Painful Decisions: An exploration of pain assessment (from the perspective of others) within a Signal Detection Theory framework

Lorraine Whisker
Master of Arts
Department of Psychology

SUPERVISOR **Dr. Kerry Greer**
Department of Psychology
Mary Immaculate College/University of Limerick

EXTERNAL EXAMINER **Dr. Fiona Lyddy**
Department of Psychology
National University of Ireland, Maynooth

SUBMISSION DATE **4th September 2012**

ACKNOWLEDGEMENTS

This thesis could not have been completed without the help and support of a number of people.

I want to sincerely thank my supervisor Dr. Kerry Greer for her unwavering support and guidance during my undergraduate and postgraduate studies in MIC. I would like to extend this thanks to all the past and present faculty members of the Department of Psychology in Mary Immaculate College.

I am indebted to the undergraduates of Mary Immaculate College/Limerick University who gave willingly of their time in the data gathering process involved in this research.

Very special thanks go to friends who helped and supported me through personal and academic difficulties during the course of my college studies. My thanks also go to the MIC post-graduate students for their support.

Finally thank you to Michael for his constant belief in my academic ability and to my family for their continuous encouragement and support.

Author's declaration

I hereby declare that this thesis represents my own work and has not been submitted, in whole or in part, by me or another person, for any purpose of obtaining any other qualification.

Signed _____________

Lorraine Whisker

Date 4th September, 2012.

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Notations and abbreviations

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fMRI	Functional Magnetic Resonance Imaging	18
ACC	Anterior Cingulated Cortex	25
CNS	Central Nervous System	35
NPRS	Numeric Pain Rating Scale	59
VAS	Visual Analogue Scale	61
VPRS	Verbal Pain Rating Scale	64
GRS	Graphic Rating Scale	65
WBS	Wong Baker Faces Pain Scale	66
MPQ	McGill Pain Questionnaire	72
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ABSTRACT

Pain perception is individualistic, subjective and difficult to assess and measure accurately. It is vital for the implementation of appropriate treatment strategies, that healthcare providers and receivers arrive at a similar pain assessment when evaluating a pain experience. The benefits that accrue from mutually derived pain assessment cannot be overstated. These include patients' well being, appropriate patient care and support, enhanced cost effectiveness of health care systems, and more efficient deployment of available resources. The primary aim of this research is to develop and assess the use of a pain detection and measurement tool within a social communication framework based on Craig's 2009 Social Communication Model of Pain. The proposed pain detection/measurement tool integrates vignette methodology with a Signal Detection Theory (SDT) framework. The objective is to help explain the under and over estimation of pain commonly observed between healthcare receivers (i.e. patients, individuals etc. who experience pain) and healthcare providers (health practitioners, doctors, nurses, families, carers etc). Existing pain measurement instruments fail to accommodate the social interaction between these two parties. A convenience sample of 660 (i.e. undergraduates n =579; those who have chosen to work in healthcare aka student nurses n =81) judged four pain levels (no pain, mild, moderate and severe pain) experienced by characters depicted in a vignette series that incorporated pain descriptors from McGill Pain Questionnaire (Melzack, 1970) and pain indicators associated with Kehoe et al's (2007) 'profile of pain', (e.g. the distress of pain, physical pain, its influence on suffers, etc). Pain judgement data was subjected to inferential and

SDT analysis. Significant differences were found between groups in their criterion adopted in their pain perception at all levels and between the response-spread across the pain rating scale. Age and gender of characters depicted in vignettes were also found to influence pain judgements differently between groups. Student nurses' criteria in their pain detection were lower in the no pain condition and higher in the moderate and severe pain condition compared to undergraduates. SDT analysis identified student nurses' higher pain detection rates compared to undergraduates across mild, moderate and severe pain levels. Differences in willingness to report pain where there were no pain descriptors/indicators were also observed. Benefits of vignettes in clinical settings where both healthcare providers and receivers respond to a similar pain experience are explored. Results fuel a discussion of the use of SDT as an alternative framework for pain detection, assessment and measurement.

