventions were marginally reflective of concepts contained in the reviewed theories of chronic pain and PTSD described in Chapter 1 of this thesis. It can be said that the therapeutic strategies, whether CBT or ACT, aim to enhance a patient’s sense that they have control over or can manage their pain. Keane and Barlow (2002) in their triple vulnerability model of comorbid chronic pain and PTSD (discussed chapter 1, section 3.2) specifically refer to this sense of loss of control. The authors postulate that for people to develop a chronic pain condition they must also develop a belief that the pain is proceeding in an unpredictable and uncontrollable manner. Keane and Barlow argue that when pain is perceived to be uncontrollable, this leads to feelings of low self-efficacy and fear of entering
situations in which pain may occur, leading to avoidance which can then lead to a worsening of their pain condition and distress. In contrast to traditional CBT therapists, ACT therapists avoid the use of the term “control” of pain, which implies a struggle with uncontrollable pain and a consequential increase in distress and reduction in pain tolerance (Hayes et al., 1999). Nevertheless, both therapies seek to address avoidance. As stated throughout this thesis, avoidance (both emotional, behavioural and situational) is only relevant to pain but is independently a criterion for PTSD (DSM 5, American Psychiatric Association, 2013).

Theory and models of pain (reviewed in chapter 1 of this thesis) also directly refer to avoidance as problematic. For example, Vlaeyen and Linton (2000) in their fear–avoidance model of chronic pain argue that increased pain intensity and functional disability is associated with a cycle of pain catastrophizing, hypervigilance, increased escape and avoidance behaviours. Similarly, Hayes (2012) emphasizes that futile attempts to avoid the experience of pain and related feelings of distress give rise to suffering (“dirty pain”) and is therefore counter-productive. It can be said that Vlaeyen and Linton is behaviourist/CBT-based, and Hayes is more ACT-based. Nevertheless, in both CBT and ACT interventions there is a common element of exposure with new non-avoidant behaviours – CBT by cognitive change (challenging and changing unhelpful thoughts) and “confronting” the pain leading to a lower fear of pain, and ACT by accepting unwanted sensations and feelings but, despite them, mindfully moving towards the patients’ valued goals. Of course, the input of interdisciplinary teams in hospital settings (psychologists, physiotherapists, medical doctors) is also important in supporting the psychological intervention strategies for chronic pain, for example, medical or surgical pain relief where
indicated, and gradual paced increases in activity (not avoiding, nor pushing through pain).

It was also demonstrated from the review of the contents of CBT and ACT interventions that more specific aspects of the reviewed theories and models of pain and PTSD were not at the forefront of the interventions. For example, despite the emphasis on a shared “vulnerability” (or “anxiety sensitivity”) to comorbid chronic pain and PTSD in theories of (Asmundson, Coons, Taylor, & Katz, 2002; Keane & Barlow, 2002; Norton & Asmundson, 2003, section 3.4 of this thesis) neither the ACT nor CBT interventions for pain attempted to discriminate between participants on this basis. Further, the interventions reviewed in the current chapter did not distinguish the personal characteristics of patients (age, gender or other personal characteristic) which may be determinable indicators for discriminating between which pain management interventional strategies would be preferable for that subgroup (an exception was Wetherell et al., 2016, comparing effect of age on CBT/ACT effectiveness – discussed in this chapter, section 2.2.4).

Chronic pain management programs do not routinely treat both PTSD and chronic pain (only small case studies exist). Only a handful of small studies distinguished between precipitating pain events (traumatic and those that were not) or specifically modified treatment for comorbid chronic pain and PTSD. This study was interested to consider the question of whether pain programs are effective for this type of pain or whether pain and PTSS should be treated separately. As stated above the literature was only marginally reflective of concepts contained in the reviewed theories of chronic pain and PTSD described in Chapter 1. However, a review of the literature on CBT-based treatments for chronic pain and PTSD
indicated that broad concepts such as acceptance of unhelpful thoughts and feelings can help with distress arising out of both traumatic memories and chronic pain.

6.3. Conclusion

It was stated at the outset of this thesis that it is primarily concerned with outpatients who may have little benefit from standard, mechanistically applied chronic pain interventions in order that economic and professional resources may be more efficiently directed towards them and programme adapted for their needs. There is the risk of a “one size fits all” approach in applying the therapies which may be useful and necessary when attempting to manage a large and ongoing pool of outpatients (some of whom will respond to treatment), but it is perhaps not surprising that, particularly in group therapies, a number of participants do not clinically improve (e.g., Morley et al., 2008) after such mechanically applied interventions.

6.4 Limitations in Comparing Programmes

The review indicated that, although chronic pain and PTSD and associated disorders are commonly comorbid, most interventions address either PTSD or chronic pain, but not both together. The reviewed meta-analyses indicated more basic differences between pain management programme than simply whether they were CBT or ACT, (for example, different numbers of sessions, programme durations, emphases of content, multidisciplinary contributions, differences in therapists’ skill and experience), which made programme difficult to compare. Eccleston (2001b) made a similar observation in a review of the literature, namely that pain management group programme represented not so much a specific approach but a variety of content and durations. The programme varied from a few hours to several weeks and included outpatients, in-patients, and often small
samples. In addition, Hofmann et al. (2012) raised methodological concerns about meta-analytic examinations of CBT for chronic medical conditions (including chronic pain), which he argued made it difficult to determine whether there are any superior effects of CBT-based programme over other types or interventions. Such concerns included: scarcity of studies, small sample sizes, poor design, and confusion of CBT with other interventions. The same concerns raised by Hoffman et al. are applicable to ACT interventions for chronic pain.

The following two chapters, while recognising these limitations, seeks to supplement an understanding of chronic traumatic pain and psychological distress in hospital outpatient through qualitative analysis (as well as quantitative analyses so typically used in the metanalyses) of inputs into patients’ unique pain experiences and life factors, which may potentially act as barriers to standard CBT/ACT interventions.

6.5 Aims of the Following Two Studies

The following two studies in this thesis are set against the background of the exploration in this chapter of the content and efficaciousness of CBT and ACT chronic pain interventions. The next study (study 4) aims firstly, to confirm whether the selected pain management programme can be said to be CBT or ACT (or a mixture of these) and if so, (i) whether traumatic or non-traumatic (work, disease) precipitating pain event, or initial PTSS, predicted drop-out rate from a pain management group; (ii) whether distress was reduced and functioning increased post-intervention, regardless of pain attribution.

Chapter 8, study 5 is a more in-depth qualitative study (thematic analysis) of ten cases selected from the chronic pain management groups in which the histories, general patterns of behaviours, and motivating factors of participants are explored. Consideration is given to whether life context ultimately influences the selection of
demonstrated pain management strategies. The study also investigates the potential usefulness of identifying behavioural patterns to predict barriers to psychological and functional improvement even post-group intervention. The aim of this chapter is to understand through an in-depth mixed method analysis (quantitative and qualitative using with case studies) what characteristics or influences contribute to, or cause pain and distress and to understand why, for some patients, avoidance, hyperarousal and “boom-bust” behaviours do not change even after an intensive CBT pain management group programme.
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CHAPTER 7

STUDY 4

(This study, along with the literature review in chapter 6 of the content and effectiveness of pain groups, primarily aims to demonstrate that the case studies in Chapter 8 were selected from a ‘typical’ CBT group)

Keywords

Pain, distress, chronic, anxiety, depression, posttraumatic stress, memory, traumatic event, stressors, diffuse pain, age, gender.
An Exploratory Study into whether Pain Event Characteristics (Traumatic, Non-traumatic) Affect Outcomes of a Hospital Group Chronic Pain Management Programme

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Summary

No significant differences were found in posttraumatic stress, attendance or non-completion of pain programme, or favoured pain strategy between traumatic, work, disease related chronic pain.
Abstract

Background and aims. Previous research indicates modest improvements for pain outpatients attending group CBT programme and that distress associated with comorbid chronic pain precipitated by a traumatic pain may be particularly difficult to treat. The general aim was to investigate whether the chronic pain management group under study reflected the contents and outcomes of similar programmes in the research literature. This study investigated: (i) Are there pre-, or post-intervention differences in posttraumatic stress associated with the pain event (traumatic, cf. non-traumatic such as work or disease)? (ii) whether drop-out from a hospital chronic pain management group was associated with a traumatic pain event?

Methods. Participants (N = 92, from 10 successive groups) were outpatients attending a four-week interdisciplinary (psychologist and physiotherapist) CBT-based chronic pain management programme. Pre-and post-intervention, self-report measures of anxiety, depression, posttraumatic stress (distress) were taken. Two functional outcome tests were also utilised: perceived disability, and a six-minute walk test (6MWT).

Results. There were high rates of pre-intervention posttraumatic stress (40.5%); anxiety (57.6%); depression (52.2%). Seventy-five of 92 initial participants (82%) attended on the last day (“attenders”). Pre-intervention distress, non-attendance, or non-completion of questionnaires was not associated with the nature of the pain event (traumatic or non-traumatic). Post-intervention, there was significant decrease in depression rates (particularly for participants with disease related pain), also perception of self-as-disabled, and a significant increase in metres walked on the 6MWT, but no significant improvements in anxiety or posttraumatic stress. Gains were maintained at six-month follow-up. The nature of the pain event (traumatic or
non-traumatic) did not predict pre-intervention distress, non-attendance, non-completion of questionnaires, nor outcome.

**Conclusions.** Results indicate that despite theories of comorbid chronic pain and distress giving prominence to traumatic events, they are of no assistance in predicting distress or programme outcomes.

**Implications.** CBT-based treatments are not universally effective but the nature of pain event (traumatic, or non-traumatic work, disease) may be ruled out as a reason for this. Future research would usefully explore the impact of whole person experience on comorbid chronic traumatic pain and psychological distress in outpatients who do not benefit from interdisciplinary group interventions.
7.1. Introduction

Comorbid chronic pain and Post Traumatic Stress Disorder (PTSD) are theorized to be mutually maintaining (Sharp & Harvey, 2001). Previous research has indicated that interdisciplinary hospital group programmes typically use Cognitive Behavioural Therapy, CBT based programme, both traditional CBT and Acceptance and Commitment Therapy, ACT (McCracken & Turk, 2002; Vowles & Sorrell, 2007). The content of such hospital group programmes as well as their overall effectiveness in improving psychological distress (although such programmes usually address and measure anxiety and depression rather than PTSD) and functioning is well documented, although there may be differences in emphasis and duration between the programme (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012). Typically, CBT-based pain management programme⁹ target maladaptive behaviours, beliefs and patterns of thought (Eccleston, 2001) although it can be said traditional CBT is more concerned with changing cognitions to bring about behavioural change, while ACT. The ACT is based on the theory that futile attempts to change distress simply produces suffering (Bach & Moran, 2008; Hayes & Duckworth, 2006) and therefore promotes striving towards valued goals despite unhelpful cognitions and feelings. CBT-based interventions for chronic pain management ultimately aim to bring about similar behavioural changes and outcomes, specifically to increase physical functioning and improve rates and levels of distress even in the presence of pain. In pain programme the involvement of a physiotherapist who supervises daily exercises increases in activity using pacing principles¹⁰ (Jamieson-Lega, Berry, & Brown 2013) is therefore of particular interest.

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⁹ Discussed fully in chapter 6 of this thesis
¹⁰ Jamieson-Lega, Berry, and Brown (2013) define: "Pacing is an active self-management strategy whereby
importance so as to avoid harm to patients and flare-ups of pain.

Although such research indicates that CBT-based group programme are beneficial, such improvements may be modest, and may be greater in some domains (e.g., functionality) than others (e.g., distress). For example, a meta-analysis (Williams et al., 2012) of CBT pain management groups (35 studies, 4,788 participants) found no effect for anxiety or depression compared to active controls (e.g., physiotherapy, education, medical regime). Mood was only improved (small effect) when compared to treatment as usual/wait lists. Disability ratings improved (small effect, Cohen, 1988) compared to both active controls and treatment as usual/waitlist, although this effect disappeared at follow-up. Morley, Williams, and Hussain (2008) investigated clinically significant change (CSC) for a four-week CBT programme for chronic pain patients (N = 600). At one-month post-intervention the investigators found a CSC for only about 1 in 4 (25%) for depression, and 1 in 5 (18%) for anxiety. Only 1 in 17 (6%) achieved a CSC on a five-minute walk test. However, in contrast to the finding relating to functional outcome, another study (Kurklinsky, Perez, Lacayo, & Sletten, 2016) of a three-week CBT interdisciplinary programme (N =150) found that six-minute walk test (6MWT) average distances improved by 39% (large effect).

A review of the literature indicated that outpatients presenting to a chronic pain management programme with traumatic pain are not routinely treated differently from patients presenting with non-traumatic pain. Only one small exploratory study (N = 6, after motor vehicle accidents) was found of a twelve-week trauma focused CBT programme which targeted both chronic pain and PTSD.

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individuals learn to balance time spent on activity and rest for the purpose of achieving increased function and participation in meaningful activities* (p.209).
POSTTRAUMATIC STRESS IN CHRONIC PAIN PATIENTS

(Shipherd, Beck, Hamblen, Lackner, and Freeman, 2003). The programme was effective in significantly reducing PTSD symptoms and in increasing functioning (the majority began working and spending less time in bed). Nevertheless, theory relating to the development and maintenance of comorbid chronic pain and PTSD (Asmundson, Coons, Taylor, & Katz, 2002; Norton & Asmundson, 2003; Sharp & Harvey, 2001) has postulated that patients with comorbid PTSD and chronic pain make greater use of maladaptive pain coping strategies (e.g., avoidance) than patients with chronic pain alone. This postulate has been supported by empirical research findings (e.g., Alschuler & Otis, 2012; Morasco et al., 2013).

The aim of this study was primarily to investigate whether a selected CBT-based chronic pain management program (described section 2.4) was typical in content and outcomes to other programmes in the research literature so as to provide a background against which study 5 (Chapter 8 of this thesis) could be undertaken. This analysis was not intended to be an analysis of the PUMP program as such. Pre- and post-intervention analyses are descriptive and provided simply to evaluate the question of whether the cases came from a typical CBT group by establishing that outcomes were similar to outcomes in the research literature. However, more specifically, the question arises as to whether there are differences in psychological distress post-intervention between outpatients presenting with traumatic chronic pain and those with non-traumatic pain. This research is primarily directed at PTSD after trauma but recognises that chronic pain patients commonly experience anxiety and depression also and that such psychological conditions can be comorbid with PTSD or cause patients to be more vulnerable to PTSD (e.g. Sharp & Harvey 2001). It is arguable that if there are, the two cohorts could usefully be distinguished at presentation to outpatient pain services, and perhaps receive alternative or at least modified group treatment. On the other hand, if there are no significant differences in diagnostic
symptoms between the pain event subgroups then this would highlight the complexity of the chronic pain experience, and there is a risk, for example, that there will be a mechanistic treatment emphasis (e.g., on the historical traumatic pain event) which can be therapeutically misplaced (e.g., the use of exposure therapy when the distress arises out of other contextual and situational factors, e.g., loss of employment; relationship stressors; adjustment to loss of physical functioning; ongoing unhelpful behaviours impacting on pain). The complexity of chronic pain is further highlighted by research literature (e.g., Boals, Trost, Rainey, Foreman, & Warren, 2017; Bodkin, Pope, Detke, & Hudson, 2006) and previous studies by our research team (Knight, Reid, & Davis, 2019b, 2019c) which have indicated that there can be posttraumatic stress-like symptoms in treatment seeking patients even where their pain event was not associated with a traumatic event. In any event, the biological, cognitive, emotional, and behavioural processes underlying a diagnosis of PTSD are not entirely clear as reflected in the changes in the diagnosis in the DSM 5 (American Psychiatric Association, 2013). For example, even unconscious patients who therefore arguably could not have remembered the traumatic event, have been subsequently diagnosed with PTSD (Roitman, Gilad, Ankri, & Shalev, 2013).

The current study investigated three questions:

(i) Are there pre-, or post-intervention differences in psychological distress associated with the pain event (traumatic, cf. non-traumatic such as work or disease)? Despite the precedence given by theorists, researchers and the DSM 5 to heightened distress after a traumatic event, even a debilitating medical condition (“disease”) may also give rise to significant distress symptoms - although PTSD has in this case been expressly excluded:
“A life-threatening illness or debilitating medical condition is not necessarily considered a traumatic event. Medical incidents that qualify as traumatic events involve sudden, catastrophic events (e.g., waking during surgery, anaphylactic shock)” (DSM 5, p. 275).

Similarly, workplace processes related to pain and injury at work, can maintain high distress and pain in chronic pain hospital outpatients (particularly where perceptions of unfairness, Robbins, Ford, & Tetrick, 2012). Pain arising out of workplace injuries can, like traumatic pain, of sudden onset, although unlike a traumatic event not related to the risk of or actual serious or life-threatening injury.

The current study therefore aimed to compare the effect of “traumatic” and “non-traumatic” chronic pain events (specifically work injury, disease) on psychological distress, pre- and post-intervention, and whether the pain event differentiated PTSD, anxiety or depression or functioning at presentation and after CBT-based group intervention.

The study also investigated the outcomes of the chronic pain management group more broadly, considering whether the group as a whole improved on distress measures, and also on measures applied by the physiotherapist facilitator of participants perception of their disability level and functioning.

(iii) Is drop-out from a hospital chronic pain management group more likely among patients who have experienced a traumatic pain event than among those who have not experienced such an event? Dropout rates were discussed in a metanalysis by Feliu-Soler et al. (2018) who reported dropout rate of 12.1% in an ACT-based chronic pain programme (citing Ong, Lee, & Twohig, 2018) - which was slightly better than 25.3% in the comparison CBT cohort in the same meta-analysis. Theorists (Sharp & Harvey, 2001; Tyrer, 2006) have postulated that people with
PTSD may be particularly avoidant of pain and distress, an argument supported by previous research which found a high drop-out rate in trauma-focused programme for PTSD between 18% (Imel, Laska, Jakupcak, & Simpson, 2013) and 32 percent (Thompson, Luoma, & LeJeune, 2013). Interestingly, Imel, Laska, Jakupcak, & Simpson, 2013 found no significant differences in drop-out rates between trauma focused or no trauma focused interventions in the same studies although another study (Schnurr et al., 2003) found trauma focused therapy had a higher dropout rate when compared with present-centred therapy (focused on current issues and maladaptive behaviours). Neither traditional CBT nor ACT approaches for chronic pain are directly trauma focused although CBT may challenge unhelpful thoughts through self-talk. However, ACT is a more present, person-centred approach which does not directly focus on past trauma or pain but emphasizes cognitive defusion and mindfulness (McLean & Follette, 2016).

We hypothesised that there would be a higher drop-out rate among participants with traumatic pain than for participants with non-traumatic pain.

7.2. Method

7.2.1 Ethical Considerations

Institutional ethics committee approval was granted (Fremantle Hospital and Murdoch University in Western Australia) to obtain and process data from the subacute trauma and chronic pain programme and patient reviews.

Assessments and notes taken by the researchers at Fremantle Hospital in relation to group members’ participation in the pain group were kept on a separate and confidential file in a locked office. Any data derived from information on the
participants’ files removed from the hospital for the purposes of analysis or transcription was de-identified (coded with an identification key) before removal.

All participants had access to individual sessions provided by an independent Clinical Psychologist at Fremantle Hospital during and after the group sessions if they should become distressed, or if issues were raised for them as a result of the sessions which they believe could be more appropriately addressed on a one-to-one basis.

7.2.2 The Facilitators and Participant Observation

The first author of this paper (psychologist) co-facilitated nine of the ten groups along with a senior physiotherapist. The first group was facilitated by a hospital clinical psychologist. At the first session of the pain management programme the participants were briefly introduced by a researcher to the purpose of the proposed study and a copy of a Consent Form and Inpatient Information Sheet were handed out. The first author’s dual role as researcher and co-facilitator was emphasized, as was the voluntary nature of the study, with no prejudice to the patient if they decided not to participate or withdraw at any stage. All patients consented to undergo psychometric testing and a taped structured interview at the end of the programme.

It was recognized in this study that the involvement of the researcher in facilitating the groups could potentially give rise to an observer-expectancy effect (Douglas, 1977) in which the researcher’s bias as to what is relevant causes him to unconsciously influence the group participants’ responses. Co-facilitation is critical in such circumstances so that triangulation of observations can be made, and reflective peer supervision undertaken after each session. In addition, as a facilitator, the researcher was therefore mindful of this potential impact and careful to maintain
“moderate participation” (Spradley, 1980) in which a balance was maintained between "insider" (group facilitator) and "outsider" (researcher) roles. This enabled an essential degree of objectivity to be maintained.

7.2.3 Participants

Participants were referred into the outpatient pain management group programme either by their community family doctors or by health practitioners working within the hospital. The group facilitator psychologist and physiotherapist then screened the patients approximately two to three weeks before the commencement of the programme on whether they were physically and psychologically able to engage in the programme. Unlike some chronic pain intervention programme, PUMP does not screen out patients by reason of their medical or mental health status, providing that the patients are not palliative and are assessed by the group psychologist to be psychologically stable (not florid, but well managed if they had mental illness).

There was a total of 92 participants (from ten successive groups) with chronic pain: 34 participants (44% male, 56% female) in the trauma group and 58 participants in the no trauma group (57% male, 43% female). The mean age of the participants in the trauma group was 44.62 years ($SD = 12.58$, age range 26-80 years); in the no trauma group 47.28, ($SD = 11.89$, age range 25-73 years).

7.2.4 Chronic Pain Programme (PUMP)

The four-week chronic pain management group programme (Pain Understanding and Management Programme, PUMP) selected for this study operated out of Fremantle Hospital, Western Australia. The group sessions took place between 09:00 am and 12:00 pm, usually starting with the physiotherapist leading the group for a daily walk and exercise. The physiotherapist facilitated 18
sessions in total over the four weeks, (five mornings a week, Monday to Friday, for about 1.5 hours). The psychologist (first author) facilitated twelve sessions of the PUMP programme (comprising of three mornings a week, Tuesday, Wednesday, Thursday, 1.5 hours each morning, usually directly after the physiotherapy morning component).

7.2.4.1 Efficacy of programme. A study of this programme by Douglas, Graham, Anderson, and Rogerson (2004) found improvements in pre- and post-intervention outcomes for participants ($N = 152$ completed the programme, $N = 35$ dropout) for depression scores $F(1, 198) = 15.13, p < .05$ (Zung Depression Inventory, Main & Waddell, 1984) and for patients’ perception of their disability, $F(1, 198) = 6.70, p < .05$ (Roland-Morris Disability Questionnaire, RMDQ, Roland & Morris, 1983).

7.2.4.2 The content of the programme. The programme covered the following content (which had been updated to include ACT concepts since the study by Douglas et al. (2004):

*Behavioural activation including exercises, pacing strategies.* The group’s physiotherapist was responsible for daily exercise (stretching and strengthening) and demonstrating activity pacing (Jamieson-Lega et al., 2013)

*Psychoeducation.* A session on psycho-neurophysiology was jointly conducted by the psychologist (first author) and physiotherapist facilitators and covered the pain response, including neural sensitivity and brain changes, the gate control theory of pain, stress and the “fight or flight” response; sickness response, including depression and fatigue, as well as a session on sleep
hygiene. The physiotherapist also provided educational sessions upon topics such as the healing process, posture and ergonomics;

_Destressing and relaxation skills training_. This was conducted by the psychologist facilitator and included mindfulness, progressive muscle relaxation (PMR), deepening (achieving a feeling of heaviness) and guided exposure/manipulation of the pain sensation;

_Cognitive therapy_. The team’s psychologist conducted this component, and it involved identifying unhelpful beliefs/thoughts and “cognitive restructuring”;

_Acceptance and commitment therapy (ACT) (Hayes, Luoma, Bond, Masuda, & Lillis, 2006)._ The selected group programme drew on a third-wave CBT (ACT) concept which contends that futile attempts to control pain and distress produce suffering. This component led by the team’s psychologist introduced cognitive defusion, the self-as-context, and acceptance of pain and distressing thoughts, the identification and pursuance of valued goals. Participants were encouraged to engage in valued activities while mindfully accepting distress and pain (Bach & Moran, 2008; Hayes et al., 2006).

_Communication skills training and family interventions_, a session facilitated by the programme psychologist.

_Stages of change, including maintenance of pain management strategies and relapse prevention_ were discussed by the programme psychologist.

The programme therefore contained psychoeducation aimed at reducing fear of pain, with an emphasis on ACT acceptance, mindfulness and pursuing valued goals but also referring briefly to traditional CBT elements, such as cognitive restructuring. It was noted that the programme did not specifically target “traumatic”
pain (arising out of serious injury or arising out of a life-threatening event) and traumatic memories were not directly addressed (e.g., by imaginal exposure).

7.2.5 Measures

The measures used in this thesis are screening tools rather than diagnostic tools - in busy outpatient departments it necessary to have quick efficient methods of screening for psychological distress. Standard cut-off points are used in the current study although various studies throughout the research literature sometimes recommend other cut-off points for specific chronic conditions (e.g., Nowak et al., 2014). However, in this chronic pain group these measures and standard cut-off points were considered sufficient for the researcher’s purposes and to enabled comparisons to be made with other studies using the same standard cut-off points.

7.2.5.1 Psychological distress measures.

The Impact of Event Scale -Revised (IES-R; Weiss & Marmar, 1997) was utilised as a screening tool to assess posttraumatic symptoms. This is a 22-item scale, with eight items on the Intrusions and Avoidance subscales respectively, and six items on the Hyperarousal subscale. It has been recommended that a cut-off total raw score of 33 and above be used to indicate probable PTSD (Creamer, Bell, & Failla, 2003) and in this study the total IES-R score was categorised dichotomously, with a raw score of 33 or higher being regarded as of clinical relevance (Wu & Chan, 2003)

The Hospital Anxiety and Depression Scale (HADS, Zigmond & Snaith, 1983). The advantage of the HADS over other instruments particularly in clinical settings, is its ease of administration and independence from physical symptomatologys which may be attributable to medical treatment (e.g., medications causing dryness so the mouth) or an underlying medical condition (Bjelland, Dahl, Haug, & Neckelmann, 2002). Seven items measure anxiety and seven items measure
depression with a score of 8-10 on either subscale regarded as “mild” and 11 or greater being regarded as clinically significant (Snaith, 2003).