1. INTRODUCTION

1.1 Introduction

Most people will experience acute pain at some time in their life. Recent research indicates that an average of 36 percent of Irish households report they are affected by chronic pain (Raftery, Sarma, Murphy, De la Harpe, Normand & McGuire, 2011). New theories and models have been proposed which have developed the understanding of the pain experience and its corresponding assessment and measurement. Nonetheless, a major problem in pain research remains; pain perception is highly individualistic and subjective. It is thereby difficult to assess and measure pain accurately. Such difficulties may underlie the fact that only less than half (52%) of European general practitioners use a pain assessment tool to measure their patients levels of pain (Johnson, Collett & Castro-Lopes, 2011) although over a third of patients visit a primary care health provider due to pain problems (Kristiansen & Lyngholm-Kjærby, 2011). It is essential that pain be assessed and measured accurately in order to ensure appropriate treatment strategies are put in place. Pain intensity is affected by environmental conditions; a similar physical painful stimulus can produce different responses in different people under the same conditions, and also produce different responses in the same people but on different occasions (Basbaum & Jessell, 2000). This contributes to the difficulty of actually defining pain. Similarly, individual subjectivity contributes to the difficulties of treating pain from a clinical perspective, and creates difficulties for healthcare providers. The individual in pain and the healthcare provider may not have the necessary understanding, or language, to communicate the pain experience from one to the other. Melzack's (1987) research into the verbal communication of pain has resulted in self-report questionnaires that facilitate insight into other's subjective pain experience (pain descriptors reflect sensory, affective and cognitive qualities of pain). These questionnaires neither consider potential influences that may occur as a result of the interaction between the healthcare receiver and the healthcare provider nor do they account for potential biases on behalf of the healthcare provider. Biases, or decisional criteria, are not considered in the analysis of pain evaluation data generated from traditional methodologies. This can lead researchers to incorrectly conclude that individuals possess different sensory or perceptual abilities.

This thesis aims to explore the 'gap' i.e. the linguistic and conceptual divide between the healthcare receiver and healthcare provider and the decisional criteria on pain evaluation. This will be done through the design and development of a pain measurement tool that addresses these issues.

1.2 Evaluation and Measurement of Pain

In the evaluation and measurement of pain, terms such as *an emotional experience*, *a perceptual event*, and *affective quality* must be regarded carefully with regard to data collected. Pain assessment, and measurement is often biased, both from the perspective of the healthcare receiver, and the healthcare provider. To date, influences of social interactions between healthcare providers (and or family) and healthcare receivers who experience pain would not appear to have been considered and therefore do not inform the design of pain evaluation questionnaires. In other words, the individual experiencing pain and their observer may be seriously 'out of tune' when communicating about the same pain experience.

Many studies have revealed discrepancies between individuals' self-evaluation of their pain experience and their healthcare providers. Pain judgements have often been shown to result in 'pain underestimation' by healthcare providers (Drayer, Henderson, & Reidenberg, 1999; Furstenberg, Ahles, Whedon, Pierce, Dolan, Roberts, & Silberfarb, 1998; MacLeod, LaChapelle, Hadjistavropoulos, & Pfeifer 2001; Marquié, Raufaste, Lauque, Marine, Ecoiffier, & Sorum, 2003; and Kappesser, Williams, & Prkachin 2004; 2006). This 'underestimation' may influence the administration or withholding of pain relieving therapies (Bell, 2000; Puntilloet, Neighbor & Nixon, 2003). The doubted individual may experience increased anxiety with negative emotions such as loss of frustration, anger, and thoughts of suicide (Jacques, 1992; Clarke & Iphofen, 2005; 2008) which may affect their pain management. The social communication model of pain addresses this pain assessment discrepancy.

1.3 Social Communication Model of Pain

The Social Communication model of pain considers both the intrapersonal and interpersonal 'social' aspect of pain from the healthcare receiver's and the healthcare provider's perspective. This model is comprehensively explored in Chapter 3 with other theories and models of pain.