7.2.5.2 Functional measures

Two measures relating to (i) the participants’ perception of their level of disability (ii) overall physical functioning, were administered by the physiotherapist group facilitator.

The Roland-Morris Disability questionnaire (RMDQ; Roland & Morris, 1983) was initially developed for measuring disability associated with back pain, but a modified 24-item form for general pain was used at PUMP (the word “pain” was substituted for “back” or “back pain”). It has good psychometric qualities regardless of pain location and extent (Asghari & Nicholas, 2001; Jensen, Strom, Turner, & Romano, 1992). The RMDQ covers a range of daily activities that patients may perceive to be limited by their pain. The score is the number of items checked by the participant. The scores can range from zero (no disability) to 24 (severe disability). Studies have reported that the test-retest reliability, validity and responsiveness of the RMDQ are adequate (Ostelo, de Vet, Knol, & van den Brandt, 2004; Stratford, Binkley, Solomon, Gill, & Finch, 1994).

A six-minute walk test (6WMT; Butland, Pang, Gross, Woodcock, & Geddes) was utilised as a direct, objective measure of functioning to assess functional capacity and to supplement the subjective self-report measures. was undertaken by the participants pre- and post-PUMP (but not at follow-up) under the supervision of the physiotherapist group facilitator (Appendix to the current study).

7.2.5.3 Assessment of attenders and non-attendees. It was a policy of the programme for participants who missed more than three of the twelve psychological components, or more than four of the eighteen physiotherapy sessions to be invited
to cease the programme and attend the programme in its entirety at a later date. Those participants who completed the programme (or at least nine of the twelve psychological components, and fourteen of the physiotherapy sessions) and all questionnaires and the 6MWT were classified as “attenders”. In addition to those participants who ceased to attend (‘non-attendees”, those participants who did not fully complete or return the post-intervention questionnaires were also classified as “non-completers” (even if they attended most of the sessions).

7.2.5.4 Event characteristics. Identified pain events were confirmed by checking them against the hospital records and patient self-report and were identified as traumatic if they met the criteria set down in the DSM 5 (American Psychiatric Association, 2013) and non-traumatic if they were work injuries, or gradual onset disease. The trauma sub-group (37%) had sustained pain after life-threatening events or serious injury such as road accidents, assaults, falls, medical negligence. Participants in the no trauma group reported that their pain was either the consequence of minor incidents at work (33.7%, e.g., lifting, slipping, poor workplace ergodynamics), or their pain was attributable to gradual onset illness or disease (29.3%).

7.2.6 Procedure

7.2.6.1 Programme. Self-report instruments were handed out and 6MWT was undertaken on the first day of the pain programme. The same pen and paper measures were again handed out at the conclusion of the programme and the second walk test undertaken. The measures were posted out to participants at a six-month follow-up to complete and return at a one-hour hospital review, however there was no follow-up walk test.
7.2.6.2 Data screening. Data were screened for missing values and accuracy of data entry, and assumptions of multivariable analysis were checked. Outliers were examined and considered extreme if they were three or more box lengths from the upper or lower edge of the boxplots (Coakes, 2013).

7.2.6.2.1 Missing values. The response rate for the questionnaires pre-, post and follow-up in set out in Table 1. A number of participants chose not to complete the IES, stating that they had not experienced any traumatic pain event, or they could not remember the onset of their pain, and their pain in itself was not “traumatic” to them. Questionnaires with missing responses on any item were excluded from analysis.

Table 1
Response Rate for Participants on Questionnaires

<table>
<thead>
<tr>
<th></th>
<th>Pre-intervention</th>
<th>Post- Intervention</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N participants = 92)</td>
<td>(N =75)</td>
<td>(N =32)</td>
</tr>
<tr>
<td>IES-R</td>
<td>84</td>
<td>61</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>91.3%</td>
<td>81.3%</td>
<td>100%</td>
</tr>
<tr>
<td>HADS</td>
<td>92</td>
<td>64</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>85.3%</td>
<td>100.0%</td>
</tr>
<tr>
<td>RMDQ</td>
<td>86</td>
<td>60</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>95.5%</td>
<td>80.0%</td>
<td>68.8%</td>
</tr>
<tr>
<td>6MWT*</td>
<td>66</td>
<td>39</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>71.7%</td>
<td>52.0%</td>
<td>-</td>
</tr>
</tbody>
</table>

*Logistical reasons at hospital prevented some participants being tested

7.2.6.2.2 Outliers. Scatterplots and boxplots were examined, and no outliers were found for HADS anxiety or depression at any time point. Pre-programme, one outlier was found for IES-R, but no outliers at subsequent time points. On the RMDQ there was one outlier pre-intervention and none at post-intervention or follow-up. On the 6MWT there were no outliers at any time point. None of the outliers was considered extreme (Coakes, 2013). It was therefore decided not to delete the outliers.
7.2.6.2.3 Assumptions of normality. An inspection of the data for the IES-R and HADS and subscales, (including the frequencies, histograms stem and leaf, box plots and probability plots and detrended normal plots and probability plots) revealed a number of deviations from the assumptions of normality (Kolomogorov-Smirnov <.05). The assumption of normality was violated (p < .05) in the cases of HADS Anxiety, pre-intervention and at follow-up, and HADS Depression pre-intervention. The RMDQ also pre-intervention violated the assumption of normality. An inspection of the histograms for HADS Anxiety and Depression, and RMDQ indicated only mild positive skews and it was decided not to transform the variables.

7.2.7 Overview of Statistical Analysis

Pre-intervention characteristics of attenders were compared to those of non-attendees. Chi-squared test of independence was used to investigate whether the categorical variables PTSS or pain event types (trauma vs no trauma) were associated with drop-out. The overall effectiveness of the programme was explored using independent sample t tests and paired samples (i.e. repeated measures) to analyse pre- and post- intervention measures on the distress (HADS, IES-R) and functional measures (RMDQ, 6MWT).

Repeated measures ANOVAs were used to analyse the changes on the dependent variables (distress and functional) for the participants who returned questionnaires post-test and at 3 months follow-up.

7.3. Results

7.3.1 Pain Event and Outcomes Pre- to Post-, and Follow-up

7.3.1.1 Pre- and post-programme compared.

Irrespective of pain cause, clinically relevant posttraumatic stress, anxiety and depression rates were particularly high pre-intervention in the PUMP group: 40.5%
posttraumatic stress; 57.6% anxiety; 52.2% depression. In comparison, general population prevalence of PTSD has been estimated as 3.5%; anxiety 18.1%, and 6.7% major depression (Kessler et al., 2005). A higher prevalence of distress in chronic pain populations has been found: diagnosable PTSD between 23% and 48% (Ahman & Stalnacke, 2008; Andersen, Andersen, Vakkala, & Elklit, 2012), anxiety disorders of 25% (Asmundson & Katz, 2009) to 44% (Ahman & Stalnacke, 2008); depression at between 27% and 45% (Ahman & Stalnacke, 2008; Soberg, Bautz-Holter, Roise, & Finset, 2010) and as high as 52% in pain clinics (Bair, Robinson, Katon, & Kroenke, 2003). The prevalence of moderate or severe symptoms for the pain event groups were compared by chi-square tests for independence (Table 2).

Table 2
Pre-Intervention Frequencies and Chi-square tests between Pain Event and Clinically Relevant Distress

<table>
<thead>
<tr>
<th>Distress</th>
<th>% within event</th>
<th>Pain event</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Disease</td>
<td>Work</td>
<td>Traumatic</td>
<td></td>
</tr>
<tr>
<td>PTSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=84)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal/</td>
<td>N</td>
<td>15</td>
<td>15</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>%</td>
<td>68.2%</td>
<td>50.0%</td>
<td>62.5%</td>
<td></td>
</tr>
<tr>
<td>Moderate/</td>
<td>N</td>
<td>7</td>
<td>15</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>%</td>
<td>31.8%</td>
<td>50.0%</td>
<td>37.5%</td>
<td></td>
</tr>
<tr>
<td>χ² (2, N = 84) = 1.93, p = .38, Cramer’s V = .15</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Anxiety</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(N=92)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal/</td>
<td>N</td>
<td>10</td>
<td>10</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>%</td>
<td>37.0%</td>
<td>32.3%</td>
<td>55.9%</td>
<td></td>
</tr>
<tr>
<td>Moderate/</td>
<td>N</td>
<td>17</td>
<td>21</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>%</td>
<td>63.0%</td>
<td>67.7%</td>
<td>44.1%</td>
<td></td>
</tr>
<tr>
<td>χ² (2, N = 92) = 4.15, p = .13, Cramer’s V = .21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depression</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal/</td>
<td>N</td>
<td>14</td>
<td>13</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>%</td>
<td>51.9%</td>
<td>41.9%</td>
<td>50.0%</td>
<td></td>
</tr>
<tr>
<td>Moderate/</td>
<td>N</td>
<td>13</td>
<td>18</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>%</td>
<td>48.1%</td>
<td>58.1%</td>
<td>50.0%</td>
<td></td>
</tr>
<tr>
<td>χ² (2, N = 92) = .67, p = .71, Cramer’s V = .09</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Cramer’s V: small effect size = .01; medium = .3; large = .5 (Cohen, 1988. p.25 and 79).
* HADS ≥11
** IES-R ≥33
Chi-squared results did not indicate that pain event significantly distinguished between rates of distress on the HADS and IES-R. In fact, as can be seen from the rates of clinically relevant distress set out in Table 2 there was a trend, although not significant, for those in the work-related injury category to report the most distress, even for PTSS (though the work-related incidents were minor and were not considered life-threatening). The findings did not, therefore, support the hypothesis that participants whose pain was from a traumatic event would be more distressed than those whose pain was from non-traumatic disease or work events.

An investigation was also made of the post-intervention scores for psychological distress and pain events (Table 3). Chi-squared tests indicated that pain event significantly distinguished depression post-intervention (medium effect). An inspection of the data indicated that moderate or severe depression occurred less frequently post-intervention when pain was disease-related than when it was work- or trauma-related.
Table 3
Post-Intervention Frequencies and Chi-square tests between Pain Event and Clinically Relevant Distress Categorisation

<table>
<thead>
<tr>
<th>Distress</th>
<th>N</th>
<th>% within Event</th>
<th>Pain event</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Disease</td>
<td>Work</td>
</tr>
<tr>
<td>PTSS (N=61)</td>
<td>Normal/Mild</td>
<td>N</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Moderate/Severe</td>
<td>%</td>
<td>50%</td>
<td>68.4%</td>
</tr>
<tr>
<td>Anxiety (N=64)</td>
<td>Normal/Mild</td>
<td>N</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Moderate/Severe</td>
<td>%</td>
<td>57.9%</td>
<td>47.4%</td>
</tr>
<tr>
<td>Depression (N=64)</td>
<td>Normal/Mild</td>
<td>N</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Moderate/Severe</td>
<td>%</td>
<td>94.7%</td>
<td>55.6%</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>5.3%</td>
<td>44.4%</td>
<td>34.0%</td>
</tr>
</tbody>
</table>

χ² (2, N=61) = 2.44, p=.30, Cramer’s V=.20

χ² (2, N=64) =1.08, p = .58, Cramer’s V=.13

χ² (2, N=64) = 7.75, p=.02, Cramer’s V=.35

Further comparisons were undertaken of mean outcome measures at pre-, post-test and follow-up (i) for distress, and (ii) for measures of functional change (RMDQ, 6MWT), in order to see if overall improvements were significant. Paired samples t-tests were conducted with pre-intervention and post–intervention scores on the distress and functional measures (Table 4).
Table 4

*Paired samples t-tests between pre- and post, significant \( p < .05 \)

<table>
<thead>
<tr>
<th></th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M )</td>
<td>( SD )</td>
</tr>
<tr>
<td>Anxiety (n = 64)</td>
<td>10.97</td>
<td>3.48</td>
</tr>
<tr>
<td>Depression*</td>
<td>10.38</td>
<td>4.07</td>
</tr>
<tr>
<td>Posttraumatic (n = 61)</td>
<td>38.15</td>
<td>18.14</td>
</tr>
<tr>
<td>Disabled (n = 60)*</td>
<td>13.64</td>
<td>4.51</td>
</tr>
<tr>
<td>Walk (metres)* (n = 39)</td>
<td>376.35</td>
<td>88.74</td>
</tr>
</tbody>
</table>

There was a significant decrease in HADS Depression from pre-intervention to post-intervention. The eta-squared statistic (0.20) indicated a large effect (> .14, Cohen, 1988).

There was a significant decrease in disability self-ratings from pre-intervention \((M = 13.64, SD = 4.51)\) to post-PUMP, \((M = 11.56, SD = 6.02)\), \(t\) (58) = 3.923 \( p < .0005\) (two tailed). The eta squared statistic (.21) indicated a large effect size (Cohen, 1988).

In addition to an improvement in mood and in disability ratings, a paired samples \(t\)-test also demonstrated a significant increase in metres walked from pre-intervention \((M = 376.35, SD = 88.74)\) to post-intervention \((M = 455.24, SD = 101.51)\), \(t\) (63) = 1.79, \(p < .001\) (two tailed). The mean increase in metres walked was 78.90 metres (a 21% increase) with a 95% confidence interval ranging from 57.13 to 100.67. The eta squared statistic (.59) indicated a very large effect (> .14, Cohen, 1988).

7.3.1.2 Pain event and psychological distress at follow-up. Three months follow up was also examined for the sub-sample of participants attending for follow-up assessments (Table 5).
Table 5
Follow-up Frequencies and Chi-square tests between Pain Event and Clinically Relevant Distress

<table>
<thead>
<tr>
<th>Distress</th>
<th>N</th>
<th>% within event</th>
<th>Pain event</th>
<th>Disease</th>
<th>Work</th>
<th>Traumatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>9</td>
<td>81.8%</td>
<td>75.0%</td>
<td>77.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>2</td>
<td>18.2%</td>
<td>25.0%</td>
<td>22.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*χ² (2, N = 32) = .16, p = .93, Cramer’s V = .07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>5</td>
<td>45.5%</td>
<td>58.3%</td>
<td>77.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>6</td>
<td>54.5%</td>
<td>41.7%</td>
<td>22.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*χ² (2, N = 32) = 2.15, p = .34, Cramer’s V = .26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>7</td>
<td>63.6%</td>
<td>66.7%</td>
<td>55.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>4</td>
<td>36.4%</td>
<td>33.3%</td>
<td>44.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*χ² (2, N = 32) = .28, p = .87, Cramer’s V = .09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cramer’s V: small effect size = .01; medium = .3 large = .5 (Cohen, 1988, p.25 and 79).
* HADS > 11
** IES-R > 33

None of the differences between the pain event groups was significant at follow-up, and it was noted that depression rates for disease, which had fallen significantly at immediate post-intervention assessment, no longer distinguished between the subgroups. However, given the small sample size at follow-up, caution should be exercised in interpreting this result as a small sample size would account for lack of significant difference. An alternative explanation could be that some of the participants who had improved significantly on depression measures did not attend follow-up which confounded the scores.

One-way repeated measures ANOVAs were used to assess change in the continuous variables over time, and the means and the standard deviations for those who returned all pre-, post- and follow-up PUMP are presented in Table 6. Effect...
sizes were assessed according to the guidelines set by Cohen (1988) where .01 = small; .06 = moderate; .14 = large effect size. There was a significant improvement for HADS Anxiety, Wilks’ Lambda = .67, $F(2,23) = 5.66$, $p = .01$, multivariate partial eta squared = .33 (large effect size). Pairwise comparisons (using the Bonferroni correction to guard against Type I errors) indicated that the significant improvement occurred between pre-intervention to six-month follow-up, but not pre-to post-post intervention. There was also significant improvement in depression pre-to post-intervention, Wilks’ Lambda = .76, $F(2,23) = 3.56$, $p = .045$, multivariate partial eta squared = .24 (large effect size). Pairwise comparisons indicated that for the follow-up time point (Table 6) the improvement occurred between pre-intervention and post-intervention.

There were no significant improvements for the participants who attended all pre, post and follow-up on the IES-R, Wilks’ Lambda = .92, $F(2,25) = 1.09$, $p = .35$, multivariate partial eta squared = .08 (small effect).

Similarly the improvements on the perceived disability measure, RMDQ, were not significant, Wilks’ Lambda = .76, $F(2,20) = 3.09$, $p = .07$, multivariate partial eta squared = .24 (but still a large effect size).

Table 6

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>HADS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=25)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>10.56</td>
<td>3.95</td>
<td>9.96</td>
</tr>
<tr>
<td>Depression</td>
<td>9.88</td>
<td>3.46</td>
<td>8.64</td>
</tr>
<tr>
<td>IES-R (n=27)</td>
<td>36.44</td>
<td>18.31</td>
<td>31.89</td>
</tr>
<tr>
<td>RMDQ (n=22)</td>
<td>12.23</td>
<td>4.95</td>
<td>10.00</td>
</tr>
</tbody>
</table>

*No 6MWT was administered at follow-up
7.3.2 Comparison of Pain Events and Distress for Attenders and Non-attendees

Seventy-five participants (81.5%) of the original ninety-two participants attended on the last day of the programme (“attenders”), indicating a drop-out rate of 18.5%, which was similar to that set out in the literature (Imel et al., 2013; Thompson et al., 2013). The pain event types of attenders were compared to those of the non-attendees and non-completers (Table 7). No association was found, \( \chi^2 (4, N=92) = 5.4, p=.24, \) Cramer’s \( V =.17 \). However, there was a trend (although not significant) for those participants with work related chronic pain to be less likely to complete the programme than those with trauma or disease related pain.

Table 7

<table>
<thead>
<tr>
<th>Event causing pain</th>
<th>N</th>
<th>% within Event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Disease</td>
</tr>
<tr>
<td>Attender</td>
<td>N</td>
<td>20</td>
</tr>
<tr>
<td>%</td>
<td>74.1%</td>
<td>51.6%</td>
</tr>
<tr>
<td>Non-attendee</td>
<td>N</td>
<td>3</td>
</tr>
<tr>
<td>%</td>
<td>11.1%</td>
<td>22.6%</td>
</tr>
<tr>
<td>Non-completer</td>
<td>N</td>
<td>4</td>
</tr>
<tr>
<td>%</td>
<td>14.8%</td>
<td>25.8%</td>
</tr>
</tbody>
</table>

Pre-intervention rates of anxiety and depression and posttraumatic stress symptoms (PTSS) were compared to those of the non-attendees and non-completers to ensure that these participants were not the most traumatised or distressed, which may have interfered with their continued attendance (Table 8).
Table 8
Psychological Distress, Attendance and Completion Programme

<table>
<thead>
<tr>
<th></th>
<th>PTSS+ (N=84)</th>
<th>Anxiety++ (N=92)</th>
<th>Depression++ (N=92)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal/Mild</td>
<td>Moderate/Severe</td>
<td>Normal/Mild</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Attender*</td>
<td>33</td>
<td>66.0%</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>64.7%</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>69.2%</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>62.3%</td>
<td>30</td>
</tr>
<tr>
<td>Non-</td>
<td>11</td>
<td>22.0%</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>11.8%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>17.9%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>15.1%</td>
<td>7</td>
</tr>
<tr>
<td>Completer***</td>
<td>6</td>
<td>12.0%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>23.5%</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>12.8%</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>22.6%</td>
<td>11</td>
</tr>
<tr>
<td>Attendee**</td>
<td>6</td>
<td>13.6%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>22.9%</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>34</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>43</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

+IES-R > 32
++HADS >10
* Attender: Completed programme and attended on last day
*Non-attendee: did not complete programme
*** Non-completer: Attended on last day but did not return or complete all post-programme questionnaires
Chi-squared tests of independence were performed (Table 9) to examine the relationship between clinically relevant rates of psychological distress and attendance or non-attendance. There was no significant difference between the groups.

Table 9  
*Chi-squared Tests of Independence (with Continuity Correction) for Distress and Attendance at programme*

<table>
<thead>
<tr>
<th>Distress</th>
<th>$\chi^2$</th>
<th>Cramer’s V*</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTSS</td>
<td>$\chi^2 (2, N=84) = 2.80, p=.25$</td>
<td>.18</td>
</tr>
<tr>
<td>Anxiety</td>
<td>$\chi^2 (2, N=92) = 1.45, p=.48$</td>
<td>.13</td>
</tr>
<tr>
<td>Depression</td>
<td>$\chi^2 (2, N=92) = 1.37, p=.51$</td>
<td>.12</td>
</tr>
</tbody>
</table>

* Cramer’s V: small effect size = .01; medium = .3; large =.5 (Cohen, 1988, p.25 and 79).

7.4. Discussion

A consideration of the contents of the PUMP programme and its outcomes and comparison with similar programme in the research literature confirmed to the current researchers that the programme was typical of other CBT-based chronic pain although there was an ACT emphasis which aimed to encourage participants to pursue valued goals despite some distress and pain. The three questions raised in the Introduction to this paper are addressed below in turn.

7.4.1 Are there Pre-, or Post-intervention Differences Associated with the Pain Event?

7.4.1.1 Outcomes between the pain event subgroups. Contrary to this research team’s expectations, participants with traumatic pain were not significantly more distressed pre-intervention than participants who attributed pain to work or
disease (Table 2). On the contrary, an inspection of distress scores indicated that the participants with work-related pain were even slightly (but not significantly) more distressed than the traumatic pain subgroup.

Similarly, there were no significant differences in clinically relevant PTSD or anxiety symptoms post-intervention (Table 3) or at follow-up (Table 5) between participants whose pain was traumatic in origin or non-traumatic. However, of interest was the finding that there was a significant drop in the post-intervention rates (but not at follow-up) and mean for depression which was particularly evident in the disease subgroup compared to the work and trauma subgroups. Why a similar fall in depression rates and scores was not found for the work and traumatic pain subgroups might simply be a consequence of the small sample size where, for example, a few participants can have a big impact on results. Another possibility may be that workplace processes (particularly accompanied by patient’s perception of unfair treatment; Robbins et al., 2012) are particularly stressful, perhaps subjectively even felt by the worker as “traumatic” (in the sense the pain event was both unexpected and had serious consequences) which both can impede recovery from work-related pain, and lead to persistent depression – particularly if the worker felt “targeted” by employers or compensation insurers (i.e. subject to “exclusive, active, and intentional social rejection of an individual”; Slavich, Thornton, Torres, Monroe, & Gotlib, 2009). On the other hand, the disease-related pain group may not have felt a sense of injustice, or of being targeted by others.

7.4.1.2 Outcomes for the chronic pain management groups overall. This paper also explored the effectiveness of the pain management programme in reducing psychological distress on the chronic pain group as a whole. Overall there were some non-significant improvements on PTSS and anxiety measures but
significant improvement in mood (large effect size, Coakes, 2013). These results can be compared to the meta-analysis of chronic pain groups by Williams et al. (2012) who found no effect for a CBT group intervention on anxiety or depression compared to active controls (e.g., only physiotherapy, education, medical regime) but a moderate effect size on mood and a small one at follow-up when compared with treatment as usual or wait list. What is clear also from the findings in this study (Tables 3 and 5) is that although it can be said there are some improvements in distress outcomes following the group intervention, that there remains a high rate of outpatients post-intervention who have symptoms of moderate or severe PTSD, anxiety and depression.

In the current study, it is postulated that ongoing anxiety even post-intervention perhaps could be a by-product of leaving the daily support of the group combined with a new commitment to pursue their valued goals (e.g., finding work; resolving relationship issues). However, the improvement in mood was perhaps indicative of participants’ increased optimism about their future.

The outcomes for the two measures applied to the groups by the physiotherapist facilitator were also explored. Both the subjective and objective measures of functional change, namely self-perceived disability and 6MWT improved significantly post-intervention with a large effect size for the RMDQ and very large effect size (Coakes, 2013) for the 6MWT (21 % improvement in the mean distance walked). This finding was in agreement with that of Kurklinsky et al. (2016) (N =150) found that six-minute walk test (6MWT) average distances improved by 39% (large effect) after a three-week CBT interdisciplinary programme.

At follow-up (N =32), the overall post-intervention gains were maintained in those who completed the questionnaires (Table 6, no 6MWT was undertaken). A full
exploration of why such a small number of participants (27%) returned for review three months after completion of the programme was beyond the scope of this paper. It may be that some had returned to work, or moved away, or felt that they were coping well enough and did not require review. The improvement in depression scores pre-intervention to follow-up was still significant and in addition, there was significant improvement in anxiety (but not PTSS) between the pre-intervention and follow-up which had not been present pre- to post intervention. It was also noted that the mean follow-up scores for anxiety, depression and posttraumatic stress symptoms all fell within the “mild” range (HADS $\leq 10$, IES-R $< 33$). However, the disability perception score, which improved at immediate post-intervention, did not maintain significant superiority over pre-intervention in the follow-up group. This finding was consistent with that of Williams et al. (2012) where disability ratings improved post-intervention (small effect, Cohen, 1988) compared to both active controls and treatment as usual/waitlist, but this effect disappeared at follow-up. It was noted in the current study that the less impressive result at follow-up may have arisen out of a lower pre-intervention disability score in the twenty-five attenders at follow-up than in the sixty post-intervention attenders. It is also possible that only less functional participants attended the follow-up and they perceived themselves therefore as not self-managing their pain (compared to others who were now, e.g., working, travelling, caring for family).

7.4.3. Do Traumatic Pain Event or PTSS Predict Programme Drop-out?

PTSS has been found to be associated with non-completion of a chronic pain programme (Imel et al., 2013; Thompson et al., 2013). It was therefore predicted in the current study that traumatic pain (compared to pain associated with work or disease) or high PTSS would be associated with non-attendance in the PUMP pain
programme. The findings did not support this hypothesis and there were no significant differences in pain event or PTSS between attenders and non-attendees. Nor were there significant differences (contrary to this research team’s hypothesis) between attenders and non-attendees on functional measures (self-reported disability, 6MWT) or in anxiety or depression – which finding supported previous research into this group (Douglas et al., 2004). It is open to speculation as to why there are different findings throughout the research literature in relation to pre-intervention posttraumatic stress symptoms and its effect on dropout rates. It may simply be that in the current study the potential participants were well-screened as to their likelihood to complete the programme, and those who were doubtful because of high distress and tendency to avoid were referred on to more individualised psychological treatment. Most non-attenders in the current programme expressed valid reasons for not completing the programme fully which were unrelated to whether their pain and distress was traumatic or non-traumatic in origin (for example, unanticipated medical complications, unexpected family obligations, or work opportunities).

7.5. Limitations

An important limitation in this study lies in the fact that the samples were broadly drawn from a chronic pain management programme at a public hospital. No conclusion can, therefore, be drawn in respect of more specific cohorts whose traumatic pain, for example, is treated in primary care, in subacute settings, or specific outpatient groups whose traumatic pain is related to combat, sexual assault, or experienced during palliative care.

7.6. Conclusion

The current findings, that response to intervention does not differ systematically between patients whose pain is traumatic and non-traumatic in origin,
parallel those of a previous study by this research team (Knight et al., 2019c) that distress (including PTSS) in those participants attending a chronic pain management programme is not distinguishable by nature of pain event alone. The current exploratory study extends that conclusion and found that drop-out rates from pain programme, programme outcomes, and preferred pain management strategy are similar, whether trauma was experienced or not.

A question raised in the introduction this paper was whether clinically relevant posttraumatic stress, anxiety or depression between the traumatic, work or disease chronic pain subgroups was so significantly different that it indicated the need for differentiation in terms of treatment. In the current study, the findings of a relative homogeneity of psychological distress in the subgroups and similar outcomes post-intervention, do not suggest the need for differentiated treatment based on the type of pain event. What is also highlighted from the findings in this study (Tables 3 and 5 as well as in the research literature reviewed (e.g., Morley, et al., 2008; Williams, et al., 2012) is the high proportion of outpatients (no matter what their pain attribution) who do not significantly benefit from CBT-based group interventions.

It is argued here that these patients’ pain experience and the identification of potentially effective interventions can better be understood by an exploration of the whole person experience rather than focusing primarily on empirically based variables directly related to chronic pain and PTSD that are prominent in the research literature. This approach is consistent with a biopsychosocial model (BPS) of pain management. As Gatchel (2004) argues:

“The BPS model views physical disorders such as pain as the result of a dynamic interaction among physiologic, psychological, and social factors,
which perpetuates and may worsen the clinical presentation. Each individual experiences pain uniquely.” (p.796)

7.7. Future Recommendations

This current study and previous studies by this research team (Knight et al., 2019b, 2019c) cast doubt upon the special relevance of identifying a historical traumatic event both in informing CBT-based group treatments, and in relation to the overall question of why so many outpatients make little improvement despite intensive multidisciplinary intervention. Future studies that investigate the impact of whole person experience on pain, distress (particularly PTSD), and on the adoption of coping and pain management strategies, may better add to an understanding of chronic pain after a traumatic event.

Conflict of Interest Statement
The authors have no conflicts of interest to declare.

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References


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POSTTRAUMATIC STRESS IN CHRONIC PAIN PATIENTS


Appendix

Six Minute Walk Test

The six-minute walk test (6MWT) was originally designed to assess functional capacity in patients with chronic pulmonary disease. It has been commonly used in randomised controlled clinical trials to assess drug efficacy (Demers, McKelvie, Negassa, Yusuf, & Investigators, 2001) and has been used to detect change in fitness in functional capacity for walking and fatigue with an exercise programme (e.g., Pankoff, Overend, Lucy, & White, 2000). It has good test-retest reliability (Demers et al., 2001): interclass correlation coefficient [ICC] = 0.90).

The procedure (Pankoff et al., 2000) for the 6MWT was as follows. A practice walk was undertaken to provide a second stable walk performance, and in this study the pre-programme walks were ordinarily done on the second and third days of the programme (the first day was an orientation). The post-programme walk was undertaken on the second last day of the programme. Group participants were instructed to walk back and forth along a corridor (30m long) for 6 minutes whilst being timed by a stopwatch operated by a group facilitator. The participants’ total distance was calculated at the end of the 6 minutes. Encouragement was given to the participants approximately every minute (e.g., “Five minutes remaining. Do your best”).

Standard instructions were given by the group physiotherapist in the following terms:

“You will walk back and forth along this corridor between the brass plate and the exit sign for 6 minutes. You will be given one-minute warnings so you know how long you have been walking for. Please walk at your own
pace, while attempting to cover the greatest distance possible during the allotted time. If you need to stop and rest, feel free to, however, we encourage you to start again and keep going. We want you to obtain the greatest distance possible for you; however, we do not want you to have pain flare up afterwards so keep this in mind as you do your walk.”

References


CHAPTER 8

Study 5

The British Psychological Society (2011) guidelines offer assistance to researchers and therapists. The Society has urged a move away from narrow mechanistic approaches to understanding psychological distress (particularly in making mental health diagnoses). They counsel recognising the effect of wider social and environmental contexts that influence the maintenance of unhelpful behaviours. It is argued by this research team that this advice is applicable to a significant number of participants with chronic pain and comorbid distress.

Keywords: Pain, distress chronic, anxiety, depression, posttraumatic stress, memory, traumatic event, stressors, diffuse pain, age, gender.

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Summary

A thematic analysis of ten case studies with chronic pain identified four behavioural patterns, which may assist in more focussed treatments for high risk patients.
Abstract

**Background and aims.** Despite the evidence-base for the effectiveness of multi-disciplinary programmes for chronic pain, many participants still demonstrate little or no progress post-intervention. This study aimed to investigate how beliefs, attitudes and motivational factors influence psychological distress, as well as influencing participants’ selection and utilisation of pain management strategies.

**Methods.** An in-depth thematic analysis was undertaken of post-intervention interview transcripts with ten pain group participants (males = 5, females = 5). The second phase of this study triangulated the qualitative findings obtained from thematic analysis of semi-structured interviews with (i) the informal observations of facilitators of participants’ behaviours prior to or in group sessions, and (ii) with data from post-intervention quantitative analysis of outcome measures pre- to post-intervention on the Hospital Anxiety and Depression Scale, Impact of Event Scale-Revised, Roland-Morris Disability Questionnaire and a functional walk test.

**Results.** Four outcome categories were identified: (i) The most hopeful participants were confident in their ability to manage their pain and tended to have multiple motivators for change. They utilised the majority of the strategies taught and were flexible in adapting them to their changing needs; (ii) hyperaroused participants were less likely to pace their activities, and used a narrow range of pain management strategies, namely activity or distraction but not meditation or formal pacing; (iii) Clients who reported feelings of helplessness and pessimism about their futures and their ability to actively self-manage pain were unlikely to adopt any demonstrated strategies; and (iv) some participants were strongly holding onto childhood memories of major childhood stressors which appeared to influence their adult coping responses to pain and stress. The second phase of the investigation confirmed
that facilitators’ informal observation of behaviours corresponded with distress and functional measures and the behaviours readily fitted within the identified thematic categories.

**Conclusions.** Screening clients using this framework for behavioural patterns may assist in a more client-centred and individually responsive treatment for patients who do not benefit from usual CBT-based group interventions.

**Implications.** The primary psychological treatment for patients who do not benefit from CBT-based interventions may best be directed at breach of issues of trust and relational repair, and only secondarily directed at reinforcing new behavioural approaches and pain management strategies.
POSTTRAUMATIC STRESS IN CHRONIC PAIN PATIENTS

8.1 Introduction

There is considerable research to demonstrate the utility of interdisciplinary chronic pain management programmes (Ospina & Harstall, 2006; The British Pain Society, 2007), including both traditional Cognitive Behavioural Therapy (CBT; Eccleston, 2001; McCracken & Turk, 2002) and “third wave” Acceptance and Commitment Therapy (ACT; Mason, Mathias, & Skevington, 2008; McCracken, Vowles, & Eccleston, 2005; Vowles, McCracken, & Eccleston, 2007) in improving anxiety, mood (Eccleston, 2001) and physical functioning (Wicksell et al., 2013). The programmes demonstrate to patients alternative evidence-based pain strategies for managing both external (e.g., exercise; pacing) and internal behaviours (e.g., cognitive restructuring; de-stressing; cognitive defusion, Hayes, Wilson, & Strosahl, 1999). Specifically, there is support for the argument that maladaptive neuroplastic responses arising out of chronic pain may be reorganized by changes in behaviours - for example, by meditation (Lazar et al., 2005), and exercise (Knaepen, Goekint, Heyman, & Meeusen, 2010).

However, other studies (Eccleston, Williams, & Morley, 2009) have found that CBT had only a weak effect in improving pain, minimal effects on disability associated with chronic pain although effective in altering mood outcomes. Morley, Williams, and Hussain (2008) report clinically significant change for only about 1 in 4 (25%) for HADS Depression, and 1 in 5 (18%) for the HADS Anxiety scale. Only 1 in 17 (6%) attained a clinically significant change on the 5-minute walk test - a measure of physical functioning. Similarly, a previous study by our team (Knight, Reid, & Davis 2019d, manuscript in preparation) found no significant improvements in anxiety or posttraumatic stress after a four-week group pain management programme, and high rates of clinically relevant psychological distress were still
POSTTRAUMATIC STRESS IN CHRONIC PAIN PATIENTS

prevalent. For example, for precipitating pain events related to disease, work, and trauma, moderate or severe symptoms of psychological distress were reported at 50.0%, 31.6%, 26.9% respectively for posttraumatic stress and at 42.1%, 52.6%, 57.7% for anxiety. There was an overall significant decrease in depression (particularly for participants with disease related pain), but there was still a high percentage of participants reporting clinically relevant symptoms post-intervention: 5.3%; 44.4%; 34.0% for disease, work and trauma related pain respectively. However, was a significant improvement in participants perception of themselves as less disabled, and a significant increase in metres walked on a six-minute walk test (6MWT).

The question of why significant change eludes a substantial number of participants remains a vexed one. A large volume of quantitative research (e.g., Haagsma et al., 2012; Kazantzis et al., 2012; Maneeton, Maneeton, & Srisurapanont, 2013; Mundal, Grawe, Bjorngaard, Linaker, & Fors, 2014; Trevino, Harl, Deroon-Cassini, Brasel, & Litwack, 2014) and a series of studies by the current authors, (Knight, Reid, French, & Davis, 2019; Knight, Reid, & Davis, 2019b, 2019c, 2019d: manuscripts in preparation) have investigated barriers to recovery by attempting to identify predictors of persistent distress in pain sufferers. These studies offer partial descriptions of differential distress outcomes but little by way of explanation.

Empirical studies commonly ignore the subjective experience of the client, despite recognition that current bio-medically based diagnostic systems give undue weight to symptoms rather than patients’ unique experiences (Braun & Clarke, 2006; British Psychological Society, 2011). In a previous study (Knight, Reid, & Davis 2019d, manuscript in preparation) we sought participants’ feedback post-intervention on which the strategies demonstrated in a pain management programme they found
most useful in managing their pain. Participants identified functional strategies (51% exercise; 20% pacing) as most useful over psychological strategies (18%). Participants (30%) identified destressing techniques (mindfulness, progressive muscle relaxation, diaphragmatic breathing, guided imagery) as the most useful psychological strategy. Increase in physical functioning in chronic pain outpatients is an aim of pain management programme, but given the high rates of psychological distress even post-intervention it is puzzling why more participants do not give precedence to psychological strategies (e.g., mindfulness and destressing), and even in relation to functioning strategies give precedence to simple exercising over broader research-based principles of activity pacing.

The current study aimed to extend previous empirical findings by focussing on deeper consideration of the patient experience of pain, specifically, the life context in which the pain experience occurs and how this context influences the participants’ perception of, and commitment to potentially helpful chronic pain management strategies. We argue that some outpatients do not respond to standardised CBT-based treatments because, even though pain management is important, they rigidly cling to old behavioural patterns and do not adjust to changing physical, social and environmental contexts. If such psychological inflexibility can be identified in outpatients who do not obtain benefit from standardised CBT-based programme, then potentially therapists can plan more individualised interventions leading to the patient’s adoption of more helpful pain and stress management strategies.

The concept of psychological flexibility has been discussed in relation to patients with chronic pain. Kwok, Chan, Chen, and Lo (2016) highlighted the close
association between “psychological inflexibility” and self-regulatory processes in chronic pain conditions:

“… whether a person is motivated to pursue their goals depends on the value of the goals and the expectation that the goals can actually be achieved (Edwards, 1954; Van Damme & Kindermans, 2015) … These approaches work in line with psychological flexibility, which stresses the importance of individuals’ abilities to adjust values-based behaviours according to contextual needs (Hayes et al., 2006) … In other words, recognition of self-worth and self-values could be attuned through flexible (re)construction of self-concept (i.e., story of self) in response to changing contexts. These adaptations and regulatory functions then in turn may predict the subjective feelings of pain interference, emotional distress and pain tolerance level perceived.” (P 912)

In other words, there may be a “psychological inflexibility” where an individual either lacks sufficient motivation to pursue new goals, or their story of self (“conceptualised self”) is so rigid that they are unable to reconstruct it in a new context - even to manage their pain. Lin, Klatt, McCracken, and Baumeister, 2018 investigated the role of psychological flexibility as a mechanism of change (as utilised in ACT) in a study of chronic pain patients in the community (N = 302). The researchers found psychological flexiblity significantly mediated pre-intervention to post-intervention outcomes (including anxiety and depression) in the treatment groups compared with waitlist (standardized estimates ranged from I0.16I to I0.69I).

Törneke (2010) elaborates more generally on the story of self and proposes that life-experiences give rise to a relatively stable "story of self" which has its origins in the individual’s interactions with the social environment. Stories of self
may become summaries that function as “scripts for action” and result in a number of self-rules which dictate valued goals and result in congruent behavioural choices. Such scripts and self-rules are unobservable internal processes, sometimes implicitly (subconsciously) as well as explicitly (conscious thoughts and memories) driven. However, they can be given expression to in the form of observable patient behaviours which health practitioners can potentially identify over time particularly in pain management programme which extend over several weeks. Behaviours that are unhelpful in managing chronic pain and psych could then be explored with participants. It is hoped by the health practitioners that with added insight, patients will become more psychologically flexible and the self-rules dictating participants’ behaviours become less dominant so that patients adopt more helpful evidence-based pain management rules (e.g., you must pace your activity).

Törneke (2010) refers to three type of rule governed behaviours:

1. Tracking: For example, a patient who follows (tracks) the rule that if you balance activity and rest using a watch to time yourself then you will have fewer flare-ups of pain, and finds that that this occurs, is tracking.

2. Pliance and counterpliance: For example, if a patient is told by a physiotherapist to “stop bending like that” and the patient complies without knowing the reason why, then their behaviour is “governed by the social contingencies of being compliant to their instructor’s wishes” (Bach & Moran, 2008, p. 76). Bach and Moran emphasize that there may be conflict between tracking and pliance, as when a patient is told by their doctor to walk with the assistance of a zimmer frame (tracking) but their spouse tells them that they will look ridiculous if they do, and so they refuse (pliance). “Counterpliance” is the opposite of pliance as when a
person opposes authority because “I should never follow orders”
(Törneke, 2010)

3. Augmentation. Bach & Moran, 2008 (citing Hayes et al., 1989, p.206) point out that augmenting may be combined with tracking and pliance. This rule governed behaviour is “under the control of apparent changes in the capacity of events to function as reinforcers or punishers”.

Augmenting is relevant to both a person’s valued goals. Thus, the examples are given by Bach and Moran of a person who makes a value statement of “I value staying physically fit” and this may function as an augmental by increasing physical activity. Alternatively, problematic augmenting increases the possibility of avoidance, such as a person follows a rule that “this pain is unbearable” which may function to increase the aversive functions of pain.

The question remains as to why some outpatient do not “track”, or “ply” and do not adopt the pain management strategies demonstrated to them by health practitioners. We argue that the reason why patients may continue to utilise unhelpful strategies (e.g., avoidance) rather than more helpful pain management strategies can be appreciated through the lens of a participant’s life-context. and pre-existing self-concept. Through this lens the therapist will be better able to understand and treat, not only subjective feelings of pain and distress, but also the patient’s use, explicitly or implicitly, of maladaptive behaviours governed by life-context informed self-rules.

The current qualitative study begins from the premise that patient narrative supplied by patients and identification by health practitioners of pre-existing behavioural patterns provide a "window” into complex private experiences, acute,
distal and lifelong. The identification of such patterns of behaviour potentially enables health practitioners and the patient to target and consciously alter unhelpful entrenched attitudes, beliefs and behavioural patterns that ultimately may influence the selection of valued goals and pain management strategies.

This in-depth study seeks to complement the understanding of chronic pain and distress that is achievable through traditional narrow, structuralist interventions and mechanistic diagnostic and statistically driven approaches (Bach & Moran, 2008; British Psychological Society, 2011). It seeks, firstly, to identify and classify patterns of behaviour and, secondly, to translate the findings of a thematic analysis to the workplace in a practical way so that facilitators in outpatient group settings can potentially identify and treat rigid and unhelpful behavioural patterns which may act as a barrier to adopting more useful chronic pain management strategies. The authors investigated whether outcome measures along with the group facilitators’ observation of participant behaviours in group sessions and could be triangulated with the thematic classification. It was aimed to identify thematic categories which could be readily identified by group facilitators so as to assist health practitioners’ understanding of patient barriers which arise out of patients’ “self-rules” (Törneke, 2010) and so potentially plan more individualised interventions for those outpatients who did not obtain optimum treatment benefit from standardised CBT-based programme.

8.2. Method

8.2.1 Participants

Participants (N = 10, 5 females, 5 males) were outpatients with chronic pain who had been referred into the hospital group pain management programme at Fremantle Hospital in Western Australia by their treating doctors, namely their
general practitioners, or hospital specialist doctors. They were drawn from two successive CBT chronic pain management groups. The mean age of participants was 41.2 years with a range of 27-64 years. The participants were screened pre-intervention by the facilitating psychologist and physiotherapist approximately 1-2 weeks prior to the group intervention. Selection criteria only excluded participants from the group programme if their condition was palliative, if they were unlikely to benefit from the programme (e.g., cognitively impaired), or if in the opinion of the assessors they would be disruptive to the group.

The case study sample (N = 10, two successive groups selected at random) was regarded as small but sufficient for the analysis as behavioural themes were so clearly evident in the sample from a deep individual case analysis that adding a larger sample would have added little. Participants were drawn from two successive CBT chronic pain management groups. To aid interpretation, the case number, gender and age of the participants is reflected in their ‘tag’ throughout this paper (e.g., 1M52 is the first participant, male and 52 years of age).

8.2.2 Design

There were two parts to this mixed method design study (both qualitative and quantitative: Leech & Onwuegbuzie, 2009). Firstly, the case study method utilised in this research opens the way to discovery of individual complexities as well as more common features of experience (Shaughnessy, Zechmeister, & Zechmeister, 2006). It also helps us to look beyond the factors already identified in the pain literature to perhaps reveal as yet unconsidered factors that influence treatment outcomes for chronic pain patients. Secondly, a quantitative method was utilised to assess the participants pre-, post- and follow-up outcomes on the standardised measures
The advantage of a mixed method was that it allowed triangulation of the qualitative findings (obtained from thematic analysis of semi-structured interviews) with the informal observations of facilitators prior to or in group sessions and with data from post-intervention quantitative analysis of outcome measures. Convergence of findings from different methods provides confirmatory evidence to research findings that may be ambivalent when using a single method (Tashakkori & Teddlie, 2010). It improves the trustworthiness of the data; and congruence in findings from different methods improves the strength of inference.

8.2.3 Measures

8.2.3.1 Variables sourced from hospital records.

8.2.3.1.1 Background: family, social, marital, work status, age and gender of participants were obtained (as far as recorded) from the general hospital chart and confirmed with participants.

8.2.3.1.2 Pain-event related characteristics (e.g., injury severity; a history of traumatic pain event) were ascertained from hospital medical records. Particulars of the main event causing pain were obtained from the referring letters and hospital files and confirmed with the participants both at a pre-programme assessment (physiotherapist and psychologist) and in the post-programme structured interviews. Whether the pain event was “traumatic” or “non-traumatic” was assessed by the researchers, in accordance with the guidelines set down in the DSM 5 and ICD10 (e.g., DSM 5 definition “exposure to actual or threatened death, serious injury or sexual violation”).
8.2.3.2 Self-report psychometric measures.

8.2.3.2.1 The Impact of Event Scale Revised (IES-R) (Weiss & Marmar, 1997) is a screening tool that measures symptoms of posttraumatic stress: Avoidance (eight items); Hyperarousal (six items) and Intrusions (eight items) and provides a total symptom score. In this study, as recommended by Weiss and Marmar, the total IES-R score is categorised dichotomously, with a score of the sum of the means of the subscales totalling 6 (raw score of 44) or higher for the IES-R Total regarded as of clinical relevance. This cut-off represents a conservative estimate: On the IES-R raw scores a cut-off mean value of 1.5 (raw score of 33) and above has also been said to represent diagnosable PTSD among Vietnam veterans (Creamer, Bell, & Failla, 2003).

8.2.3.2.2 Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983) is designed to detect clinically significant depression and anxiety. Seven items measure anxiety and seven items measure depression. It has been recommended (Snaith, 2003) that on the HADS a score of 8-10 is mild, 11 and above moderate, and 16 severe. For the purposes of the current study, the scores are categorised dichotomously with 11 and above representing symptoms of clinical concern.

8.2.3.2.3 Roland-Morris Disability Questionnaire (RMDQ) (Roland & Morris, 1983). The RMDQ covers a range of daily activities perceived by patients to be limited by their pain. The RMDQ was initially developed for measuring disability in back pain, but a modified 24-item form for pain generally was used at the pain programme (the word “pain” was substituted for “back” or “back pain”). Participants were asked to tick a
sentence if it described them “today”. The score is the number of items checked by the participant. The scores can range from zero (no disability) to 24 (severe disability). There are no recommended cut-off scores, but rather change in RMDQ score is compared before and after intervention. The question therefore of whether participants view themselves as “disabled” was regarded in this study as a separate question from extent of pain.

8.2.3.3 Objective measures of physical function.

The *Six-Minute Walk Test* (6WMT) (Pankoff, Overend, Lucy, & White, 2000) was used as a direct physiological functioning measure to supplement the subjective self-report measures. The 6MWT was originally designed to assess functional capacity in patients with chronic pulmonary disease but has been commonly used to detect change in fitness in functional capacity for walking and fatigue with an exercise programme (Butland, Pang, Gross, Woodcock, & Geddes, 1982). Group 2 took the 6MWT.

*Alternative Twenty-minute Walk Test.* No timed thirty metre laps were taken by the physiotherapist facilitator for Group 1 (because of operational difficulties in the hospital). The participants, however, monitored the time they took on a morning walk on the hospital grounds pre- and post-PUMP up to a maximum allowed time of 20 minutes.

No follow-up scores were available for any of the walk-tests.

8.2.4 Procedure

8.2.4.1 The programme contents. The group intervention was a four-week (five mornings a week) CBT-based chronic pain management group programme.
Twelve sessions were undertaken by the psychologist facilitator, including sessions on psychoeducation (e.g., on identifying and setting valued goals) and destressing and mindful strategies (progressive muscle relaxation, diaphragmatic breathing, mindfulness, guided imagery). Eighteen sessions (including demonstrating activity pacing principles\(^\text{11}\), and supervising daily walks, stretches and strengthening exercises) were undertaken by the physiotherapist facilitator. A study by Douglas, Graham, Anderson, and Rogerson (2004) had found that the programme was effective in significantly improving mood and reducing the participant’s perception of themselves as disabled.

8.2.4.2 Informed consent and data collection. All ten participants (across two successive groups) were fully advised by the facilitators of the purpose of the study and voluntarily agreed to participate. They completed informed consent forms on the first day of the group programme and the data collection measures pre- and post-intervention and at six-month follow-up. The walk-tests were administered by the physiotherapist facilitator pre- and post-intervention but not at follow-up. All participant data used in the quantitative analysis was entered into PASW for Windows 18.0 (Coakes & Ong, 2011) for analysis.

8.2.4.3 Observer-expectancy effect. The authors of the current study recognised that the first author’s position as both researcher and facilitator of the groups could potentially give rise to a researcher’s bias which could unintentionally influence the participants’ responses to questionnaires and in interviews (observer-expectancy effect, DeWalt & DeWalt, 2011). The researcher was therefore careful to maintain “moderate participation” (Spradley, 1980) in which a balance was

\(^{11}\)Defined by Jamieson-Lega, Berry, and Brown (2013): “Pacing is an active self-management strategy whereby individuals learn to balance time spent on activity and rest for the purpose of achieving increased function and participation in meaningful activities.” (P.211)
maintained between "insider" (group facilitator) and "outsider" (researcher) roles. This enabled an essential degree of objectivity to be maintained. Co-facilitation and reflection and feedback between the co-facilitators after each session also helped to reduce the possibility of facilitator bias impacting on participants. Whilst issues of observer bias were considered, the benefit of having a participant observer involved in the interviews was considered to be of primary benefit. Specifically, pain patients are notoriously self-protective and would have been unlikely to open up with an unknown researcher. Care was taken to adhere to pre-prepared questions and prompts but the potential for bias is acknowledged.

8.2.4.4 Behavioural observations of participants. Unstructured behavioural observations were made by both the psychologist and physiotherapist facilitators over a four-week period during the course of the group sessions and summarized immediately on conclusion of the programme in reports by the facilitators to referring doctors. No attempt was made to formalise behavioural observation of participants during group sessions, but rather facilitator observation was limited to subjective impressions during the sessions. The observations were made prior to scoring and analysing the clients’ pre- and post- intervention standardised outcome measures, which were undertaken at the conclusion of the programme, so as not to influence the facilitators’ assessment of behaviours during the programme. Examples of observed behaviours are: good adherence or non-compliance to treatment; patients exhibiting pain behaviours (such as grimacing, groaning, shuffling, holding the pain area); continued avoidance, or non-pacing of activities.

8.2.4.5 Semi-structured interviews. A semi-structured interview (Appendix) was conducted. Eleven standard questions were posed including an open-ended question at the end of the interview (“Do you have anything to add?”) and within the
boundaries of this guide, participants were allowed to freely narrate their story.

Guiding questions in the semi-structured interviews included: describing their pain and its location; asking if their memory of the pain event complete, partial or absent; what did they find most useful in the group intervention; what were the barriers to managing their pain; and what were their valued goals and aspirations after the programme. Interviews took between approximately 40-120 minutes, were taped with consent, and finally transcribed. Participants were interviewed individually by the pain management groups’ psychologist over the final two days of the programme, and again at a follow-up six months after the programme. All the participants completed face to face initial and follow-up interviews apart from one who, because of work commitments, completed the follow-up interview by telephone. Two participants did not return the follow-up outcome measures.

8.2.5 Thematic Analysis

First, a qualitative analysis was employed to explore case studies from the perspective of the patient experience, giving recognition to the participants’ unique histories and social context. The study involved both within case (idiographic) and cross case (idiothetic) analysis (Shaughnessy et al., 2006). Thematic analysis of transcribed interviews was used as proposed by Aronson (1995) to identify themes and subthemes relating to patterns of behaviour and underlying motivating values and beliefs. The analysis was conducted in two ways: firstly, in an exploratory, bottom-up way, looking for emergent themes; secondly, in a top-down way looking for confirmatory or disconfirmatory evidence relating to tentative hypotheses. This dual method was chosen to explore the participants’ individual complexities as well as more common features of their experience. Braun and Clarke (2006) argue that
thematic analysis has the advantage that it is a-theoretical and, therefore, more flexible in application across a range of epistemological approaches.

Participants’ subjective experience of their pain and distress, rather than the researcher’s interpretation of it, was considered most important in this study. The analysis therefore only considered semantic themes: the themes were identified and described with the explicit or surface meaning of the data (rather than “latent” i.e., identifying underlying ideas, assumptions or conceptualisations). Further, the thematic analysis was conducted within a realist/essentialist paradigm. In other words, the reported experience and motivations of the ten participants were interpreted in a straightforward way, on the presumptions that the language they used reflected their meaning and experience. However, as cautioned by Braun and Clarke (2006), themes do not passively “‘emerge’ like Venus on the half shell” (p.80) from an analysis, but the process is always an active one, influenced by the researchers’ thoughts, understanding and selection of the data.

Analysis followed the phases recommended by Braun and Clarke (2006) and began with reading and re-reading the transcripts, so as to become immersed in the content, and rechecking the content against the recordings. Any initial thoughts or ideas were noted down. This was followed by coding each of the interview transcripts line by line looking for data that were relevant to the research question, noting emergent explicit content themes, and searching for associations or relationships within the content that indicated the emergence of higher order themes and thematic categories. Braun and Clarke (2006) caution that “as coding data and generating themes could go on ad infinitum, it is important not to get over-enthusiastic with endless re-coding. It is impossible to provide clear guidelines on when to stop, but when your refinements are not adding anything substantial, stop!”
(p. 92). Following the analysis, a master list of themes was produced along with sub-themes providing more detail for each master theme.

Certain questions were, however, prioritised. Given the study’s purpose of increasing understanding of why multi-disciplinary chronic pain management interventions do not bring about significant improvement for so many people, and the hypothesis that life context would directly impact on behavioural patterns, and ultimately on what pain strategies were selected, the interviewer’s questions and the semi-structured format restricted the participants’ responses and prioritized the following:

**8.2.5.1. Life context.** The participants’ account was obtained of the pain event and stressful antecedents and consequences perceived to be related to the pain event.

**8.2.5.2 Values and behavioural motivators** (“augmenters”, Törneke, 2010). The identification of participants’ valued motivators was guided by ACT theory (Hayes, Wilson, & Strosahl, 1999) namely: relationships (intimate, family, parenting, social), work, community, spirituality, personal growth, health and leisure.

**8.2.5.3 Pain management strategies.** The choice of pain management strategies was explored including the influence of life contexts and valued motivators on the use of these strategies.

**8.2.6 Triangulation of Behavioural Observations and Outcome Measures with Behavioural Themes**

The second part of this study investigated whether group facilitators’ subjective observation of participant behaviours could readily be fitted within this emergent thematic classification and ultimately be triangulated with changes pre- to
post-intervention on the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983), the Impact of Event Scale-Revised (Weiss & Marmar, 1997), Roland-Morris Disability Questionnaire (Roland & Morris, 1983) and a functional walk test (Pankoff et al., 2000).

8.2.7 Identification of Self-Rules

Once the thematic analysis was complete, the current research team sought to identify the participants’ self-rules (Törneke, 2010) arising out of their story of self. No specific guidance or method was found in the literature reviewed upon how to identify self-rules which dictated behaviours. It was decided that the self-rules should be in the form of “I” statements (e.g., “I am disbelieved and always receive poor treatment from doctors and therefore I am counterpliant”) to distinguish them from other individuals or society’s general rules (Törneke, 2010) (as discussed in the Introduction to the current paper).

8.3. Results

Idiographic analysis of the structured interviews for the ten case studies indicated that there were complex life context issues contributing to the participants’ experience of pain and their suffering or resilience. The analysis suggested four resultant attitudinal themes in the context of pain management, labelled here as: Hopeful, Helpless, Hyperaroused, or Holding onto Childhood Issues. Once these themes were recognised, secondary analyses were undertaken to look for confirmatory and disconfirmatory evidence of themes.

The thematic analysis of the ten participants is summarised in Table 1 below.
### Table 1
Themes of Pain Experiences, Strategies, Valued Motivations and Outcomes Pre- and Post-intervention

<table>
<thead>
<tr>
<th>Theme</th>
<th>ID</th>
<th>Pain attribution</th>
<th>Identified stressors</th>
<th>Programme strategies Utilised</th>
<th>Non Programme strategies Utilised</th>
<th>Motivations and values (Augmenters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hopeful</td>
<td>5F46</td>
<td>Work/degeneration</td>
<td>Work</td>
<td>All</td>
<td>-</td>
<td>Work /Spouse/Health</td>
</tr>
<tr>
<td></td>
<td>7F49</td>
<td>Work/degeneration</td>
<td>None</td>
<td>All</td>
<td>-</td>
<td>Spouse /Family/Work/ Community/ Health</td>
</tr>
<tr>
<td></td>
<td>10M28</td>
<td>Work/degeneration</td>
<td>Marital</td>
<td>All but pacing</td>
<td>-</td>
<td>Work/Fiancée</td>
</tr>
<tr>
<td>Helpless:</td>
<td>1M52</td>
<td>Work</td>
<td>Pain only</td>
<td>None</td>
<td>Distraction</td>
<td>Get rid of pain</td>
</tr>
<tr>
<td></td>
<td>6F40</td>
<td>Childbirth/Traumatic</td>
<td>Marital</td>
<td>None</td>
<td>Avoidance</td>
<td>Get rid of pain/?family</td>
</tr>
<tr>
<td>Hyperaroused:</td>
<td>3M64</td>
<td>Degeneration/Traumatic</td>
<td>Pain only</td>
<td>None</td>
<td>Unpaced activity/distraction/biomedical</td>
<td>Community/Spirituality</td>
</tr>
<tr>
<td></td>
<td>9M37</td>
<td>Traumatic accidents</td>
<td>Military/Marital</td>
<td>Exercise</td>
<td>Unpaced activity/distraction/positive thoughts</td>
<td>Work/Spouse/Parenting</td>
</tr>
<tr>
<td>Holding onto Childhood:</td>
<td>2M34</td>
<td>Traumatic accident/infection</td>
<td>Drugs/Family</td>
<td>?Pacing</td>
<td>Unpaced activity/distraction</td>
<td>Work/ Friends/Parenting</td>
</tr>
<tr>
<td></td>
<td>4F27</td>
<td>Disease</td>
<td>Family</td>
<td>Accept/Relax</td>
<td>Seeking support/distraction</td>
<td>Community/Spirituality /Parenting</td>
</tr>
<tr>
<td></td>
<td>8F35</td>
<td>Work/degeneration</td>
<td>Family</td>
<td>None</td>
<td>Biomedical</td>
<td>Get rid of pain/ Parenting</td>
</tr>
</tbody>
</table>
8.3.1 Hopeful Participants (5F46, 7F49, 10M28)

The hopeful behavioural pattern was characterised by an optimistic, confident and forward-looking outlook, despite pain. For example:

“I thoroughly enjoyed the PUMP. I thought it was um, it was very reassuring knowing that I was doing some things that I was already doing. That was part of the plan, you know.” (5F46)

“I think more or less I’ve got a fairly positive attitude towards life and always have had. And, I like trying to keep that. Because you know, if you’re positive yourself it comes out in others as well”. (7F49 at the six-month interview)

“I’ve recommended it (the pain management programme) to a couple of people I know. Um, yeah, as soon as I get my go ahead from CRS (Commonwealth Rehabilitation Service) I will be starting work again and I’m going to start work again without their go ahead anyway!” (10M28)

8.3.1.1 Life context.

8.3.1.1.1 Objective assessments.

Backgrounds. Participant 5F46 (a nurse aide, cleaner) had her pain for a year - less than the other participants. She had remarried (prior to onset of pain), had adult children and felt well supported by her current husband and family.

7F49 was an aged carer, divorced and remarried, with two adult daughters and a stepson. She was well supported by her husband and family and still on good terms with her ex-husband.
Participant 10M28 was a navy seaman (being medically discharged), engaged with no children. He reported some current relationship stress with his fiancée. However, he was focused on improving his relationship.

**Characteristics of pain event.** None of the pain events experienced by these three participants were objectively “traumatic” as they did not sustain nor were threatened with life-threatening injuries (DSM 5; ICD10). Participant 5F46’s back pain occurred in the course of her work as a hospital cleaner. Participant 7F49’s back was attributed to degeneration, aggravated by a history of heavy work as a cleaner. Participant 10M28’s neck and back pain as arose out of arthritis (spondyloarthropathy) and back injuries while in the Australian navy.

**8.3.1.1.2 Subjective experience.**

**Perception of pain event.** Participants 5F45, 7F49 and 10M28 all reported complete memory of their pain events and although highly unpleasant, none subjectively regarded their injuries as serious or life-threatening.

5F46 reported that: “I didn’t want to have to go off work. I didn’t want to have to, you know, compensation, and things like that”.

7F49 also denied her gradual onset pain was in consequence of a traumatic event. When a medical complication occurred, she maintained her optimistic outlook:

“I’ve had a couple of weeks off (work) now because I had a cyst come up and they had to cut it out, so I’ve got a nice big hole (laughter). So it drained. Yeah. They didn’t want to get cross infection, so I wasn’t allowed to work. (laughter) - I had an enforced holiday!”

Participant 10M28 had experienced a number of related pain flare-ups while working. At the post-intervention interview he gave an account of the initial work
injury seven years previously, which occurred while carrying a toolbox down a ladder:

“(Laugh) I actually passed out from the pain. The first time I hurt my back I just turned the wrong way. My back felt like it ‘popped’ and I passed out and I woke up in the back of an ambulance. I spent a week and half in hospital.”

10M28 loosely described as “traumatic” (i.e., stressful) the occasions he was strapped up in a Paraguard (rescue stretcher) for several hours before evacuation by helicopter to a hospital. He stated, however, that he had been more traumatised by his parents arguing when he was a child.

### 8.3.1.2 Valued motivators.

When asked what was important to them in life, hopeful participants all reported a range of motivational factors and clear goals. Health was important to them, and all exercised regularly. Other motivators included relationships – social, partner and family. They regarded any potential stressors as a challenge, rather than a threat or loss.

“I suppose I’m going out a bit more... because my husband wants to go out more (laugh).” (5F46)

“I’m lucky there because my husband having been through something similar, of course he stuffed his back up. Yeah. We bounce off each other.” (7F49)

“If I wanted to stay in my relationship of eight years then I had just sort of to pull myself together a little bit more and ... do more things and be a little bit more normal and spend more time with her, so... It was sort of either do it
or... or say goodbye to my relationship. So that was a pretty big motivational factor for me”. (10M28)

By the six-month interview all three had returned to part-time work and all retained their optimistic focus here. At the six-month interview 5F46 reported that clerical filing tasks she had been given were aggravating her pain. However, she raised it with her supervisor which resulted in her being given different duties:

“I’ve only just started it, so hopefully if I give it a bit of time it’ll be easier on the body.”

(5F46, six-month follow-up)

Participant 7F49 had continued working part-time as an aged carer up until and immediately after the pain programme. She summed up her outlook:

“Um, I like to help other people, you know, and you can’t do that unless you feel positive about yourself. And are proud of yourself for what you’ve achieved”. (7F49, six-month follow-up)

10M28 was actively looking for work even though his naval discharge was not yet complete. By the six-month review, he had started a paced return to work:

“I’m back employed (part-time in the refrigeration industry) and living life again!”

(10M28, six-month follow-up).

8.3.1.3 Pain management strategies.

To accomplish their valued goals, the hopeful participants employed a broad range of the pain management strategies. They all reported that they were “busy”. The optimistic theme was reflected in their flexible approach and openness to adapting demonstrated strategies.
8.3.1.3.1 Exercise and pacing. The hopeful participants acknowledged the benefits of exercise and activity and at least 5F46 and 7F49 (possibly not 10M28) adopted a form of activity pacing.

“… my walking and going to the gym and my exercise regime there and doing now Pilates…Yes, I’m still doing that pacing, the cleaning side of things at home and the gardening.” (5F46)

“Instead of doing about twelve for everything, I did about seven of everything and I found that that I was coping very well with it… Oh, one day I will do the exercises I was given here and then I’ve got a DVD that my daughter got me – with the ball. Which is just gentler exercise, more towards losing… the reduction of weight… So now at home I’ve got my little exercise bike and I’ve got a treadmill. I’ve got my ball! (laugh).” (7F49)

“And exercise really is what I’ve mainly been doing and giving myself projects that will keep my mind off it (pain). I really try and push myself to do other things and keep myself extremely busy.” (10M28)

8.3.1.3.2 Destressing and meditation. The optimistic participants reported that they actively used mindfulness, cognitive defusion and destressing techniques.

“You know er, it’s so true, how our brain thinks and your little voices you know, in the back… Just think, you know, listen to what’s being said and think: ‘Oh gosh that’s rubbish!’ I (when her pain increased) just try to relax and let everything get heavy, and just switch off.” (5F46)
“You can feel the pain starting, and you put yourself into the relaxation mode more quickly... So I find that’s a lot easier, to do the deep breathing and then push it back down, than what I did before, yeah... to be able to deal with them (unpleasant thoughts or feelings) by sitting doing the relaxation and observing the whole.” (7F49 at six-month interview)

“I mainly try and look at anything that is distressing more upon being a pain to someone else. I just sort of think ‘what would they do in this situation?’ Or ‘what would someone else do in this situation?’ - One of my friends or something like that. Put myself into someone else's shoes and ... see what I think my friends would think would be the right thing to do I guess.” (10M28)

8.3.2 Helpless Participants (1M52, 6F40)

This theme was characterised by a pessimistic outlook, psychological inflexibility, a lack of motivators and a focus on pain and distress. There was an absence of hope and an avoidance, reluctance or refusal to try new strategies.

Helplessness and hopelessness are typical of diagnoses of depression (DSM 5) and was evident in both of these participants. The concept of self as intrinsically disabled and helpless was obvious in 1M52’s use of language: “My neck’s basically broken”; “Oh it’s been smashed. It’s um, the whole lots gone”; “I got five crushed discs in my neck. There’s just not much I can do.” At the six-month follow-up interview 1M52 summed up his helplessness:

“It just gets so bad. I sit there and cry and cry and cry”. (1M52)

6F40, like 1M52, felt hopeless and trapped:

“I understand like, this is my life but it’s not going to change”. (6F40)
8.3.2.1 Life context.

8.3.2.1.1 Objective assessments.

Background. Participant 1M52, a former air-conditioner installer, was married with independent adult children. 1M52 was emotionally well supported by his solicitous family and was financially secure. He denied the existence of any life-stressors other than his pain.

Participant 6F40 was married and had two children, an adult son with whom she had lost contact, and a fifteen-year-old (surviving twin). She and her husband were both on disability pensions. In the interviews, 6F40 volunteered little information about her family situation other than she had stress in relation to her adult son and in coping with her husband’s disability in addition to her own.

Characteristics of pain event. 1M52’s could not be described as objectively “traumatic” (although 6F40’s could). 1M52’s chronic headaches and neck pain were precipitated eight years previously while working as an air conditioner installer and using a hydraulic lift when his head hit a concrete beam. His pain was of gradual onset, increasing in intensity over the following twenty-four hours.

6F40 was a former nurse who had lost a twin son in childbirth fifteen years previously. Her anaesthetic had only limited effect, and she remained paralysed but conscious during most of the birth. She had a succession of surgeries subsequent to the birth to correct the medical consequences of the delivery. The event could be objectively classified as a traumatic, and she had symptoms of PTSD although she had not been formally diagnosed.
8.3.2.1.2 Subjective experience.

Perception of pain event. Both 1M52 and 6F40 (apart from when briefly under anaesthetic) reported clear memory of their pain events. Both participants looked back on their pain events with regret and sadness, and in the case of 6F40 with anger. 1M52 denied that his accident was traumatic when it first occurred:

“I had a peaked cap on and I didn’t see the step in the concrete above my head. I was standing very erect. I reversed the machine back and hit the up button and it just crunched me. Ah, shortly afterwards I went to see the site nurse and got some Panadol, went back to work. The next day things must have swelled up because I was um...like electro man. I was jumping and going twitch, twitch because the nerves in here were crunched. I was just going crazy. They thought I’d broken my neck at that stage. The aide from the company took me to hospital, or to the doctors … I just wish it had never happened. Um, I’ve accepted it now.”

1M52 was the only participant who reported post-intervention that his headache pain and spinal pain (which radiated to his arms and hands) was changing and unpredictable in location, which added to his sense of helplessness. Post-programme he stated:

“Because of the nature of my injury, being the nerve in my spine, it moved anyway and right now it is in my left side, but when I started (the programme) it was in my right side”.

6F40 had a vivid recollection of her pain event:

“Um... they (medical staff) panicked and ... the doctor... they whisked me to theatre out, near. They whisked me into theatre. The doctor just did a carotid
artery block to get me knocked out quickly. But it still took them fifteen minutes to get to do it. I recall everything up until the carotid artery block. I remember waking up. Looking at the clock. Looking over seeing my son… Everything! (laugh). Yeah. The two sets of… um… crash teams that came down. The flights back. The ambulance…”

Participant 6F40’s past experiences and anger towards health professionals maintained her pessimism about the utility of demonstrated strategies. She blamed the doctors not only for the death of her twin son, but the subsequent multiple surgeries:

“…to repair all the damage that they did in trying to get my second son… And basically, doctors not knowing what’s wrong with me so they just go ‘oh, we’ll do this and that might make it better’, and it just aggravated it. So basically, I should just have had the initial repair work done and just left it.”

8.3.2.2 Valued motivators. The helpless participants, 1 M52 and 6F40 both identified values important to them. However, these values were not motivating, and their focus remained on pain and misfortune. In the case of 1M52 he was well supported by his family and financially secure and there appeared little real incentive to change his pain behaviours. In referring to their spouses, 1M52 and 6F40 commented:

“We’ve (1M52 and wife) done the yards. If we’d been a young couple…we’d been stuffed. …we are not financially strapped. But we would have been very well off if I hadn’t got worse… My personality deals with things. I always have. But if it was my wife, or something that something happened to her I
imagine I’d be very distressed.” (1M52).

“Even now my husband’s like, yesterday, he said: ‘I want you to go to the GP and have another laparoscopy’. I don’t want a doctor to touch me anymore. The damage is done... there’s too much. ‘Oh no, no, no there’s gotta be something more going on’. He feels more helpless than me. Because he wants me to be the way I used to be.” (6F40)

When 6F40 was specifically asked what motivated her, she reported that she concentrated only on “my basic life’s things” such as “cooking” and “coping” with her husband.

Neither 1M52 nor 6F40 believed that return to work was a possibility. Participant 6F40 was in any event, caring for her husband and fifteen-year-old son. 1M52 joked that he “worked” in his dreams “every night” but rejected the possibility of obtaining real employment:

“Not unless they come up with some new drug that... or something that can fix up my spine. Cos the arms don’t work properly. I’ve tried working for nothing. I’ve got a mate that owns a golf course...”

Participant 1M52 was specifically asked whether there were certain things that were so important to him in life that he felt he would move forward with his pain regardless. He responded that he used to go four-wheel driving in the bush. He was asked why it was important to him:
“It’s what I’ve always done. I’ve always gone bush... We did the centre of Australia in the sixties. I had my first Land Rover when I was eleven (laugh)... I’ve got photos of me driving on Cottesloe Beach when you could.”

However, 1M52 reported that he could no longer drive in the bush “because I have a neck problem if it’s bumpy.” Generally, he now viewed the outdoors as a dangerous place:

“I actually broke my ribs. And that was about probably three years ago now. Um, I was outside and moved something and just fell over... we were out bush, and we got the flying doctor out.”

Similarly, he reported having gone caravanning:

“... gold prospecting. I stayed in the van for two weeks. I couldn’t go out - I was too crook.”

Even standing at a barbeque appeared to 1M52 to be potentially dangerous:

“I did fall over at a barbeque once. Was just standing there at the barbie. And umm... again we (1M52 and wife) were alone and I just fell over. Except this time I didn’t hurt myself.”

8.3.2.3 Pain management strategies. The helpless and pessimistic outlook of 1M52 and 6F40 interfered with their adoption of the demonstrated pain management strategies.

8.3.2.3.1 Exercise and pacing. The participants did not express commitment to the use of formal pacing principles of gradually increasing functioning by balancing activity and rest (Jamieson-Lega et al., 2013):
“Lost the manual that tells you what it’s (pacing) all about. ...um that seems to have fallen by the wayside... I lost it very shortly after (the programme). It wasn’t very long. I was hunting for it everywhere. I can’t understand where it went.”  (1M52, six-month follow-up interview)

6F40 admitted some benefit from general exercise in the programme but did not mention pacing principles.

“Um. The exercise part (in the group programme) has been good - because I’m more flexible.”  (6F40)

8.3.2.3.2 Destressing and meditation. Neither participant 1M52 nor 6F40 reported the demonstrated destressing and meditation techniques to be useful, and it was clear that they did not attempt them on a regular basis:

“Aww... I try and change the pain whether it’s through drugs or TENS (transcutaneous electrical nerve stimulation). Or heat bags. “

Interviewer: “Any other psychological techniques?”

“Aww... just sit down and relaxation. Umm, I do that a fair bit.”

Interviewer: “For example, do you do progressive muscle relaxation?”

“Yup. It’s not always successful when you got a headache and that’s what gets you. You think about relaxing your fingers or something and err the headaches just blinds you.”  (1M52)

“No (strategies were useful). Avoidance probably! Yeah actually that’s right. I probably use avoidance. I try to keep things very nice at home and stuff... I
feel overweight and revolting anyway. Stop making me feel worse (e.g., by using heaviness and destressing)! (laugh).” (6F40)

1M52 and 6F40 were asked if they did anything differently after the programme:

“Um, not really. But I understand it a lot better, which is... doing it differently.” (1M52)

“I don’t know. Because I haven’t really analysed it. I’ve sorta, just at the moment - this last month I’ve just been concentrating on getting here. Doing what I have to. Taking in the information you’ve been giving us. And...being... going home. Processing all of that.” (6F40)

8.3.3 Hyperaroused Participants (3M64, 9M37)

“Hyperaroused” has been defined as a state of high psychological and physiological tension typified by anxiety, exaggerated startle responses, insomnia. (Dorland, 2012). The focus of these participants was on a struggle with pain and with life. Narrowly defined valued goals were relentlessly pursued, even where the consequence was to aggravate pain and distress. Hyperarousal symptoms are typical of both anxiety and PTSD diagnoses (DSM 5; ICD 10).

Both participants had been diagnosed with PTSD. 3M64 became easily agitated, as when asked about his accident and pain and distress:

“I don’t want to come into it... I’ve got post-traumatic stress... look I’m ready to explode ...If I even just dwell on that, I know what’s going to happen. I’ve got to walk out...”
Similarly, at the six-month follow-up when again asked his accident:

“That was, well, I can’t go back, I can’t go back (becoming anxious).

Interviewer: “So that’s memories that is causing that is it?”

“Yep”.

Interviewer: “Okay, we won’t go through any of that stuff.”

“I can’t go back. My memory is shocking.” (3M64)

9M37 reported having difficulty in adjusting to civilian life and remained angry at his perceived abandonment by the army. At the six-month follow-up interview, he was asked about his distress:

“I’ve found out that my anger and a lot of things are all inside a bit, but why is that deeply affecting me so much now when it didn't it didn’t affect me in the beginning so much. It’s getting worse. Maybe I've had a bit of time out from that sort of stuff now and it’s all coming to the fore. Maybe it’s the pressure I'm under at the moment. I don't know. I'm supposed to be seeing a psychologist about to work it out. It’s getting bad. I'm grinding – I had to see the dentist I cracked all my teeth in the middle of the night. I'm sleeping in a separate bed (from wife). I've got to work it out.” (9M37)
8.3.3.1 Life context.

8.3.3.1.1 Objective assessment.

*Background.* Participant 3M64 was in the navy in the 1960’s.

“I was in a supervisory capacity so there was never any physical work”, and when discharged had worked in real estate but had retired by the time of the group programme. He was active in the Church and in community work. He was married to a supportive wife and had adult children.

Participant 9M37 was in the army and was in the process of being medically discharged (on both psychological and medical grounds) and rehabilitated. He was married and had three children under the age of five years.

*Characteristics of pain event.* It was notable that the pain and distress of 3M64 and 9M37 could not objectively be directly attributed to a single traumatic event. 3M64’s low back pain (which sometimes radiated to his legs and feet) was degenerative and of gradual onset, but also related to several motorcycle accidents over the years, and to a serious motor vehicle accident in 1968 when several of his naval comrades had died and when he sustained multiple serious injuries. He also fell down a flight of stairs in about 1962 while in the navy.

Multiple events also contributed to 9M37’s pain including a failed parachute landing; falling from a height through glass while training; carrying a 50kg backpack; poor diet when operational.

8.3.3.1.2 Subjective experience.

*Perception of pain event.* Despite his PTSD diagnosis, 3M64 maintained that his distress, like his pain, had just become worse over the years and was not related to any particular incident or traumatic event. When asked if he
remembered the worst accident (in 1968 when a semi-trailer had collided with an army truck) he stated:

“Well, no because I had two fractures of the skull, eight broken ribs, all the side of the face was... I was unconscious for about ten days... All I remember just getting into the back of an army truck, that’s all. And every second person got killed, so it’s, I can’t remember anything about it.” (3M64)

9M37 also could not attribute his pain or distress to any particular traumatic incident. However, it appeared that subconscious intrusions were more troublesome than his explicit memory:

“So yeah, there were multiple situations where I suppose where any medium person would be, er...Whether it be in the middle of Afghanistan with six guys to support, or I did my knee in on the Afghan border and it took 48 hours to be picked up.”

“... I've had a hell of a lot of dreams, but if I take it back at all to what it’s been, to a situation where things aren't working, weapons aren't working, I'm being followed, positions I can’t get away from.” (9M37)

8.3.3.2 Valued motivators. Both 3M64 and 9M37 both valued and were committed to their wives and family and had good support from their spouses. The influence of their hyperarousal on their struggle with pain and distress, focus on threat, and “push through” outlook, was clear even when discussing their motivations. For example, participant 3M64 commented that he discussed a participant with his supportive wife, and focused on her struggle with pain:
“The young girl (4F27), she was in such agony. You know, we still - the wife and I - talk about her. You know, and, that's where the wife got involved in talking about her house. You know, we felt closer to her.” (3M64)

Similarly, 9M37 had the support of his wife and dedicated to his children, but even here his struggle was obvious. He was vague about any plans they had for the future:

“It’s very hard with three little kids under five. Particularly in this situation I’ve (chuckle) been going through. But we sorta are working that out and... and getting a plan for the future of what we want to do together”. (9M37)

Work, spirituality and service to the community, were important to 3M64 and in pursuit of these he pushed through his pain:

“Well I used to sell houses, new homes, and it was a twenty hour a day job, seven day a week and I my mind was always fully effective of the client… Yeah, you persevered. I went for epidurals, injections.”

“…You see, (sigh) when you at church on Sunday, you don't want to do it you still got to attend it. It's just like giving back to God when he said to Peter 'I want to wash ya feet.’”

“When we were in Thailand, we were involved with the leper people. And even though my back was so bad - to be involved with these people you accept your injury” (3M64, six-month follow-up).

Participant 9M37 was unclear about his future work prospects and had not yet been fully discharged from the army. As well as his family, fitness remained an
important motivating value for him, but also a distraction. When asked how he maintained his intensive fitness regime:

“Just motivation to get back and you know...once again look after the family and, and just start enjoying life a bit more. And look it just feels so good to exercise. And so if I could do it all day every day, that’s what I would be doing (laugh).”

(9M37)

8.3.3.3 Pain management strategies. The hyperarousal of both 3M64 and 9M37 was evident in their narrow selection and use of demonstrated pain management strategies which tended to be unpaced and pushing through pain.

8.3.3.3.1 Exercise and pacing. After the programme 3M64 had a severe flare-up on a trip to Thailand and was asked at the six-month follow-up if he had paced. His response did not include the key pacing concepts (Jamieson-Lega et al., 2013) of measuring activity according to time or count, nor of breaking up his activity into manageable amounts:

“If it’s heavier than a can of tomatoes or whatever I don’t get involved. I just can’t lift it. I won’t, I won’t attempt, I won’t lift anything. Hmmm, yeah. I probably... I had a couple of HIV kids up there which I nursed and... Maybe that was it. I don’t know. But, umm.”

(3M64, six-month follow-up)

9M37 explained that unpaced exercise was his way of relaxing:

“Look I went for a 40km bike ride yesterday, last night, and tried, because I was feeling really down, tried to get really tired to go to sleep. Last night I dreamt...war zones all night again. So, I’ve just got to get up this morning try and smile, try and get on with it ... But look I do a gym day one day and
I’ll do a cardio the next. And I’ll break it up into specific groups I’m really exhausting myself, but it seems to work all right.” (9M37, six-month follow-up).

8.3.3.3.2 Destressing and meditation. Hyperarousal was a barrier to the committed use of mindful meditation which had been abandoned in favour of distraction:

“I’ve tried it (mindfulness) before, um. You know, how do you get rid of pain without medical attention? And I think it’s, you look for relief. It’s like, if I’m standing for any length of time, then I get pain. I’ve got to go and sit. When you sit, you try to take your mind elsewhere. Yeah, that did help a little bit um… We take it (the dog) for long walks. It just seems to be another avenue. I don’t know. As I say, I had to put me mind elsewhere.”

(3M64, six-month follow-up).

“Look I find it hard to meditate. I do. I suppose my meditation is on a push bike. When I’m feeling down or whatever it seems to really help me to a point that I… Look I’ve got three kids and by the time they go to bed at 8:30 they’ve been up since you know… 6 o’clock it’s very hard to, you know… Television probably a medium which you can relax. As long as I’m not watching war pictures or anything like that (laugh), that seems to work well… No, not doing the meditation, no.” (9M37, six-month follow-up)
8.3.4 Holding onto Childhood Issues (2M34, 4F27, 8F35)

Among these participants, the thematic analysis revealed an unexpected focus on memories of child and adolescent experiences. In particular, the analysis revealed a relationship between ruptured childhood relationships with significant others, and the participant’s adult responses to pain and stress.

2M34 had a longstanding sense of injustice towards his school and family members. For example, he reported that he was bullied and unjustly disciplined at school from an early age, He was angry at a teacher who “forced” him to walk on his broken leg on discharge from hospital, attributing this event to the onset of bone infection leading to eventual amputation of the leg. He felt emotionally unsupported by his father (whom he admired and said was a doctor, former SAS, and farmer):

“He always pushes. Dad is always pushing. Dad has no pain. All right? ... He... He called me a “faggot” because I wouldn’t watch my operation. So my last operation I had to have an epidural and watch it... My mental distress was like I was punished.” (2M34, six-month follow-up)

Like 2M34, 4F27’s narrative of the onset of her pain centred around childhood events rather than on the ramifications of her pain. She described her father as physically and mentally abusive, and her mother as passive and ineffectual in protecting her. Her mother had been diagnosed with severe bi-polar and, when 4F27 was 16 years of age, she had on multiple occasions found her mother attempting suicide. When asked about the onset of her pain she referred to her father’s strict, physically abusive and unempathetic treatment of her as a child, even before the onset of her illness. She wondered if her father’s treatment of her had contributed to the onset of her disease:
“He would belt the crap out of me with a belt. And I wouldn't cry. I wouldn't show any fear and that kind of thing- you know what I mean? I won't show that you're hurting me. So my personality didn't go down well with his determination to break me (laugh). So that went on for a few years. And then I became really chronically ill … He left me there to die” (in mental hospital with misdiagnosed anorexia). (4F27)

8F35 also highlighted events from her childhood and allied herself strongly with her parents. She reported that when she was 15 years old her Middle Eastern father had been politically imprisoned during the Iraqi invasion of Kuwait:

“He was taken to prison on a couple of occasions... umm... he is a heart patient and without any supply of medication. I think that this has left a scar in me somehow”

8F35 also made reference to the death of siblings before she was born. Even here she felt her mother’s grief as well as guilt:

“There were twins before me. They died at birth. I remember like my Mum had me just a year after that. I don’t know why - I think it’s my fault. Even though my parents were very, very, very happy with me.” (8F35)

8F35’s childhood sense of deprivation and injustice again came to the fore in the pain management group in her expressed frustration at of her surgeon’s refusal to implant a spinal cord stimulator to help manage her pain until she had attended the pain management programme.
8.3.4.1 Life context.

8.3.4.1.1 Objective assessment.

Background. Participant 2M34 resided and worked on the family farm. He was married with a four-year-old son. He reported both marital and family discord. 4F27 was single, on a disability pension, lived alone and had strong Christian beliefs. Participant 8F35 was married with no children, born and raised in Egypt and had been working in human resources before the onset of pain.

Characteristics of pain event. 2M34 sustained a serious leg injury in motorbike accident at the age of 17 years (he had been drinking “Moonshine” alcohol and was doing “wheelies”). His injured leg subsequently became infected and he had successive surgeries, eventuating in the amputation of the leg three years later. Participant 2M34’s original pain event could be objectively classified as “traumatic.”

4F27 had a gradual onset of gastro-intestinal and back pain from the age of thirteen years caused by the onset of Crohn’s Disease, urethritis, and anaemia. She was originally misdiagnosed at fourteen years as having anorexia nervosa, was involuntarily institutionalised for almost a year until her condition was correctly diagnosed. She reported medical negligence in her subsequent medical treatment which caused further complications. She subsequently had extensive and ongoing medical, psychiatric and psychological input. Under the DSM 5, a life-threatening illness or debilitating medical condition is not necessarily considered a traumatic event unless it is “sudden” or “catastrophic” – which under the DSM 5 arguably excludes the objective classification of the gradual onset of 4F27’s pain experience as “traumatic.”
Participant 8F35 had low back pain, attributable to an underlying degenerative condition precipitated by descending stairs (“fifteen flights”) during a fire drill at work. The onset of pain for 8F35 was not objectively classifiable as “traumatic” in the sense of being life-threatening or a serious injury.

8.3.4.1.2 Subjective experience.

Perception of pain event. All three of the participants reported complete memory of their pain events. When 2M34 was asked if he had a clear memory of the accident, he stated that at first he thought that his leg had just been badly dislocated.

“But the most traumatic actually was when I crawled about half kilometer – I could see the town site. I had four people come to their verandas. And when I begged in the end to just call the cops they wouldn’t do that. I became angry against the community there.” (2M34, six-month follow-up).

4F27 felt abandoned by her parents after her misdiagnosis at age 13 years, and humiliated during her hospital confinement (e.g., by nurses continually watching her, even on the toilet, with the suspicion she was purging). She described herself as 30 kg in weight and looking like a “holocaust victim”: “I was grey. My hair fell out”. Her medical condition (Crohn’s Disease) was only correctly diagnosed when a new treating psychiatrist came to the hospital, and she was immediately discharged.

Participant 8F35 also felt abandoned by her work manager after her flare up of pain at work. She did not believe her onset of pain was “traumatic” but here her manager’s response triggered her sense of injustice, deprivation and cued thoughts of illness and death reflective of her childhood experiences.

“He (the manager) did not accommodate (i.e. make allowance for) my injury even though I did not put forward any Workers Comp because I know how
stingy the company is... And he didn’t appreciate that. He did not answer to my invitations... I gave my notice. He never spoke to me even though I was very close to his mother. Um, I was next to her when she was dying and I went to the funeral, even though I don’t go to funerals, I can’t cope with death.”

When asked if her pain event was “traumatic” 8F35 replied:

“Ye, it did harm my back and this is why I have been crippled since”. (8F35)

8.3.4.2 Valued motivators. Parenting was an important motivator for 2M34, 4F27 and 8F35:

“I do want my son to have the best in life. And go to a good school, become a professional, or the army, or a farmer - but it’s up to him.” (2M34)

“I still actually want to have kids.” (4F27)

“I haven’t had children.” (8F35)

For 2M34, work was also identified as an important motivating value. He still grieved the loss of his childhood dream to become a “grunt” (private) in the army, but took pride in his farm and in the positive feedback of an older man who had complimented him:

“The old Wesfarmer’s agent when I was younger said that the farm and the cattle were never as good as when I was there. I was ‘It’, all right? And, in time you’ll see that again, all right? And I mean that. And he is not a man to

12 8F35 spoke with an accent.
Participant 4F27’s work and community values were influenced by her spiritual beliefs. Her unhappy relationship with her father was again mentioned:

“I think that I really want to do medicine. I want to work for Doctors Sans Frontieres... I’ve been a Christian for about four years and um, I believe in God and I believe that when I pray, um, about something, um, God is hearing and I when I um, prayed about (pause) - I wanted to not hate my Dad.”

(4F27)

8F35 did not reveal any immediate plans to return to work until her pain was resolved although it had been important to her.

8.3.4.3 Pain management strategies. The approach of 2M34, 4F27 and 8F35 towards exercise was reflective of their childhood personas: 2M34 soldiered bravely on; 4F27 was fragile and like 2M34, misunderstood; 3M35 was disparaging of any pain management strategy other than the medical solution which she, like her parents, was being deprived of.

8.3.4.3.1 Exercise and pacing. The following excerpts made it doubtful that any of these participants used pacing principles (balancing time spent on activity and rest) (Jamieson-Lega et al., 2013) although 2M34 and 4F27 professed to do so:

“I can’t focus on anything other than pacing, was the most intelligent, simplest - but wisest... I try and suppress it (i.e., the pain) as such I guess. But not ‘suppress’ it as such, but ‘go through’ it would be better, and then ... just that little bit. But not too far. If it’s too far it’s too much... I juu...sst keep
on plodding... and I can get there (patient, long-suffering intonation) ... I just stop (when he reached his threshold of pain). I don’t tell anyone or do anything, I just stop. It’s none of their business - they can get buggered.”

(2M34, six-month follow-up)

“I know I’m actually too ill to make that (paced exercise) happen at the moment, and that’s quite frustrating... I guess what my doctor and I looked at was maybe doing like a two, a bit of a two-tiered approach to it, so that I have like days that are more active days and days that are more restful days, so I have two different levels, two different types of days.”

(4F27, six-month follow-up)

“Um, (the most useful in the programme was) the exercise and having someone with you to do it. So the discipline. I lack discipline.” (8F35)

8.3.4.3.2 Destressing and meditation. The participants were asked if they found the demonstrated destressing and meditation techniques helpful. Again, the participants’ old strategies dominated over demonstrated strategies:

“I’ve not used the (meditation) CD as such, but I do take within myself, you know. I don’t go off to some (funny voice) ‘woopness or weirdy place’. But I do. It just slows my body down. And relax.” (2M34, six-month follow-up)

“It, it (mindful meditation) helps with the distress. But it doesn’t actually help you (with the pain). It sometimes it makes it worse. But talking to somebody, having somebody here - that will make a huge difference.”

(4F27, six-month follow-up)
When 8F35 asked if any psychological technique had helped her, she bluntly responded: “No”. When she was pressed as to what, if anything, else was useful and she expressed the need for more participant control:

“I identified with some of the groups (members)... their pain and how they managed their lives... So I was hoping that um... there would be more group sessions. And each talk about their pain and how it affected the lifestyle... choose each topic instead of just having a lecture”.

8.3.5 Outcome Measures and Behavioural Observations

The second research question raised at the outset of this mixed method design study was whether the Hopeful, Hyperaroused, Helpless and Holding on childhood themes identified were corroborated firstly, by outcome measures, and secondly by health professionals’ informal behavioural observation within a chronic pain management group setting.
8.3.5.1 Participants’ pre-, post-, and six-month follow-up scores on screening outcome measures

Pre- and post-treatment test scores for the ten case studies on the IES-R are summarised in Table 2. Clinically relevant scores are highlighted in bold font.

Table 2

IES-R*: Comparison Pre- and Post-Intervention and Six-month Follow-up

<table>
<thead>
<tr>
<th>ID**</th>
<th>Pre-Pump</th>
<th>Post – Pump</th>
<th>6 months</th>
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</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5F46</td>
<td>4.63</td>
<td>5.21</td>
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<tr>
<td>7F49</td>
<td>1.38</td>
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<tr>
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<td>8F35</td>
<td>8.67</td>
<td>6.88</td>
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</tr>
</tbody>
</table>

*IES-R: a mean total score of > 6 = moderate to severe distress.

**ID number represents Case Number; Gender; Age

Pre- and post-treatment test scores for Anxiety and Depression on the HADS are set out in Table 3. Clinically relevant scores are highlighted in bold font.
Table 3

*HADS*: Comparison Pre- and Post-intervention and Six-month Follow-up

<table>
<thead>
<tr>
<th>ID**</th>
<th>Subscales</th>
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Hopeful

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Helpless

(6F40 – features of Hyperaroused)

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Hyperaroused:

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<td>Depression</td>
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Holding onto Childhood:

(8F35 – features of Hyperaroused)

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<th>Post – Pump</th>
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<td></td>
<td>Depression</td>
<td>11</td>
<td>15</td>
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* HADs Anxiety & Depression subscales ≥ 11 = moderate, ≥ 16 = severe
**ID number represents Case Number; Gender; Age

Table 4 sets out the pre- and post-treatment test scores for the RMDQ and the walk tests.
Table 4

RMDQ (Patients’ Perceived Disability) and Walk Tests: Comparison Pre- and Post-intervention and Six-month Follow-up

<table>
<thead>
<tr>
<th>ID</th>
<th>Disability</th>
<th>Walk (min)</th>
<th>6MWT (metres)</th>
<th>Pre-PUMP</th>
<th>Post-PUMP</th>
<th>6 months</th>
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<td><strong>Holding onto Childhood</strong>:</td>
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<tr>
<td>2M34</td>
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<td>4F27</td>
<td>21</td>
<td>19</td>
<td>-</td>
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<td>8F35</td>
<td>21</td>
<td>19</td>
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1RMDQ: No cut-off recommendations. Scores range from 0 (no disability) to 24 where 24 (self-perception of severe disability)

2Walk-tests: A 6MWT was unable to be performed for group one and a timed-walk was substituted.

39M37 and 10M28 elected to walk together

4Completed the maximum walk time limit of 20 min

5A recent medical procedure unrelated to pain condition may have reduced his potential performance.

6An acute pain injury prevented walk
8.3.5.2 Hopeful behavioural pattern (5F46, 7F49, 10M28).

8.3.5.2.1 Standardised measures. On PTSD, mood and anxiety measures pre- and post-intervention, three participants, 5F46, 7F49 and 10M28, had positive overall outcomes, which reflected their observed optimistic outlooks (Tables 3 and 4). Pre-intervention, only one of the participants in the Hopeful category fell within a range of clinical concern for anxiety (5F46), and none post-intervention. None of the Hopeful group reported significant PTSD symptoms. On the HADS-Depression subscale (Table 3), only 10M28 fell with the range of clinical concern, (but contrary to his reported symptoms on the HADS it was observed by the facilitators that he presented as cheerful, forward looking and engaged during the sessions and post intervention interview). Post-intervention, all three participants improved on the 6MWT and perceived themselves to be less disabled on the RMDQ (Table 5).

8.3.5.2.1 Behavioural Observations. It was observed by the facilitators that the general behaviours of participants 7F49 and 10M28 reflected their optimistic demeanours. They were cheerful, frequently used humour, and both on occasion defended the programme when other participants made negative comments or voiced scepticism about self-management strategies for their pain. 5F46 was more pragmatic and saw the programme as another step in her rehabilitation, rather than an opportunity for social interaction with the group (sometimes commenting if she perceived other members were wasting time). The participants used a good balance of all the demonstrated pain management strategies and were flexible in their use of strategies they had not previously used.
8.3.5.3 Helpless behavioural pattern (1M52, 6F40).

8.3.5.3.1 Standardised measures. Corresponding to these observed behaviours, at post-intervention participants 1M52 and 6F40 both remained high on the HADS-Depression measure (Table 3) and both reported higher posttraumatic stress scores on the IES-R (Table 2). 1M52 neither improved on his six-minute walk test nor saw himself as particularly less disabled post-intervention (Table 4). Participant 6F40 improved on the walk-test but still perceived herself just as disabled post-intervention (Table 5).

8.3.5.3.2 Behavioural Observations. For participants 1M52 and 6F40 a sense of helplessness is evident in their behaviours in the group sessions. 1M52 had ongoing complaints of frequent pain flare-ups and, despite encouragement and support from the physiotherapist facilitator, had significant fear of movement and exercise. He remained focused on potentially reducing his symptoms with passive strategies rather than by active self-management. Participant 6F40 openly expressed her disbelief in the ability of demonstrated strategies (or any other medical or psychological intervention) to assist her with pain and distress. In this regard, although she was categorised within the Helpless theme, she also displayed some of the behavioural traits of the participants in the Hyperaroused category (e.g., occasional anger while talking about her past medical treatment).

Although both 1M52 and 6F40 were pleasant and polite in the group sessions, they openly stated they did not believe in their own ability to improve their quality of life through the pursuance of valued goals, or in the potential of the demonstrated pain management strategies to help them manage their chronic pain. Their sense of helplessness and hopelessness was reflected in their demeanour in the group, in sharp contrast to the Hopeful participants who, despite their pain were fully
engaged in the group process and were committed to using the demonstrated pain management strategies.

8.3.5.4 Hyperaroused behavioural pattern (3M64, 9M37)

8.3.5.4.1 Standardised measures. Both 3M64 and 9M37 had high scores pre- and post-intervention on both the posttraumatic stress and anxiety scales. None of the participants throughout all the categories reported clinically relevant anxiety or PTSD symptoms at follow-up. Both participants reported depression symptoms and 9M37 fell within the severe range (all the participants within the Helpless and Hyperaroused categories reported depression symptoms) but the participants did not report a sense of helplessness or hopelessness, nor were behaviours associated with this observed by facilitators in the group sessions.

9M37 perceived himself as "disabled" both pre-and post-intervention), even though he improved significantly on a 6MWT (Table 4). 3M64’s pre-intervention walk scores (his group were not administered a 6MWT but he walked the alternative test’s maximum time of twenty minutes allowed both pre- and post-intervention) (Table 4) were confounded by the fact that he had a spinal epidural immediately prior to the group intervention which relieved his pain, and he therefore attained the maximum time allowed on his walk tests pre- and post-intervention (twenty minutes) and scored low on the disability measure. At the six-month review, 3M64 reported a pain flare-up after the group programme and his perceived disability score increased.

8.3.5.4.2 Behavioural Observations. It was observed throughout the group sessions that both participants, although pleasant and socially interactive with other participants, remained physically tense and anxious during the educational sessions. 3M64 and 9M37 were observed to lack an ability to simply relax and it was
observed by the physiotherapist facilitator (and expressed to the psychologist facilitator and in the hospital record) that they frequently overdid their activities and exercise. The post-intervention interviews highlighted that this hyperarousal could not be solely related to the advent of chronic pain, and remained a barrier to applying pacing principles, and in utilising meditation or destressing techniques.

3M64 became claustrophobic on occasion and had to leave the group treatment room for “some air”. 9M37 would sit and stand stiffly (as if on a military parade - feet apart, hands behind back), with little facial expression other than an occasional smile, and spoke in deep clipped tones.

8.3.5.5 Holding onto childhood behavioural pattern (2M34, 4F27, 8F35).

8.3.5.5.1 Standardised measures. The majority (two out of three participants, 4F27 and 8F35) in the Holding onto Childhood category reported depression symptoms. 2M34 reported moderate anxiety but only mild depression pre-intervention (Table 3). His scores were normal post-intervention. The scores of 8F35 for both anxiety and depression on the HADS were within the range of clinical concern (≥11) pre- and post, and both increased further pre- to post-intervention (her HADS Anxiety score = 19, within the severe range). Similarly, 4F27’s scores rose from the normal range to within the range for moderate anxiety (≥ 11) and mild depression (HADS Depression = 10).

8.3.5.5.2 Behavioural Observations. The facilitators were aware of childhood issues for 2M34, 4F27 and 8F35 from a screening assessment before the group programme (Table 1), as well as from occasional comments made by the participants in group sessions. The dearth of standardised instruments relating to
childhood background made reliance on behavioural observation all the more important. However, the relationship of their behaviours to childhood issues was also not obvious from informal observation alone.

It was noted by facilitators that, in the group programme sessions, participant 4F27 vocally emphasized the uniqueness of her medical condition and expressed scepticism that active self-management could assist her with her pain. She demonstrated a high degree of pain behaviour (e.g., using heat packs, walking slowly, grimacing). On occasion she had to be assisted after group sessions to her car. Her follow-up interviews were held at her home as she reported that she was too unwell to travel to the hospital.

Participant 8F35 was vocal in group sessions in her belief that she was unreasonably being deprived of surgery for an internal spinal stimulator implantation to help relieve her pain. She made it clear within the group that she had attended the programme reluctantly. She, like 4F27, remained resistant to the suggestion that self-management strategies could assist with her pain, sometimes upsetting more motivated group members (e.g., 10M28). She was especially vocal in her opposition to the notion that pain could be influenced by anything other than “physical” factors. During the physiotherapy component of the programme, she presented with a high degree of fear of movement.

It was noted by the group facilitators that the participant 2M34 appeared overmedicated and was tangential during nearly all of the programme sessions. His interjections during the sessions, although well intentioned, demonstrated that he did not grasp the concepts. The post-intervention one-on-one interview was terminated early as he was teary, highly anxious and rambling. He explained that an ulcer on his stump had become increasingly painful and, in addition, he reported that the friends
he had been staying with had locked him out. At the six-month follow-up interview, he admitted that, in addition to prescribed medications, he had taken other substances during the programme, and had engaged in a high level of socialising with his friends at night.

8.4 Discussion

As stated in the Introduction to this paper, the authors aimed in the current study to extend previous empirical findings by focussing on the patient experience of pain within their life context. It was argued that it is life experiences and events which gives rise to a story of self (concept of self; Törneke, 2010) along with accompanying self-rules which may be adaptive or maladaptive in respect of applying demonstrated pain and distress management strategies. The current research sought to be translational, applying the findings and thematic classification to a hospital chronic pain programme in a way which could assist health practitioners to better understand patients who did not get optimal benefit from standardised CBT-based pain management group programme. In this way health practitioners could potentially identify and then, on an individual basis, address patient barriers to adopting evidence-based pain and distress management strategies. Confirmatory evidence for the thematic classification was sought in the consideration of the outcomes on the standardised measures (Tables 3,4,5) and facilitators’ behavioural observation of group participants and interviews, and whether they could relatively easily be triangulated within the thematic categories.

8.4.1 Life Contexts, Self-rules, and Pain Management Strategies

8.4.1.1 Hopeful participants. The optimistic participants were not focused on their pain or unpleasant past events, but rather on their everyday activities and future goal. They minimally reflected on their past. They had a varied balance of
values and goals (e.g., returning to work, good relationships) and were confident in their ability to achieve them. Where there was, for example, a return to work stressor (5F46) or a relationship stress (10M28), they approached the problem assertively and used problem solving. They all engaged fully in the programme, used a balanced array of demonstrated pain management strategies (apart from 10M28 where it was not clear from his interview as to whether he used formal activity pacing principles) and were flexible and committed in applying them. Their pre- and post-intervention outcomes on the psychological and functional measures (Tables 2,3,4) were almost all within the mild or normal ranges for anxiety, depression and PTSD symptoms. They all made good improvements on the functional walk test (Table 5).

8.4.1.2 Helpless participants. The entrenched helplessness and hopelessness of 1M52 and 6F40 were a barrier to these participants accepting and adopting active pain strategies – they simply did not seem convinced the strategies would assist them. Their scores on the HADS Depression subscale ($\geq 11$ for both participants) supported the facilitators’ observations of their pessimistic and hopeless view of the world and of their pain prognosis. It was possible that a family dynamic (over-solicitous or medically focused; McCracken, 2005) contributed to the maintenance of behavioural patterns. Participant 6F40’s condition was complicated by her resentment towards doctors whom she blamed for the loss of her child and her unrelenting pain. Both these cases had an inflexible focus on inexorable suffering: 6F40 was cognitively fused (Hayes, Wilson, & Strosahl, 1999) with a traumatic event and 1M52 was fused with his pain. Their sense of helplessness was so entrenched that neither 1M52 nor 6F40 were motivated by their identified values to change their behaviours. They used none of the demonstrated pain strategies, relying only on avoidance of pain and distraction.
8.4.1.3 Hyperaroused participants. Both these participants had high PTSD scores on the IES-R (Table 3) and anxiety and depression on the HADS (Table 4). This comorbidity between posttraumatic stress and depression symptoms is supported by the literature - Flory and Yehuda (2015) estimated about 50% of people with PTSD also have Major Depression Disorder, MDD. More specifically, the hyperaroused patterns of behaviour of both 9M37 and 3M64 seemed related to unresolved autonomic responses (Van Der Kolk & Fisler, 1995) perpetuated by rigid behavioural rules based on their story of self. In the case of 9M37, his story was that of perceived abandonment by the military and his loss of career was more distressing than his pain or the memory of life-threatening events in the military. Nevertheless, he retained his soldier’s mentality of pushing through his pain (e.g., maintaining fitness), contrary to formal pacing principles. He considered himself to be as disabled after the intervention as before, despite an improvement on the walk test. This possibly arose out of a comparison made by him with his previous functional capacity as a serving soldier as compared to his capacity in the group. It was considered by the first author of the current paper (who conducted the post-intervention interviews) clinically inadvisable to explore in-depth the origins of 3M64’s distress in this research setting as high distress was easily triggered. However, he referred to a self-sacrificing schema (Young, Klosko, Weishaar, & Ebooks, 2003) connected to his Christian values, which reinforced his strategy of pushing through his pain rather than pacing. He reported a significant flare-up of pain shortly after the group programme caused by his spinal epidural having less effect, and his unpaced activity (e.g., in helping the community). The hyperarousal of both participants was also reflected in their inability or unwillingness to practice destressing and meditation techniques (although 3M64 used prayer). In summary, the
participants with Hyperaroused patterns of behaviour did not significantly change their approach to pain management after the intervention.

8.4.1.4 Holding onto childhood memories.

For 4F27 and 8F35 their scores on measures for psychological distress (Tables 2,3,4) did not change significantly, perhaps indicative of the fact that their distress was also related to their distal life histories and not just to their pain symptoms. It was likely also that their scores reflected their scepticism of the effectiveness of the material presented in group sessions. The improvement in scores for 2M34 was simply contradictory, given his obvious distress post-intervention (teary, over-medicated, a painful ulcer on his leg stump which prevented his undertaking the walk test). Participant 2M34 was apologetic and keen at the follow-up to make amends for his behaviour in the group. He emphasized that he had found the programme useful. Ostensibly he improved post-intervention (Tables 2,3,4), but given the lack of converging evidence, it seems likely that his scores were influenced by his efforts to please the facilitators (“response bias”, Furnham, 1986).

Even though 8F35’s made an impressive improvement on the 6MWT (200m to 375m improvement over six minutes), her perceived disability (Table 4) did not change. 4F27 (on the alternative to the 6MWT, the twenty-minute walk test undertaken by the second group of participants) managed only a 9-minute walk test where a maximum of 20 minutes was allowed. She required individualized strategies (e.g., her pacing had to be modified by her Family Doctor and one-on-one training in mindfulness). She required individualized strategies (e.g., her pacing had to be modified by her Family Doctor and one-on-one training in mindfulness). Participant 4F27 was the only participant interviewed both post-intervention and at six-month follow-up at her home as she reported to the interviewer that she was too ill and in
too much pain to travel to the hospital for an interview. Participant 8F35 was unavailable to attend the six-month follow-up as she had travelled to her country of origin looking for a medical solution to her pain. Neither participant completed the six-month follow-up questionnaires.

There is, much literature on the vulnerability of the developing brain to abuse and stress (Glaser, 2000; Committee on Child Maltreatment Research et al., 2014). The theme of fractured childhood relationships was particularly obvious here in participants’ feelings of parental abandonment, rejection, or family deprivation. Behavioural responses seemed to reflect attempts to address these unmet childhood needs for approval, attention, or redress of perceived injustices. In turn, this was a barrier to pursuing valued goals or adopting a broader range of pain management strategies. For example, 4F27 clung to a fragile childhood persona, and was resistant to exercise, although prepared to meditate; 2M34 clung to reckless, unpaced, oppositional behaviours, but with a need for approval from authority figures; 8F35 felt that she, like her father during her childhood, was being unjustly deprived of medical intervention and she shared in the misfortune of her mother in losing a previous child. Such childhood experiences gave rise to rigid self-rules aimed at redressing childhood injustices and were accompanied by a suspicion of medical professionals. It is hard to imagine how this would not impact on therapeutic engagement if not addressed.

What was common to all three participants in the Holding onto Childhood category was their “counterpliant” behaviours (Törneke, 2010), namely, an explicit or implicit resistance to the rules (i.e., demonstrated pain strategies) advocated by the hospital facilitators (possibly regarded as authority figures). It was also observed that all three participants had agendas in addition to pain management: 2M34, who was
from the country and staying with friends, was obviously overmedicated (illicit as well as prescribed) in group sessions and was enjoying socialising at nights; 4F27 frequently sought individual attention and displayed overt pain behaviours, emphasizing that she was different from the others in the group; 8F35 made it clear that she was only attending the programme as a compulsory prerequisite to obtaining a medical solution (insertion of a spinal cord stimulator), of which she believed she was being unreasonably deprived. The existence of these general counterpliant behaviours in the group sessions and the participants’ focus being unaligned with the purpose of the pain management group, raised the possibility that there were longstanding childhood schemas (Young, Klosko, Weishaar, & Ebooks, 2003) and self-rules dictating behavioural patterns causing barriers to adoption of the demonstrated pain management strategies. In the case of all three participants, the haphazard or lack of practice of demonstrated pain self-management strategies was dictated by their personal view of the world and themselves. However, 6F40 within the Helpless thematic category (traumatised by what she perceived as the negligent medical treatment while in labour) also demonstrated counterpliance in that she openly expressed disbelief in group sessions at the benefits of active management, despite being presented with research-based evidence.

8.4.2 Subthemes: Self-rules, the Relationship between the Participants’ Life Contexts, Attitudes, Motivations and Behaviour

In summary, the participants who fell within the Hopeful category were primarily future focused, and psychologically flexible. They adopted and benefited from the pain management strategies principles demonstrated to them in the CBT-based group programme, but where necessary were flexible adapting them to their personal needs and circumstances. However the participants who were categorized
into one of the three remaining behavioural categories, namely Hyperaroused, Helpless, and Holding onto childhood, were characterised by non-compliant (Törneke, 2010) behavioural patterns in that they did not adopt a balanced range of demonstrated pain management strategies - even though they well understood the concepts post-intervention. Specifically, pain management behaviours in participants who did not benefit significantly from the CBT-based group treatment were characterised by unpaced activity (Hyperaroused, Holding onto childhood categories) or avoidance (Helpless, Holding onto childhood).

One of the aims of this paper was then to identify the self-rules (Törneke, 2010) which underlie some participants’ persistence with old unhelpful patterns of behaviour over the pain management strategies demonstrated by the group facilitators. Based on the thematic analysis of the narratives, a summary of the participants’ main self-rules as identified by the authors of the current paper is set out in Table 5.
Table 5
Participants’ Self-rules Influencing Appraisals and Behavioural Strategies

<table>
<thead>
<tr>
<th>Theme</th>
<th>ID</th>
<th>Self-rules</th>
<th>Focus</th>
<th>Function of Behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hopeful (Optimistic)</td>
<td>5F46</td>
<td>I can meet challenges (in work, health)</td>
<td>Focus on future challenges or</td>
<td>Broad range of motivating</td>
</tr>
<tr>
<td></td>
<td>7F49</td>
<td>Life is good if I just look for the positive. I believe life is to be lived</td>
<td>opportunities</td>
<td>motivating values. Flexible and</td>
</tr>
<tr>
<td></td>
<td>10M28</td>
<td></td>
<td></td>
<td>assertive in problem solving.</td>
</tr>
<tr>
<td>Helpless (Pessimistic)</td>
<td>1M52</td>
<td>I must avoid activity to avoid pain (and I am able to do this financially</td>
<td>Fused in present with pain distress,</td>
<td>Values were not motivating. No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and with the support of my wife).</td>
<td>and in past loss</td>
<td>activity, passive or passive-</td>
</tr>
<tr>
<td></td>
<td>6F40</td>
<td>Doctors are not to be trusted.</td>
<td></td>
<td>aggressive</td>
</tr>
<tr>
<td>Hyperaroused</td>
<td>3M64</td>
<td>My lot is to suffer and push through when faced with difficulties (self-</td>
<td>Future threat to self-identity</td>
<td>Overactivity to re-obtain old</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sacrifice is part of my being a Christian).</td>
<td></td>
<td>goals. Rigid and inflexible in</td>
</tr>
<tr>
<td></td>
<td>9M37</td>
<td>As a soldier, I must fight through hardships</td>
<td></td>
<td>pain strategies.</td>
</tr>
<tr>
<td>Hanging onto Childhood</td>
<td>2M34</td>
<td>I try to please people, but will act out to obtain attention, particularly</td>
<td>Childhood loss and threat of</td>
<td>Acting out childhood strategies,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of father (because I was undervalued as a child</td>
<td>deprivations repeating themselves in</td>
<td>passive-aggressive</td>
</tr>
<tr>
<td></td>
<td>4F27</td>
<td></td>
<td>adulthood</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8F35</td>
<td>I need to seek individual advice because I am fragile but disbelieved</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(doctors when a child; parents; group facilitators).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is a cure for my pain, but I am needlessly deprived of a medical</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>solution (just like they did to my father when I was a teenager)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.5 Conclusion

The general research question posed at the beginning of this paper was why some participants do not improve significantly after an evidenced based multidisciplinary pain management programme. The implication to be drawn from the findings in this study is that where patients with chronic pain do not benefit from CBT-based interventions, primary psychological treatment may best be directed at breach of issues of trust and relational repair, and only secondarily directed at reinforcing new behavioural approaches and pain management strategies. This calls for a movement away from mechanistic application of CBT-based interventions, towards identifying and addressing such longstanding, underlying issues.

This study indicated (in a way that would have been difficult in a purely quantitative study) that participants’ general Hopeful, Hyperaroused, Helpless, or Holding onto childhood behavioural patterns were difficult to shift and continued post-intervention, influencing the utilisation or non-utilisation of pain management strategies. Without identification of such broad patterns within the context of the whole life experience, clinicians’ understanding of an individual’s pain may become over-focussed on the pain event, and treatment mechanistic. The triangulation of findings supported the heuristic value of the entrenched behavioural patterns and unhelpful self-rules and supports the themes as a useful way for health practitioners to identify barriers to patients who potentially may not benefit from CBT-based pain programme. The post hoc triangulation of outcome measures and behavioural observations with the thematic classification supported the identification of the themes as a useful and heuristic way for health practitioners to identify barriers to patients who do not benefit from CBT-based pain programme and refer them on for more individualised treatment.
8.6 Future Recommendations

It is argued that it may be futile to continue to attempt to address pacing and avoidance in participants who already have a good understanding of the concepts (e.g., post group intervention) but who continue with old patterns of behaviour. Such participants may benefit more from a more person-centred, less didactic approach aimed at building trust and exploring entrenched self-rules than the standardised CBT-group approach which they attended. Subsequent intervention could potentially aim to increase their psychological flexibility by broadening their stories of self, targeting self-rules relating to struggling or pushing through, focusing on pleasant relaxation and destressing strategies, and enhancing their narrow range of motivating values. Further research into a behavioural framework based on the narratives and life contexts of the participants would provide greater insight into the whole person experience of unrelenting pain and distress.

A second recommendation is that clinicians be further trained and encouraged in their use of patient behavioural observation to supplement treatment planning. Health professionals, although routinely aware of the importance of unhelpful patient behaviours (particularly avoidance, overactivity, or “boom and bust” (Karsdorp & Vlaeyen, 2009) behaviour), may be less confident in the utility of their subjective clinical observations over more proven objective outcome measures, particularly where such observations appear to contradict previous psychiatric or medical diagnoses. This study made no attempt to utilise formal behavioural observation instruments and techniques, which potentially could provide greater insight into the participants’ pain experience and coping strategies. However, the disadvantage of such formal behavioural observation may add a further burden on group facilitators and interfere with the group process. Nevertheless, informal
behavioural observation may not be as useful in brief clinical settings, non-hospital settings, or where the sessions are one-on-one, or involve a large number of participants. Further research into the utility of observing patient behaviours and classifying entrenched coping mechanisms and behavioural patterns in different hospital specialities and settings would aid a preliminary understanding of why some patients do not benefit from usual CBT or ACT interventions and ultimately assist treatment.

8.7 Limitations

A limitation in this study arises out of what is also an advantage of thematic analysis methodology (Braun & Clarke, 2008), namely the flexibility of the approach. The methodology can usefully summarize features and offer insights in a complex body of data in a way that more structuralist methods (e.g., quantitative analysis) cannot. However, it also allows for a wide range of subjective interpretations on the data depending on the research questions asked (although guided by theory) and ultimately in identifying underlying themes and classifications. For example, there is a subjectivity in selecting and phrasing the questions for a structured interview, or in identifying participants’ self-rules – it may well be that other researchers may have identified different themes or self-rules using the same thematic analysis approach.

A further potential flaw was that there was no blind evaluation of the data when the participants were classified into their respective thematic categories. The advantage, however, of the facilitators (independently) classifying the participants was that they were familiar with the participants over a period of four weeks (Monday to Friday mornings) in a small group outpatient setting and they were therefore well suited to make the judgement call. Support for the classification was
provided by the triangulation (post hoc) of outcomes and facilitator observed behaviours with the thematic categorisation.

It is possible also that with a greater number of case studies other behavioural themes may have been identified. However, as Braun and Clarke (2006) caution, searching for and generating themes “could go on infinitum” In the current study it was decided that the aim of identifying general behavioural patterns that may act as barriers for some patients in their adopting research-based pain management strategies had been met.

This study was undertaken specifically of hospital outpatients attending a multidisciplinary pain management programme. Caution must be exercised in generalising to a wider population. Patients presenting with chronic pain at a hospital may have different characteristics from other chronic pain patients in the general population or presenting to primary care. For example, certain participants may have had a bias towards purely obtaining legal compensation, and this influenced them to emphasize their adversities rather than joys and motivational goals. In a different context, participants may both present and respond differently, both in relation to their behaviours and in answering the questions on the self-report instruments.

**Conflict of Interest Statement**

The authors have no conflicts of interest to declare. Work undertaken on this study was part of an unfunded PhD studentship at Murdoch University, Perth, Western Australia

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Appendix

Semi-Structured Interview Guide

Pain location
1. Where was your pain located in your body before PUMP?
   - Back
   - Peripheral (all areas apart from back)
   - Both Back and Peripheral

2. Where is the pain located in your body after PUMP?
   - Back
   - Peripheral (all areas apart from back)
   - Both Back and Peripheral
   - No pain

3. (a) Have your pain levels changed in your back after Pump?
   - Increased
   - Reduced
   - The same

   (b) Have your pain levels changed in your Peripheral (all areas except the back) after Pump?
   - Increased
   - Reduced
   - The same

   (c) Have your pain levels changed in both Back and Peripheral areas after Pump?
   - Increased
   - Reduced
   - The same

   * * *

Age
4. If you consider pain and psychological distress separately:
   (a) Do you think your pain would have been easier to accept if you were?
       - Older
       - Younger
       - Age would make no difference
(b). If yes, how do you think Age affected your ability to accept pain?

5. If you consider pain and psychological distress separately:
   (a) Do you think your distressing thoughts, images or feelings would have been easier to accept if you were
      □ Older
      □ Younger
      □ Age would make no difference

(b) If yes, how do you think Age affected your ability to accept psychological distress?

* * *

Pain Event

6. (a) Is a particular traumatic event* or a number of events related to the onset or aggravation of your pain? (If No, go to (d))

(*Defined as “a stressful event or situation (either short- or long-lasting) of an exceptionally threatening nature”; or “experiencing, witnessing, of being confronted with an event or events that involved actual or threatened death or serious injury or a threat to the physical integrity of self or others”)

□ One event
□ Multiple events
□ Not related

(b) If a particular traumatic event or a number of events is related to your pain, is it rated to the onset or to the aggravation of existing pain? (if No, go to (d))

□ Onset
□ Aggravation
□ Both

(c) If there are more than one traumatic event is there one which most affected your pain?

□ Yes
□ No – all the same
□ Don’t know

(d) Briefly, what was the nature of event(s) and when did it/they occur?

(e) If your pain is not related to a traumatic event (e.g. accident or assault) would you describe your first experience of severe pain as so bad that it could be described as traumatic?
   (i.e. At the time you believed it was so severe it involved actual or threatened death or serious injury or a threat to the physical integrity of yourself)
   Describe:

(f) If a traumatic event (s) is not related to your pain, to what do you attribute the cause of your pain?

(g). If the traumatic event/another cause is related to the onset or aggravation of your pain, how is it?
Memory

7. How good is your memory of the pain (traumatic) event causing pain or pain event now after PUMP? (Defined as reasonably remembering all or most of the details immediately preceding and during and after the event) 
   - Complete
   - Partial
   - No memory

(Defined as reasonably remembering all or most of the details of 2 of the following: immediately preceding and during and after the event)

(Defined as reasonably remembering none or completely vague about the details of all of the following: immediately preceding and during and after the event)

8. Do you think that your memory of the traumatic event has changed after PUMP?
   - Better
   - The same
   - Worse

9. If your memory has changed, how was it before PUMP? (See definitions above)
   - Complete?
   - Partial
   - No memory

* * *

Usefulness

10. (a) What did you find to be the most useful component of PUMP OVERALL?
    (b) Least useful?
    (c) What did you find to be the most useful PSYCHOLOGICAL component of PUMP?
    (d) Least useful?
    (e) What, if anything, has changed in relation to your management of pain since PUMP? What do you do differently now?
    (f) How have you managed to maintain any changes? (e.g. family support, de-stressing techniques; reinforcements...)
    (g) What have been the barriers to managing your pain? What coping skills or strategies do you use to overcome these barriers?
    (h) What are your valued goals and aspirations now?

* * *

Open question

11. Is there anything else you would like to add?
References


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### CHAPTER 9

#### Grand Finale

#### Introduction and literature review

**Chapter 1**

*Introduction*

**Chapter 2**

*A comprehensive review of potential predictors (IVs) of psychological distress in the context of chronic pain caused by a traumatic event.*

#### Predictors of distress in chronic pain patients

**Chapter 3, Study 1**

*Outpatients attending a subacute trauma clinic (ISS>15), (early hospital utilization, 3-6 months post-discharge).*

**Chapter 4, Study 2**

*Outpatients attending a chronic pain management program (hospital utilization, pain > 1 year).*

*A quantitative analysis (profiling) of predictors of levels and incidence of posttraumatic stress in chronic pain patients with pain event of traumatic origin (N = 64).*

*A comparison of findings in Studies 1 and 2: Chronic pain trauma (N=64) Subacute pain trauma (N=77)*

**Chapter 5, Study 3**

*Chronic pain trauma (N=64) Chronic pain no trauma (N=88)*

*Compare distress and predictors between chronic pain trauma and chronic pain no trauma groups.*

#### Understanding treatment outcomes for chronic pain patients

**Chapter 6**

*A literature review of program contents and outcomes*

**Chapter 7, Study 4**

*(N=92). The association between traumatic and non-traumatic pain and outcomes after a pain management group intervention are explored.*

**Chapter 8, Study 5**

*Case studies (N= 10) Thematic analysis A practical application of themes in group setting.*

**Chapter 9**

*Final Discussion*
A Review of a Series of Studies on Predicting and Explaining Chronic Pain and Posttraumatic Stress: Structuralist Approaches vs. the Influence of Life Context on Behavioural Patterns in the Maintenance of Pain and Distress

9.1 Introduction

9.1.1 Background

It remains a conundrum why some people with chronic pain, despite evidence of psychological distress, do not significantly benefit from evidence-based Cognitive Behavioural Therapy (CBT) interventions (Morley, Williams, & Hussain, 2008). It has been argued that one complicating factor is pain that arises out of a traumatic event and which gives rise to comorbid PTSD. It has been theorised (Sharp & Harvey, 2001) that comorbid pain and PTSD gives rise to a cycle of pain where pain reminds the individual of the traumatic causal event, and the memory of the traumatic event maintains or even aggravates the pain leading to chronicity of both conditions. Other theories (Asmundson, Coons, Taylor, & Katz, 2002; Keane & Barlow, 2002; Norton & Asmundson, 2003) emphasise a specific vulnerability in some people to comorbid chronic pain and PTSD, due either to an inherent “anxiety sensitivity” or to a predisposition shaped by environmental factors.

A series of five research studies that together form the basis of this PhD dissertation (Knight, Reid, & Davis, 2019b; 2019c; 2019d, 2019e; Knight, Reid, French, & Davis, 2019: manuscripts in preparation) sought to: (i) establish the nature and extent of clinically relevant posttraumatic stress symptoms amongst pain patients, considering factors such as the event characteristics (injury severity, traumatic or non-traumatic injury, time since injury) and client perception of their
pain (memory of event, pain extent); (ii) extend theory about the chronic pain-distress cycle; (iii) provide an evidence base about factors contributing to both traumatic and non-traumatic pain and distress (particularly seeking combinations of factors selected across a broad base) and, (iv) to increase our understanding of these contributing factors by exploring a broader contextual framework. The ultimate goal of this investigation was to better inform assessment, prediction of symptoms and treatment. With these aims in mind, this chapter will collate the results of the studies, and discuss their cumulative findings in relation to the mutual maintenance model (Sharp & Harvey, 2001) and vulnerability models (Asmundson et al., 2002; Keane & Barlow, 2002; Norton & Asmundson, 2003) of comorbid chronic pain and Posttraumatic Stress Disorder (PTSD). A new emergent model will then be considered.

In drawing together the findings from these studies it is important to begin with perhaps the most foundational evidence. It is clear from these studies that, in these hospital outpatients, there were significantly elevated rates of posttraumatic stress in both the subacute and chronic stages of injury recovery. The rates of psychological distress found among outpatients in the studies (Table 1, section 2.4) were also far higher than those in the general Australian population (Australian Bureau of Statistics, 2010). This affirmed the need for further investigation and suggested that disentangling these complex comorbidities may require a multi-study approach and may need to draw upon a range of methodological options to adequately explore both commonalities and individual differences in experience. Further, that a premium needed to be placed on adopting a translational approach to ensure that findings would be applicable to this real-world context and could
realistically inform treatment planning particularly for the significant group for whom gold standard psychological treatment approaches (CBT) are not effective.

9.1.2 A Mixed Methods Translational Approach

The question of why some individuals are vulnerable to comorbid chronic pain and psychological distress was investigated from two perspectives:

(i) From an “expert-driven” mechanistic viewpoint, which sought to ascertain whether the association between persistent psychological distress (posttraumatic stress) and chronic pain can be efficiently predicted by a combination of factors routinely collected in busy hospital settings and based on academic theory and expert consensus in the form of the DSM 5 (American Psychiatric Association, 2013) criteria for PTSD, that is:

a) Event related factors (injury severity; the nature of the event itself);

b) Client perception of pain and trauma (extent of pain; memory of traumatic pain event).

A series of cross-sectional studies considered these analyses in relation to a subacute pain group and chronic pain groups of both traumatic and non-traumatic origin. A further longitudinal study explored pre- and post-intervention and follow-up outcomes of a specific cognitive behavioural programme over a three-month period (Knight, et al., 2019d, manuscript in preparation) with comparisons made between chronic traumatic pain and non-traumatic pain subgroups.

These quantitative studies are described more fully in section 9.2.1 below.

(ii) From the patient’s own perspective. Pain and posttraumatic stress may be understood by a broader qualitative investigation of subjective experiences within contextual frameworks of understanding the world, comprising the individual’s histories and current social environment, which are sometimes only
indirectly or arbitrarily related to pain and trauma (British Psychological Society, 2011; Törneke, 2010).

Evidence in favour of the second perspective emerged in this project in respect of patients for whom traditional medical and CBT-based interventions do not work. It was argued that the vagaries of unresolved pain and distress are best understood not only by psychometric questionnaires, diagnostic categorization or quantitative analysis, but by also exploring emotional responses and patterns of behaviour against the background of the individual’s own account of their unique life-story. The concerns raised in this thesis about an “expert” focus are reflective of concerns expressed by the British Psychological Society (Response to DSM 5, 2011) (British Psychological Society, 2011) namely, that many patients are negatively affected by medicalization of normal responses to life experiences. Problems are identified as located within individuals and health practitioners seek to ascertain what is “wrong” with a patient, rather than acknowledging that:

“… well-being and mental health stem from our frameworks of understanding of the world, frameworks which are themselves the product of experiences and learning through our lives.” (pp 2-3).

The current programme of research was designed to explore posttraumatic stress symptoms in chronic pain patients whose pain was traumatic in origin from these two potentially complementary perspectives and in practical way that translates the academic theory into real world hospital outpatient settings. As stated by Rubio et al. (2010) such “T1 research” seeks to breach “bench to bedside” (p. 4) in a way that leads to improved standards of care. The translational rationale therefore seeks (i) to inform the direction of hospital resources at an early stage to those outpatients most
likely to need them and (ii) to identify ways in which intervention could be personalized to increase chances of success.

This translational goal was pursued through a mixed methods design adopted both between and within studies through (i) the integration of the findings from this series of studies, some qualitative, some quantitative; but also (ii) within study, in the adoption of a mixed method case study approach to investigation of the patient experience of chronic pain and posttraumatic stress (Knight, et al.2019d, 2019e, manuscripts in preparation). Specifically, this latter study undertook triangulation of (a) the themes derived from analysis of participants’ account of their pain (b) pre-and post-intervention psychometric measures of posttraumatic stress and function, and (c) with the physiotherapist facilitator’s independent observations of patients behaviours during the programme (notes accessed after thematic classification). Essentially this cumulative series of clinical case reviews, constituted an idiothetic approach to knowledge development.

McKim (2017) reviewed the value of mixed method research and argued that a mixed method approach integrating both quantitative and qualitative analyses can complement and overcome shortcomings in any one method, and thereby increase validity and give greater confidence in the findings. Ultimately the approach enables a deeper and broader understanding of the phenomenon being researched (McKim citing Hurmerinta-Peltomaki & Nummela, 2006). Despite the value of a mixed method approach, another study (O'Cathain, Murphy, & Nicholl, 2007) investigated the use of mixed methods in the health services and found that only 18% ($N = 119/647$ studies) utilised the approach. In my review of the literature I did not find any studies that adopted a mixed methods approach – this is a unique contribution of the current series of studies, to the pain literature.
In both the longitudinal study following up a pain management programme’s outcome (Knight, et al., 2019d, manuscript in preparation) and the mixed methods study (Knight, et al., 2019e, manuscript in preparation) a facilitator-researcher (the author of this thesis) was present in the pain management groups. This had the advantage of allowing a more direct observation of participant behaviours over the course of four weeks, as well as affording the facilitator-researcher the opportunity to develop a good therapeutic alliance with the participants and thereby obtain their trust in telling their life stories about the context within which they lived with their pain. There was, admittedly, the risk of bias (“response bias”, Furnham, 1986) which perhaps occurred with one of the participants at follow-up in the mixed method study (Knight, et al., 2019e). – but identified when triangulating post-intervention narrative, outcomes on measures, and identified behavioural pattern and contrasting with follow-up self-report outcomes and narrative. There was, however, no evidence such bias was present with the other participants and any potential disadvantages were mitigated by the triangulation measures noted above. In my review of the literature I found no other pain studies that adopted a facilitator-researcher or clinician-researcher framework. This is a unique contribution to the literature and points to the greater potential for research to be undertaken by clinicians in parallel with their routine clinical practice. Importantly this strengthens the translational potential of the findings through clinically sensitive design, data collection, data analysis and interpretation.

A flow chart of the five studies is set out in Figure 1.
Predictors of posttraumatic stress in subacute trauma patients

Study 1
Outpatients attending a subacute trauma clinic (ISS>15), (early hospital utilization, 3-6 months post-discharge).
(N=77).

Predictors of distress in chronic pain patients with pain (i) of traumatic origin and (ii) non-traumatic origin

Study 2
Outpatients attending a chronic pain management program (hospital utilization, pain > 1 year).
A quantitative analysis (profiling) of predictors of levels and incidence of posttraumatic stress in chronic pain patients with pain event of traumatic origin (N = 64).

A comparison of findings in Studies 1 and 2: Chronic pain trauma (N=64)
Subacute pain trauma (N=77)

Study 3
Chronic pain trauma (N=64)
Chronic pain no trauma (N=88)
Compare posttraumatic stress and predictors between chronic pain trauma and chronic pain no trauma groups.

Understanding treatment outcomes for chronic pain patients

Study 4 (N=92). The association between traumatic and non-traumatic pain and outcomes after a pain management group intervention are explored.

Study 5
Case studies (N= 10)
Thematic analysis
A practical application of themes

Figure 1. The series of five studies exploring posttraumatic stress in outpatients with traumatic chronic pain
9.2 Summary of Quantitative Studies on Distress and Predictors of Chronic Pain

The four quantitative studies (Knight et al., 2019b; 2019c; 2019d; Knight et al., 2019: manuscripts in preparation) were undertaken to investigate the association between clinically relevant posttraumatic stress and a selected range of factors. In line with a translational approach, a broad range of potentially predictive factors were selected based on theory and PTSD criteria (DSM 5, American Psychiatric Association, 2013), namely, event characteristics, personal characteristics, and patient experience.

It was found (Knight et al., 2019b, manuscript in preparation) that number of years in pain among patients presenting at a chronic pain programme did not correlate with posttraumatic stress scores, indicating that length of time in pain was not associated with systematic changes (whether an increase, decrease, or no change) in rates of distress. There was support for this finding in the general research literature (Gerrits, van Oppen, van Marwijk, Penninx, & van der Horst, 2014; Harris, Young, Rae, Jalaludin, & Solomon, 2008; Woodruff et al., 2017). Additional insight was gained by comparing a chronic traumatic pain group to a subacute traumatic pain group (Knight et al., 2019b, manuscript in preparation) and to a chronic non-traumatic pain group (Knight et al., 2019c, manuscripts in preparation). Together, these three studies specifically investigated whether event, or patient perception of pain extent and the pain event were associated with pre-intervention rates of posttraumatic stress symptoms between the groups. A fourth longitudinal study (Knight et al., 2019c) investigated whether there were differences in participants attending a chronic pain management group in drop-out rate or outcomes when considering those whose pain was traumatic or who had elevated levels of
posttraumatic stress symptoms, and those whose pain was non-traumatic in origin or did not have clinically relevant levels of posttraumatic stress.

Findings from these four studies are discussed in turn below.

9.2.1 Event-related Factors (Injury Severity and a Traumatic Event)

9.2.1.1 Injury severity and distress. Where chronic pain is accompanied by PTSD, this has been said to be a maintaining or aggravating factor for both conditions (Sharp & Harvey, 2001). Criterion A of the DSM 5 (American Psychiatric Association, 2013) requires actual or threatened death or serious injury for the diagnosis of PTSD. Criterion A of the DSM 5 tightened the definition of a “traumatic event” so that, by itself, chronic pain (e.g., from gradual onset disease, or minor injury) could not be classified as satisfying this criterion:

“A life-threatening illness or debilitating medical condition is not necessarily considered a traumatic event. Medical incidents that qualify as traumatic events involve sudden, catastrophic events” (DSM 5, p. 275).

Despite the emphasis in the DSM 5 on injury severity or life-threatening event as a requirement for PTSD, a review of the literature (chapter two of this thesis) among injured hospital outpatients showed only limited support (Baecher et al., 2018) for the association between severe injury and PTSD at twelve months post-injury. Out of the eleven studies reviewed among injured trauma outpatients, ten indicated no association (Boals, Trost, Rainey, Foreman, & Warren, 2017; Dougall, Ursano, Posluszny, Fullerton, & Baum, 2001; Harris et al., 2008; O'Donnell et al., 2013; Ryb, Dischinger, Read, & Kufera, 2009; Soberg, Bautz-Holter, Roise, & Finset, 2010; van Delft-Schreurs et al., 2017; Woodruff et al., 2017; Zatzick, Jurkovich, Gentilello, Wisner, & Rivara, 2002).
For the current studies, ISS scores were not available in the chronic pain cohort but I had hypothesised that in the subacute trauma group (Knight et al., 2019, manuscript in preparation), participants who had sustained exceptionally severe or critical injury as measured by the Injury Severity Score (ISS $\geq 24$) would report significantly higher rates of clinically relevant posttraumatic stress symptoms than those participants with ISS rated as “major” or “severe” injury severity (ISS 15-23) (Baker, O’Neill, Haddon, & Long, 1974). The findings did not support this hypothesis. Even very severe injury (ISS $\geq 24$, as rated by medical professionals), was not associated with increased risk of posttraumatic stress.

What was of interest was that, in the reviewed literature, two of the studies reporting no association between higher ISS and PTSD three and six months post injury (O’Donnell et al., 2013; Ryb et al., 2009) nevertheless found an association in some patients between higher ISS and delayed PTSD at twelve months (53% and 8% of those who had PTSD). It is postulated therefore that by the chronic stage among the outpatient group, other less dramatic or indirect stressors may give new meaning to the initial serious injury, and more generally to the (objectively assessed) “traumatic event”. This, in turn, can give rise to PTSD-like symptoms which maintain pain. However, in the subacute stage, the more recent traumatic pain event might increase distress but, for most outpatients, this will resolve within a year (Freedman, Brandes, Peri, & Shalev, 1999). I postulate that while serious injury be an important contributing factor in those outpatients with posttraumatic stress symptoms, it must be considered within a broader framework of other influences arising out of the patient’s current circumstances and life history. Health practitioners’ awareness of the broader impact of life content on comorbid pain and
distress is of particular importance within a hospital clinic environment, which tends primarily to have a medical rather than psychological emphasis.

9.2.1.2 Traumatic event and posttraumatic stress. Generally, significant differences in distress were not found between the chronic trauma and non-trauma groups (Knight et al., 2019b; 2019c, manuscripts in preparation), nor differences in drop-out rates or group programme outcomes. However, it was noteworthy that there was a high rate of participants with diffuse pain and complete memory of the pain event as compared to the subacute group. It was argued (study 3) that this could be a consequence of hypervigilance to pain symptoms and of the memory of the pain event being malleable and affected by other life stressors. It was argued that theories of comorbid pain and PTSD could be extended to recognise that memory of even non-traumatic pain events may be aggravated by adverse life events and pain to such an extent that there is a rewriting of the event narrative. It is postulated that even partial or no memory may become a “complete” traumatic memory accompanied by PTSD-like symptoms, though this remains to be tested empirically.

These findings (Knight et al., 2019b; 2019c. manuscripts in preparation) are similar to those of researchers such as Bodkin, Pope, Detke, and Hudson (2006) who found that, in a cohort seeking pharmacological treatment for depression, posttraumatic stress symptoms were equivalent in trauma and no trauma participants. Hence, caution should be exercised in attributing the PTSD syndrome solely to a traumatic event. In respect of comorbid chronic pain and posttraumatic stress symptoms, assessing which condition should be primarily targeted may be further complicated by the overlap between symptoms such as sleeplessness, or hypervigilance. The targeting of these symptoms medically and behaviourally may help relieve both conditions in some patients, however, given the uniqueness of the
pain experience, the symptoms may also be seen as an implication not only of unrelenting pain itself but also of difficulties in adjusting to, or accepting that pain, or inputs from their life experiences (past and present) which may only indirectly be related to the current pain and trauma but still serve to aggravate or maintain symptoms.

In summary, based on the research literature and the findings in the current series of studies, it is cautioned that posttraumatic stress-like symptoms among chronic pain outpatients are not always solely, or primarily, associated with serious injury or a traumatic event – a view which may be relevant to the therapist’s choice of whether to utilise exposure strategies for PTSD memories in chronic pain patients, or some other therapy addressing life histories, contexts and behaviours.

9.2.2. Patient Perception (Extent and location of Pain, Memory of Event)

The extent of pain and of memory of a traumatic pain event are essentially subjective, and their measurement relies on patient self-report. It was argued in our previous studies (Knight et al., 2019b; Knight et al., 2019, manuscripts in preparation) that a pre-existing sensitivity to anxiety, or hypervigilance arising out of stressful experiences or traumatic events, would result in greater attention to pain symptoms (Vlaeyen & Linton, 2000) and in some patients this attention would lead to greater central nervous system sensitization and a report of multiple pain sites (Clauw, Arnold, & McCarberg, 2011).

9.2.2.1 Extent and location of pain. There were surprisingly few studies relating to PTSD in chronic pain extent and pain location among hospital outpatients - only two retrospective studies were identified. One study (Woodruff et al., 2017) found injury to the head and the spine were independently related to higher PTSD and depression scores, and the second study (DeCarvalho, 2010) found also that
patients with a combination both traumatic back and non-back related pain were significantly more likely (77%) to report PTSD. DeCarvalho suggested that one possible explanation for this was a compounding effect of more than one traumatic event. Recourse to general theory indicated that greater distress may not simply be associated with for example, reduced functioning from pain, but may occur where there is hypervigilance to pain symptoms, which can increase central nervous system sensitivity and an increase in pain extent (Clauw et al., 2011; Vlaeyen & Linton, 2000) associated with trauma was related to a greater vulnerability to PTSD. However, it was not clear from the review as to whether spinal pain combined with other pain sites (“diffuse pain”) exacerbates posttraumatic stress symptoms or whether it was the compounded trauma.

The number of studies investigating pain extent or site and psychological were sparse but based on these two studies (Clauw et al., 2011; Vlaeyen & Linton, 2000) it was hypothesised that participants reporting diffuse pain (both back and peripheral) would be more likely to report high posttraumatic stress symptoms than those participants with discrete back pain or peripheral pain. It was, therefore, predicted in both the chronic and subacute stages (Knight et al., 2019b; Knight et al., 2019) that participants with diffuse pain (both back and peripheral) would be more likely to be hyperaroused and to report high PTSD symptoms than those participants with discrete back pain or peripheral pain.

This hypothesis was partially supported by the findings although pain extent did not differentiate between rates of posttraumatic stress at the chronic or subacute stages. Further, it was noted that, overall, the chronic groups reported a higher prevalence of diffuse pain (both spinal and peripheral) perhaps indicating that the most hypervigilant individuals with diffuse pain were likely to present to hospitals as
chronic pain patients. An alternative explanation was simply that a greater number of pain areas (but involving the spine) increased the likelihood of triggering pain and therefore also distress, relative to just one, discrete body site. In terms of clinical implications, clinicians perhaps need to be more cognisant not only of the patient’s major pain complaint (e.g., back) but also of the person’s overall pain condition and acknowledge and treat the whole person along with their pain and associated PTSD symptoms accordingly. This may particularly be relevant in the chronic pain groups who reported significant prevalence of widespread pain, and high rates of distress.

**9.2.2.2 Extent of memory of event.** Memory disruption is a criterion for the diagnosis of PTSD in the DSM 5 (American Psychiatric Association, 2013). Memory disruption can result from traumatic head injury, but also from overwhelming autonomic influences related directly to a traumatic event (Van Der Kolk & Fisler, 1995; Weiss & Marmar, 1997). Some of the initial literature reviewed relating to no memory or partial memory of the traumatic pain event involved outpatients who had been injured and who had mild traumatic brain injury (TBI). Not all of the studies specifically referred to memory but simply explored the association between loss of consciousness and PTSD. However, a mild TBI may involve either loss of consciousness or no loss of consciousness but a state of being dazed, confused or disoriented, perhaps leading to partial memory of the event, which was not distinguished or known in the studies. A protocol for future studies investigating a non-awareness, and both implicit and explicit memory of the event is implicated by these findings – particularly given the studies that found PTSD in patients who had been assessed as fully unconscious.

Eight studies were identified in a review of the literature of outpatients in relation to the association between PTSD and memory of a traumatic event after
injury. Three studies investigated patients assessed as unconscious at admission and during the event (Mayou, Black, & Bryant, 2000; Roitman, Gilad, Ankri, & Shalev, 2013; Ryb et al., 2009). Roitman et al. (2013) found that, at eight months, outpatients who had been unconscious had a higher prevalence of PTSD than those who were conscious. Mayou et al. (2000) and Ryb et al. (2009) found that there were no differences in PTSD (nor anxiety and depression) at one year between those who had been unconscious and those who were conscious.

Some studies focused on outpatients who had been conscious at the time of injury found that no memory of the traumatic event was a protective factor (Gil, Caspi, Ben-Ari, Koren, & Klein, 2005; Glaesser, Neuner, Lutgehetmann, Schmidt, & Elbert, 2004). Bryant et al. (2009) found that mild TBI patients were more likely to develop PTSD than no-TBI patients, after controlling for injury severity. However, Duckworth and Iezzi (2005) found that, at six months post-hospitalization, participants with memory of a traumatic event were significantly more likely to develop PTSD than those without a memory. One older study (Bryant & Harvey, 1999) compared mild TBI (and presumed memory disruption, namely partial or no memory) and non-TBI (conscious) patients and found comparable rates of PTSD symptoms at a six-month follow-up.

The theory on memory and PTSD emphasized neurobiological ramifications of a traumatic event which interfered with memory processing (Rothschild, 2002; Samuelson, 2011; A. B. Van Der Kolk, 1994; B. A. Van Der Kolk & Fisler, 1995). More recent research (Vasterling & Arditte Hall, 2018) has emphasized learning, memory, attention, inhibitory functions, and information processing biases which often accompany PTSD, and which the authors argue reflect potential bi-directional relationships with PTSD. The authors also argued that although mild TBI is
associated with increased risk of PTSD development and maintenance, it does not typically or significantly contribute to sustained neurocognitive deficits in individuals with PTSD. In respect to the current research, the theory provides an indication as to why conscious memory, as well as unprocessed implicit memory caused by the trauma, could result in PTSD symptoms. Explanations as to why unconsciousness and presumably no memory may be associated with PTSD remain unclear.

The literature on partial memory was sparse, but, based on the reviewed research literature and theory it was predicted (Knight et al., 2019b; 2019c; Knight et al., 2019, manuscripts in preparation) that participants with partial memory of their pain event would have significantly higher PTSS than participants with complete memory or no memory. In the subacute group (Knight et al., 2019, manuscript in preparation) there was support for this hypothesis, as partial memory of the traumatic pain event was found to be a significant predictor of distress and, in particular, posttraumatic stress. This association with partial memory and clinically relevant PTSS (Impact of Event Scale, IES-R, >33) (Creamer, Bell, & Failla, 2003; Weiss & Marmar, 1997) was not replicated in the chronic traumatic pain group (Knight et al., 2019b, manuscript in preparation). However, partial memory (cf. complete or no memory) was significantly more prevalent in this group than in the chronic non-traumatic pain group (Knight et al., 2019c, manuscript in preparation), again providing some support for the theory that disrupted memory is implicated in clinically significant rates of PTSS.

A surprising finding was that more participants in the chronic pain groups (both traumatic and non-traumatic) reported complete memory of the pain event than in the subacute group (Knight et al., 2019b; 2019c; Knight et al., 2019, manuscripts
in preparation). It was expected that natural forgetting would have occurred in the chronic groups or that, for some individuals, non-traumatic pain may have been of gradual onset, and most would report partial memory of the pain event. The prevalence of those reporting complete memory provided some new support for the effect of indirect life experiences on memory, leading to memory reconstruction over time. As succinctly summarised by Rubin, Berntsen, and Bohni (2008), there is no direct memory contact (with the event causing pain), only a current memory influenced by the participants’ history and present context. In terms of intervention it is recommended that, although the fallibility of memory could be discussed with some patients, the memory should be accepted at face value rather than disputed which could undermine the therapeutic process.

9.2.3 Differences in Posttraumatic Stress within and between Groups

I also investigated the broader question of whether there were significant differences in the rates of clinically relevant posttraumatic stress symptoms between the chronic traumatic, non-traumatic and subacute pain groups (Knight et al., 2019b; 2019c; Knight et al., 2019, manuscripts in preparation).

Other research reviewed has found a high prevalence of diagnosable PTSD in chronic pain populations - between 23% and 48% (Ahman & Stalnacke, 2008; Andersen, Andersen, Vakkala, & Elklit, 2012; Asmundson, Bonin, Frombach, & Norton, 2000; Soberg et al., 2010). For comparison purposes, in the general population an Australian survey (Australian Bureau of Statistics, 2010) estimated twelve-month prevalence of potentially diagnosable as PTSD at 3.4%.

It was hypothesized in the current study that, compared to the subacute trauma group, the chronic traumatic pain group (Knight et al., 2019c, manuscript in preparation) would have higher rates of posttraumatic stress because of the recency
of the pain event and the greater influence of direct and autonomic influences from which the patient has not had time to recover (Flor, 2012).

A comparison of the rates of clinical distress between the groups is set out in Table 1.

Table 1

*Rates of Distress: Chronic (Trauma, No trauma) and Subacute Pain*

<table>
<thead>
<tr>
<th></th>
<th>% Chronic</th>
<th>% Subacute</th>
<th>General Population*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trauma</td>
<td>No trauma</td>
<td>Trauma</td>
</tr>
<tr>
<td>PTSD^3</td>
<td>40%</td>
<td>32%</td>
<td>36%</td>
</tr>
</tbody>
</table>

*Australian Bureau of Statistics (2010)

The current study found high pre-intervention rates of anxiety, depression and PTSS in all the pain groups but contrary to the hypothesis, rates of clinically significant posttraumatic stress symptoms were not higher in the subacute than the chronic groups (Table 1). Further, between the chronic traumatic pain and the chronic non-traumatic pain groups no significant difference in posttraumatic stress was found (although there was a higher rate of clinically relevant symptoms of posttraumatic stress in the chronic traumatic pain group, this was not statistically significant).

9.3 The Qualitative Study: The Impact of Life-Context

The comparisons undertaken between the traumatic chronic pain group and the chronic non-traumatic pain and the subacute trauma groups (Knight et al., 2019b; 2019c; Knight et al., 2019, manuscripts in preparation) provided some new insight into understanding the impact of a range of factors on chronic pain and
psychological distress. Nevertheless, application of statistical analyses did not explain why, despite intensive interdisciplinary interventions, some participants still remained vulnerable to persistent pain and distress while others with similar conditions were resilient and managed their pain well. This complexity of pain has been referred to by previous researchers such as Melzack and Katz (2013):

“Pain is a personal, subjective experience influenced by cultural learning, the meaning of the situation, attention, and other psychological variables” (p.1).

It was concluded that mechanistic quantitative analysis could only provide a broad overview of such complexity, and that mixed method analyses incorporating in-depth case studies could usefully supplement the understanding of pain and distress by investigating the private and unique pain experiences of those individuals who, despite intensive interdisciplinary intervention, continued to suffer and to engage in limited pain management strategies.

This programme of research sought to expand on the previous quantitative studies by undertaking an in-depth exploration of the life-contexts of ten selected patients with chronic pain from two successive chronic pain management groups in which the individuals’ unique pain and distress experience was explored. The thematic analysis of interview data highlighted the multiple indirect inputs, particularly relating to family and work relationship stressors (a sense of not being supported by significant others), that impacted on participants’ view of the world and influenced their general behavioural responses – some of which were unhelpful in managing chronic pain and distress. This qualitative study supported previous quantitative findings by the authors of this paper, namely that event-related factors alone did not directly account for clinically relevant psychological distress (Knight et al., 2019b; 2019c, manuscripts in preparation). The thematic analysis (Knight et al.,
2019e, manuscript in preparation) indicated that, where pain arose out of a traumatic event, some participants’ accounts indicated that it was an ongoing sense of not being supported or of unfairness rather than the event itself that aggravated their distress and maintained unhelpful behaviours.

It was argued in the thematic case study (Knight et al., 2019e) that, just as persistent pain and distress can become “hard-wired” (Flor, 2012), a patient’s life experience becomes fused into a “story of self” (Törneke, 2010). As discussed in the qualitative research (Knight et al., 2019e, manuscript in preparation) such a story may be that of, for example, the abandoned soldier, the fragile little girl or, simply, “I’m disabled”. This entrenched sense of identity and associated valued motivators and behavioural patterns is maintained by an accompanying use of powerful “self-rules” (explicit or implicit), which can override understanding and logic. Where the patient’s life context has been stressful, particularly where it has involved fractured relationships with significant others, old behavioural patterns designated ‘hyperaroused, helpless and holding onto childhood’ can surface (Knight et al., 2019e, manuscript in preparation). These can affect the adoption and use of demonstrated pain management strategies.

It was, therefore, argued that the key to understanding chronic pain lies in identifying these general behavioural patterns, as these behaviours may be regarded as an observer “window” into the influence of complex life contexts on pain and distress (Törneke, 2010). It is not surprising that mechanistic methods involving quantitative analyses, clinical diagnoses, and standard CBT-based interventions are not universally effective (McCracken & Turk, 2002) given there are idiosyncratic implicit and subtle driving forces which are unacknowledged by this approach. CBT-based interventions require that patients engage in significant practice of evidence-
based pain management skills outside the group intervention sessions and, in order to be successful, they require significant effort and motivation from the patient (Jensen, Nielson, & Kerns, 2003) - both of which can be lacking in patients with entrenched behavioural self-rules. It was argued that a heuristic way of identifying behavioural patterns within busy hospital settings would provide clinicians with an aid to better understand their patients’ unique pain experiences and to target and transform unhelpful self-rules and behaviours that maintain or aggravate pain and distress. The mixed method study reported in this thesis (Knight et al., 2019e, manuscript in preparation) demonstrated in a practical way that behavioural observation by facilitators combined with consideration of programme evaluation measures, enabled facilitators to easily categorise group members’ behaviours into hopeful, helpless, hyperaroused and holding onto childhood themes. This provided insight for group facilitators into the ramifications of historical and contextual influences potentially expediting or impeding the adoption of a balanced range of demonstrated CBT-based strategies.

**9.4 Contribution to Understanding Chronic Pain and Distress**

This series of studies added to our collective understanding of chronic pain and psychological distress in a number of crucial areas:

**9.4.1 In Some Outpatients, Chronic Pain and PTSD Models may Overemphasize a Single Traumatic Event**

DSM 5 (American Psychiatric Association, 2013) diagnosis of PTSD and theories of comorbid chronic pain and PTSD (Asmundson et al., 2002; Sharp & Harvey, 2001) rely on the underlying assumption that there is a special effect caused by a traumatic event in precipitating distress, resulting in the stress condition “PTSD” which then can maintain or aggravate pain. This series of studies suggests
that, at a subacute stage (Knight et al., 2019, manuscripts in preparation), the existence of a traumatic event was likely to have relevance to posttraumatic stress symptoms in that it may directly give rise to an autonomic distress response. The DSM 5 (American Psychiatric Association, 2013) limits a diagnosis of Acute Stress Disorder to lasting only between three days and one month, however, it is argued that this autonomic response may last longer (particularly when comorbid with pain), as other research indicates a broader time frame, specifically, that most patients recover within a year (Freedman et al., 1999; Zatzick, Kang, et al., 2002).

It is also suggested that, in the case of outpatients with chronic pain and PTSD who do not recover within a year, there is added guidance for the treating clinicians to be found in the case studies (Knight et al., 2019e, manuscript in preparation). Specifically, it was clear from detailed case studies that the participants’ stress symptoms did not arise primarily out of the traumatic pain event - although it could serve as a trigger or focal point for previous stressful life experiences. It was concluded that indirect stressors including unrelenting pain set against a background of a stressful life context (McEwen, 1998) may be “traumatic” in itself.

Even in the case of participants with traumatic pain, the subtheme emerged of participants feeling betrayed or unsupported by significant others in their pain and distress (Knight et al., 2019d, manuscript in preparation). The DSM 5 (American Psychiatric Association, 2013) alludes to this possibility when it makes the distinction between events that are traumatic and those that are chronically stressful but not traumatic, in which case it argues Adjustment Disorder (AD), is the more appropriate diagnosis. We argue that such a distinction calls upon health practitioners to use subjective judgment in what constitutes a “traumatic” versus
simply “stressful” event, and this again falls into “mind-body dualism” in which a single cause is sought out - as if it were a virus, or defective motor vehicle part (Bach & Moran, 2008). It is argued that, instead, a whole person pain and distress experience should be explored (at least in those patients who do not respond to standard medial and CBT-based hospital treatments). The distinction (assessed by health practitioners) between traumatic (PTSD) or non-traumatic pain (AD) is therefore not always helpful, particularly if a diagnosis dependent on finding a cause, directs treatment (e.g., exposure therapy for PTSD, cognitive therapy for AD).

9.4.2 Reconstructed Memory Maintaining Chronic Pain and Distress

Although it is argued that the existence of a traumatic event alone is overemphasized in respect of the persistence of understanding pain and distress, it is acknowledged that memory disruption (Van Der Kolk & Fisler, 1995) including partial memory following a traumatic pain event may still be relevant to posttraumatic stress symptoms. However, a surprising finding was the prevalence of participants in a chronic pain stage reporting complete memory (immediately before, during, and after the pain event) as compared to those at the subacute stage (Knight et al., 2019, manuscript in preparation). It is conjectured that, for at least some patients, there will be other indirect and unrelated influences and stressors resulting in a reconstruction of memory (even in those who were unconscious at the time of a pain event), which may either help resolve the distress, or give rise to an unhelpful “story” that maintains pain and distress symptoms. Again, this contention will have relevance to our understanding, assessment and treatment of patients with chronic pain.
It is informative to revisit explanatory theories and models of chronic pain (not necessarily those specific to comorbid chronic pain and PTSD\textsuperscript{13}) that capture the complexity of the pain experience. Flor (2012) proposed that chronic pain may be explained by learning and memory-related plastic (mouldable) changes of the central nervous system, accompanied by maladaptive changes in body perception. Such learning can include both implicit and explicit memory (as can memory related to PTSD; Rothschild, 2000). Flor argues that because the implicit memory process is non-conscious it may be more difficult to treat and stressful events (e.g., a flare-up of pain) can act as an unconditioned stimulus and can reactivate an extinguished memory. It is speculated here that the finding of a prevalence of complete memory of a pain event in the chronic groups (but not in the subacute) may be the result of such “reactivations” of memory, perhaps caused not only by pain flare-ups but also by other stressful events or memories. We further propose that where an individual has a life context of negative events and stressors this process may result in memory becoming unhelpfully reconstructed, and a negative narrative emerging, even of a non-traumatic pain event which merges into PTSD-like symptoms which maintain or even aggravate pain (Sharp & Harvey, 2000).

\textbf{9.4.3 Themes: Hopeful, Helpless, Hyperaroused and Holding onto Childhood Issues}

It is recognised that one difficulty in busy hospital environments where economic concerns are becoming increasingly dominant, is that “expert” driven, formulistic decision making and analysis (as compared to patient-centred care) is time efficient. However, this series of studies (Knight et al., 2019e, manuscript in

\textsuperscript{13} Referred to in chapter 1, section 3.2 of this thesis
preparation) offered a method for efficiently identifying and conceptualising behavioural patterns shaped by life contexts. This supplements existing outcome measures and diagnoses, and so answers the call of the British Psychological Society (British Psychological Society, 2011) for a framework to complement current mechanistic models pathologising the patient. As stated above, a mixed method investigation corroborated patient-derived themes through triangulation with informal facilitator observation of behaviours and psychometric outcomes.

9.5 The Theories and Models of Pain and Distress Revisited

While undoubtedly providing great insight into comorbid pain and psychological distress, it is argued that the current theories of comorbid pain and psychological distress (Asmundson et al., 2002; Flor, 2012; Melzack & Katz, 2013; Sharp & Harvey, 2001) still ultimately revert to a structuralist, mechanistic model (e.g., the existence of a genetic predisposition, and the presence of an objectively determinable traumatic event). As argued by Bach and Moran (2008), objectively determined causes of psychological distress (and pain) are referred to as if they were viruses, or mechanical problems which, once identified, could potentially enable the patients’ distress and pain to be “fixed”. As Bach and Moran (2008) stated in relation to the DSM, it “pathologises” mental health and is used to:

“…diagnose clients as if they have a particular disorder, as if it were a formal, internal or inherent quality of the person, that is, a form of pathology rather than a pattern of behaviour” (page 39).

The pitfalls of mechanistic diagnosis and treatment are becoming are becoming increasingly well recognised by health professionals. As stated by Iudici, Faccio, Castelnuovo, & Turchi, 2019 in regard to the use of diagnoses:
“When we assimilate clinical practice and diagnosis, we implicitly accept a vision of the individual based on the deficit as a deviation from normality. On the other hand, taking into account the specificity, uniqueness, and complexity of the patient means adopting a diagnostic and therapeutic process tailored to the needs of the person and not on the pathology within which the person is often framed (Carli, 2008; Faccio et al., 2016a,b; Iudici & Gagliardo Corsi, 2017; Iudici et al., in press).” (page 4)

As stated by Iudici et al., diagnosis should not be a mechanistic action but a diagnostic process entailing “a broad and varied complexity”. Similarly, the use of the thematic behavioural classification (Knight et al., 2019e, manuscript in preparation) should be seen as part of a “process” and not be mechanistically applied. They may be regarded as heuristics which are of particular use in identifying behavioural patterns in outpatients who do not benefit from standard group treatments and can point the way to life context factors which act as barriers to the adoption of helpful pain management strategies.

It is argued in the current paper that a knowledge of current theories, while still of utility in assessing and treating patients – even to the majority, are so broad that they are simply not tailored to or able to take account of those patients with chronic pain who do not respond to mainstream multidisciplinary interventions. For example, current theories do not specify the respective weights of bio, psycho, and social factors. In short, current theories and models (as well as mechanical applications of diagnoses) rely too heavily on “expert” driven assumptions made about the relationship between two unobservable and subjective phenomena, namely psychological distress and pain.
Specifically, we argue that the use, in current theories, of comorbid mental health categories such as “anxiety” or “depression” is of limited utility in predicting and understanding the association between pain and psychological distress, given the overlap between the symptoms of chronic pain and diagnostic categories and the fact that their relationship may be circuitous (e.g., pain causes distress, distress causes pain), or linear (e.g., nociception causes pain causes distress) (Loeser, 1982). It is simply not surprising that anxiety or depression predicts or is associated with PTSD in individuals with chronic pain and, in many cases, it is impracticable or impossible to ascertain whether the depression or the anxiety was pre-existing, learnt, genetic (a “sensitivity”), or occurred in response to other life experiences.

9.6 A New Model incorporating the Impact of Life Context on Vulnerability to Chronic Pain and Psychological Distress

The thematic analysis of in-depth case studies (Knight et al., 2019e) suggests that for many patients who do not respond to standard CBT-based interdisciplinary intervention, exploring the patients’ life history and their current social context is critically informative to clinicians. It is argued that for patients with chronic pain who remain unresponsive to evidence based interdisciplinary interventions, it is often the patient’s life history and current context which determines their story of self (their perception of themselves), their feelings and emotions, and their general behavioural patterns. The story of self also impacts on, and is influenced by, explicit and implicit memories of life events (e.g., a partial memory may become complete or reconstructed over time (Knight et al., 2019, manuscript in preparation; McBeth, Morris, Benjamin, Silman, & Macfarlane, 2001).

Age and gender are examples of objectively determinable patient characteristics which can impact on the patient’s life experiences. Age and gender
interact with significant others in the social context and can influence both other individuals’ and the patient’s responses towards each other (Törneke, 2010). Significant others therefore may respond differently to pain in younger individuals, or in females than they would to it in older individuals or males. Individuals may also respond or behave differently to their pain according to their beliefs on what is “normal” or socially acceptable for their age group or gender. It is argued that such patient characteristics are not in themselves directly associated with vulnerability to chronic pain and a traumatic event but may play an indirect role via the patient’s perception of self, their feelings and emotions and associated behavioural patterns which then determine or influence responses to pain and trauma. For example, in the subacute trauma group (Knight et al., 2019, manuscript in preparation) the 15- to 32-year-old cohort was significantly more distressed over the relatively recent traumatic pain event (three months previously) than an over-48 years group, but this was not found in the comparison chronic pain group.

I therefore propose (Figure 2) a Person-centred Contextualised Pain Model (PCPM) model which emphasizes the effect of life context in the maintenance or aggravation of pain and distress, rather than emphasising the “trigger” for distress, namely, a traumatic pain event. Perception of life experiences and social context may be based not only on conscious memories but influenced by implicit associations which are not even understood by the patients themselves. Patient self-report of life experiences (usually in the form of questionnaires or responses in face-to-face interviews) may therefore not always be accurate or reliable although it often forms the core of mental health practitioners’ assessments. Further, full assessments by clinicians of such patients in busy hospital environments may be complex and time-consuming. It is argued here that in addition to self-report and the utilization of
psychometric instruments, observable patient behavioural patterns provide an accessible and objective “window” into the impact of an individual’s unique life history on a patient’s story of self and associated self-rules (Törneke, 2010) and which, in turn, assist or impede pain and distress management. Specifically, behavioural patterns of Hopefulness, Helplessness, Hyperarousal, and Holding onto childhood were found to influence the selection or non-selection of pain management strategies. Where, despite intensive multidisciplinary intervention, patients persist with unhelpful entrenched behavioural patterns, this will act as a barrier to increasing physical functioning, maintain pain and potentiate chronic psychological distress. The risk for patients who do not improve psychologically or functionally after intensive multidisciplinary intervention is that this lack of progress may further reinforce their distress, and to cope they maintain their old behavioural strategies. The preliminary assessment of entrenched beliefs and behavioural patterns would assist the clinician in having the patient understand the origin and function of their unhelpful behavioural patterns that ultimately hinder their adoption and implementation of helpful pain self-management strategies.
Figure 2. Person-centred Contextualised Pain Model (PCPM): Chronic pain event, responses of the whole person, and pain management self-strategies within life context.
9.7 Conclusion

The series of studies was concerned with the question of why some hospital outpatients with traumatic chronic pain and PTSD (and associated anxiety and depression) do not improve despite intensive multidisciplinary, and evidence-based hospital intervention. As a starting point, guidance was sought in theory relating to comorbid chronic pain and PTSD, the DSM 5 criteria for PTSD, and in the research literature that would allow us to identify the characteristics of these vulnerable participants. Quantitative analysis compared a combination of carefully selected variables (event related, subjective patient report) in and between a chronic traumatic pain group, a chronic non-traumatic pain cohort (Knight et al., 2019b, manuscript in preparation) and a subacute trauma group (Knight et al., 2019, manuscript in preparation). This comparison offered limited insight. The analysis showed that in a subacute group with traumatic pain, but not in the chronic groups, there was an association between extent of pain and memory of the pain event and vulnerability to posttraumatic stress symptoms (which has limited and inconsistent support throughout the reviewed literature). The factors (even in combination) were not predictive of the rates of posttraumatic stress in either of the chronic pain groups, or in the subacute phase. It was therefore concluded\(^\text{14}\) that posttraumatic stress in subacute (three months post discharge) trauma patients is directly associated with autonomic arousal arising out the precipitating traumatic event three months previously.

It was concluded from the lack of findings in the chronic pain groups (Knight, Reid & Davis, 2019a, 2019b, 2019c; Knight et al, 2019: manuscripts in preparation) that there is a complexity in the environmental and social influences on

\(^{14}\) A postulated in chapter 1 of this thesis
chronic pain which makes it unlikely that vulnerable patients can be mechanistically
developed pre-intervention in studies using a set of even theory based predictors
available in outpatient settings. The pain experience and distress in those individuals
presenting as outpatients in a chronic pain stage was simply more complex and
unique to the individual than in a subacute setting three months after a trauma. The
research literature supports this view of pain as being complex and indicates that
chronic pain generally is an individual multifaceted experience influenced by many
diverse life contexts, stressors and behaviours (e.g., Melzack, 2001; McEwen, 1998).

Nevertheless, comparisons between the chronic groups and the subacute
group (Knight, Reid & Davis, 2019, manuscript in preparation) highlighted
differences in rates of clinically relevant posttraumatic stress between the groups,
and diffuse pain and complete memory in the chronic groups as indicators of
contributors to clinically relevant posttraumatic stress symptoms. The nature of the
pain event (traumatic or non-traumatic) was not clearly associated with posttraumatic
stress, although more participants with traumatic pain were likely to have partial
memory of the pain event. However, the authors of these papers recognised the
limitations of this quantitative approach and have answered the call from the British
Psychological Society (2011) to better understand wellbeing and mental health
within the context of life-experiences and learning in a mixed method qualitative
case study (Knight et al., 2019e, manuscript in preparation). Together, these studies
(Knight et al., 2019b; 2019c; 2019d, 2019e; Knight et al., 2019, manuscripts in
preparation) highlight the significance of not only direct but also a myriad of indirect
and sometimes remote influences impacting on pain, distress and patterns of
behaviours. Pain experiences may be best glimpsed through patients’ own accounts
of their whole life context, but implicit influences by observing their behavioural patterns.

It is emphasized here that such an individualist investigation may not be necessary for most patients with chronic pain and be prohibitive in busy hospitals in terms of cost and time efficacy. Initial attendance at evidence-based CBT groups may therefore be the general rule. For those, however, who do not benefit from such programme a more individualised approach is necessary, where the priority should be to address unresolved and sometimes historical life issues and social contexts, which have shaped both implicit explicit self-rules and behavioural patterns.

General Dwight “Ike” Eisenhower\textsuperscript{15} (Eisenhower, 2013), when discussing the resilience of American troops in World War II made the following comment, which may at least partly apply to chronic pain patients for whom traditional health interventions have had little effect:

“The capacity of soldiers for absorbing punishment and enduring privations is almost inexhaustible so long as they believe they are getting a square deal, that their commanders are looking out for them, and that their own accomplishments are understood and appreciated”. (p. 315)

It is suggested that General Eisenhower’s comment is equally applicable to chronic pain patients who remain unresponsive to standard multidisciplinary interventions. Past experiences of such patients may have shaped a story of self (Törneke, 2010) leading to behavioural patterns reflecting that they were not getting a “square deal”, or that significant others were not “looking out for them”, or that their accomplishments were not “understood and appreciated”.

\textsuperscript{15}Five star general, Supreme Commander of the Allied Forces in Europe during World War II, and United States president (1953-1961)
9.8 Clinical Translation and Recommendations

The translational rationale behind this series of studies was (i) to inform the direction of hospital resources at an early stage to those outpatients most likely to need them; and (ii) to identify ways in which intervention could be personalized to increase chances of success. This translational commitment was reflected in design and measurement choices as well as in the selection of variables to study. Pursuant to this rationale and following on from the findings in this series of studies, a number of recommendations are made:

9.8.1 Clinical Recommendations

(i) There is overwhelming evidence in this thesis that assessing psychological distress in some detail is critical when working with chronic pain patients as high rates of clinically relevant posttraumatic stress symptoms were of concern in all groups;

(ii) ISS should not be used in clinical decision making about allocation of therapeutic resources as it has no predictive power in understanding psychological distress or treatment outcomes;

(iii) Clinical interview should be a priority during assessment to provide an opportunity to glean relevant personal history that may influence how an individual patient is likely to respond to their pain;

(iv) Interdisciplinary assessment is key to understanding the whole person – for example, understanding physical activity/functional recovery provided a different lens than measures of psychological distress – these were complementary aspects of understanding client need;

(v) It is clear that there is a need for different therapeutic approaches to address the differing needs of what appeared to be homogeneous groups, but which
turned out to include quite distinctive and unique individuals;

(vi) Asking clients what elements of the therapy they found helpful in assisting them to improve both emotionally and functionally is important in understanding salience and relevance. Their responses may differ from what clinicians feel is important.

In sum, there are significant clinical implications resulting from this series of studies that can be confidently applied due to the consideration of ‘real world’ needs from the beginning of the research process through to the end. Maintaining an unbroken translational chain from conceptualization to analysis strengthens our confidence in making recommendations based on the findings.

9.8.2 Methodological Recommendations for Future Research

Research recommendations are similarly important outcomes from a translational study. Key recommendations are as follows:

(i) This series of studies highlighted the potential for non-traditional methodologies to make a unique and complementary contribution to understanding complex and intractable problems. It is recommended that future research further explore the potential for triangulation of data within a mixed methods design and that this goes beyond the quantitative and qualitative distinction, to consider the potential value of participant-researcher methodologies and priority for translation-ready methodologies

(ii) Working with a comparable set of groups across this series of studies minimized confounds (unexplained variance) inherent when samples are from different regions or different health systems. Similarly, gathering rich, multi-measure data from each participant balances some of the
limitations of cross-sectional studies and is more closely aligned with our clinical case practice.

(iii) Clinicians should be encouraged to be involved in research. The clinicians’ lens has added significantly to these studies through asking clinically relevant questions, selecting clinically relevant measures and designing methodologies that are ‘real world’, thereby producing results that are likely to be translatable to clinical practice. The involvement of clinicians also facilitates the conduct of research at the ‘coal face’ of therapeutic service provision rather than in a laboratory or research setting. Gathering data from a context that is embedded in real world practice, and at the point of service, is likely to more accurately reflect the experience of patients within this context.

(iv) The juxtaposition of cross-sectional and longitudinal designs allows for breadth and depth of data analysis and is to be encouraged. Triangulation of findings from these different designs again adds richness to interpretation of the results. A more extensive longitudinal study would have afforded even greater insights into the unfolding of the chronic pain experience and the development of psychological distress.

In sum, giving careful consideration to the ‘best fit’ between methodologies and clinical need has added additional richness to the findings from this programme of research.

9.9 Limitations

There were a number of limitations in this series of studies. An important limitation lies in the selection of the samples, which were broadly drawn (rather than focusing, e.g., on a sexual assault or combat cohort) from a trauma clinic and chronic pain management programme at a public hospital. There were, in addition, automatic
exclusions from the clinic and programme, for example palliative care patients, or patients with florid psychotic symptoms. No conclusion can, therefore, be drawn in respect of generalizing the findings to such specific cohorts. Further, attendance at the clinic and programme was self-selecting, and no conclusion can be drawn in relation to participants who elected not to attend, although invited. A further limitation was the relatively small samples size in the studies, although the small sample size was still adequate for the statistical methods utilised.

The selection of potential predictors of chronic traumatic pain, although based on theory, the reviewed literature, and DSM 5 criteria, was still limited to a selection that fell within the scope of a PhD thesis. Arguably there may be other predictors which in combination or by themselves may better predict psychological distress in chronic traumatic pain outpatients. Some potential predictors cited in the theory of comorbid pain and PTSD (e.g., catastrophizing, Sharp & Harvey, 2001) were excluded as they were considered potentially to be influenced by social factors indirectly associated with chronic pain and a traumatic event (e.g., Ravn, Hartvigsen, Hansen, Sterling, and Andersen, 2018) and common not only to PTSD but also to anxiety and depression. There was the potential for observer bias particularly in the group programme as the psychologist involved in collecting data and making observations is also the first author of the series of papers. However, the benefit of having a facilitator-researcher in the group programme was that participants may have been more likely to be frank and open with the researcher-facilitator than with an unknown researcher. Further, care was taken to utilise well validated patient questionnaires and follow pre-prepared questions and prompts in participant interviews to minimise the potential for observer bias.
There was also an inherent limitation in the use of cross-sectional design seeking to predict chronic pain and distress in most of the studies. Unlike longitudinal studies, cross-sectional design cannot track the development of health status or psychological distress in participants, for example in tracking the impact of age and gender on psychological distress. Causality could therefore not be inferred. Similarly, it could not be concluded that diffuse pain or complete memory of the pain event in the chronic group directly caused psychological distress, or whether diffuse pain and complete traumatic (reconstructed) memory was associated with distress and emergent over time. A longitudinal research design may have allowed for such further unpacking of the relationship between comorbid chronic traumatic pain and psychological distress. However, this is a significant challenge at the best of times due to the frequent unavailability of non-trauma induced pain patients at the point of injury. Often these patients do not present in the hospital system until sometime later when it is clear that the pain is not resolving by itself or with attention from general primary health care providers (e.g., general practitioner or physiotherapist). There are additional obstacles even in tracking a trauma-induced pain group from initial admission to follow-up due to the time course involved and also difficulties in access given the life and death nature of the initial injuries.

There was some ambiguity for the researchers in determining where a chronic pain event was traumatic or non-traumatic under DSM 5 (American Psychiatric Association, 2013) criteria for PTSD. It was relatively simple in the subacute group, given the recency of the pain event, to assess the nature of the event and the consequential pain condition, as all participants had sustained serious or life-threatening injuries and all, therefore, could be said to have experienced a “traumatic event”. The position was often less clear in making objective assessments for PTSD.
among the chronic pain patients as some of the medical records were incomplete, very brief, or unclear. In certain cases, the participants’ own accounts of the pain event were relied on to supplement existing records. For example, it was not always clear from limited information in the hospital documentation whether the pain event could be objectively classified as life-threatening or carrying the risk of serious injury or whether claims to have “complete” memory of an event (often years before) had in fact been originally partial or non-existent (disrupted memory) and been reconstructed.

A further limitation was the use of clinical cut-off points on the PTSD measures (the choice of which varied in the reviewed research literature) to compare rates and levels (not diagnoses) of PTSD. Subjective self-report measures can sometimes be unreliable when comparing distress between individuals and are only part of the process of making a formal diagnosis (usually along with observation of behaviours, and patient and family narrative). However, conservative cut-off points were used throughout the series of studies. In any event, there are also inherent difficulties in relying on clinicians’ diagnoses to fully understand and treat chronic pain and distress. Diagnoses, while useful as heuristic forms of communication, can fall into a mind-body dualism which risks impeding rather than assisting in understanding the individuals’ often unique experience of chronic pain and distress.

This study identified that some participants who did not benefit significantly from a chronic pain management programme had entrenched and unhelpful behavioural patterns which impeded the participants’ adoption and use of demonstrated and research-based pain management strategies. However, the observations were made within a small group outpatient setting (average of five participants in each of two groups) which gave the facilitators the opportunity to
become acquainted with participants, and to observe repeat behaviours. Such informal behavioural observation may not be as useful in non-hospital settings, or one-to-one or brief clinical settings or where a large number of participants are involved, and which would be burdensome for group facilitators.

Finally, this series of studies was primarily focused on understanding chronic pain and posttraumatic stress and identifying behavioural patterns of participants, some of whom did not benefit from standard CBT-based interventions. The studies did not explore fully what other forms of treatment may assist unresponsive patients. It is postulated that the assessment and intervention of such individuals would ideally take place on an intensive one to one basis with a therapist. Such an individualised approach could be supplemental to, or instead of, group intervention, but may be impractical within busy and economically restricted public hospital systems.

9.10 Future Research

The plea of the British Psychological Society (2011) still stands, namely account must be taken of the individual’s life contexts and frameworks of understanding of the world in treating psychological distress. This research provides the groundwork in the area of chronic pain for further research to be undertaken in the development of an efficient matrix based on identified behavioural patterns as shaped by life factors to supplement diagnostic criteria and treatment choices. More specifically, future research through prospective longitudinal research design would aid an understanding of those who are either vulnerable or resilient to the development of chronic pain and distress.

The big question still remains: what therapy would be effective for people who do not respond to standard methods of treatment? The integration of the current
findings into existing theory, for example, Schema Therapy (Young, Klosko, Weishaar, & Ebooks, 2003) may assist in future research aimed at answering this question. Schema therapy targets the long-standing and self-defeating patterns of cognitive and emotional behaviour (“schemas”) that often start in childhood and persist into adulthood. The identification of such schemas (e.g., abandonment, emotional deprivation, unrelenting standards, self-sacrifice) may further assist clinicians and researchers in understanding patients with chronic pain for whom standard CBT treatment has fallen short.

Conflicts of Interest Statement
The authors have no conflicts of interest to declare.
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