Individuals' social experiences (i.e. healthcare receivers and providers), in addition to interpersonal influences, affect pain experiences (Hadjistavropoulos, 2002). Pain communication, as with any form of interpersonal communication but especially the self-reporting of pain, is subject to distortion (Hadjistavropoulos & Craig, 2002 and Hadjistavropoulos, Craig, Fuchs-Lacelle, 2004). An individual's verbal account of their pain experience and their non-verbal behaviours such as grimacing, limping, and other bodily movements, are communicated to others with varying degrees of efficiency. A self-reported pain experience enables the healthcare provider, or family, to draw inference about that individual's experience (Hadjistavropoulos & Craig, 2002). The immediacy of a pain experience is constrained by its context and environmental setting; it affects those 'producing the pain messages (healthcare receivers) *and* those trying to decode them (healthcare providers)' (Hadjistavropoulos, Craig, Fuchs-Lacelle, 2004, p. 87). Available pain detection and assessment tools (examined in Chapter 4) highlight the disparity of a perceived pain experience between patients and practitioners. This thesis will examine these inconsistencies using an alternative methodology of signal detection theory (SDT) analysis of the data gathered from a series of especially designed vignettes.

1.4 Signal Detection Theory

This thesis aims to show that discrepancies between evaluations of the same pain experience may be better explained by a framework of SDT analysis. SDT is both an experimental methodology and a data analysis process. The use of SDT in the research of pain evaluation and measurement has spanned nearly three decades (e.g. Lloyd & Appel, 1976 to Allan & Siegal, 2002), and has enabled the examination of pain report variances (this and other pain measurement methodologies are outlined in Chapter 4). Lloyd and Appel argue that SDT methodology is probably the most powerful statistical tool for analysing pain research while Allan & Siegal assert that SDT has potential explanatory power. Lloyd & Appel argue that SDT can be used to separate the objective and subjective reports of a pain experience. In their review of SDT pain research studies, Lloyd and Appel state that discrepancies between groups with regard to pain report can be separated into those resulting from sensitivity differences (physiological), and those resulting from bias differences (willingness to report). The separation of the capacity to discriminate between pain stimuli, and decisional (pain experience) criteria, is the strength of SDT over other psychophysical methods in the research of sensation and pain perception (Green & Swets, 1966; MacMillan & Creelman, 2005).

Lloyd and Appel (1976) and Allan and Siegal (2002) examined SDT methodology from the perspective of the healthcare receiver rather than the healthcare provider where participants self-reported their own pain experiences. The possible influences of healthcare providers on the healthcare receivers were not examined neither were contextual or environmental influences. The Social Communication model of pain proposes that these issues are important and that they directly affect pain evaluation and measurement (Hadjistavropoulos, Craig, Fuchs-Lacelle, 2004).

This thesis proposes to employ SDT as a framework for a pain detection and measurement tool from the perspective of the observer but without the use of physical pain inducing stimuli. Participants in the current study were asked to report on another's pain experience by way of specifically designed vignettes.

1.5 Use of Vignettes in Pain Measurement

The use of vignette methodology has been shown to be a tool of choice within many different spheres of psychological research (Finch, 1987; Bendelow, 1993; Hughes, 1998; Barter & Renold, 1999a; 2000; and Hughes & Huby, 2001; 2004). Research has shown there is inadequate and incorrect pain estimation communication between healthcare receivers and practitioners for many different reasons (e.g. insufficient communication – Davies, Hiemenz & White, 2002; under or over estimation of pain due to appearance, age, gender - Hadjistavropoulos, McMurtry, & Craig, 1996). Vignette methodology can enable pain perception judgements from healthcare receivers and providers to be obtained simultaneously from the same pain experience. The use of vignette methodology, in conjunction with SDT statistical analysis, can address certain limitations of available pain measurement tools (as outlined in Chapter 4). The utilisation of such a pain measurement tool by both patient and practitioners enables potential pain assessment disparities to be highlighted and further explored and examined.

1.6 Aim of Thesis

This thesis has one general aim and two specific objectives.

1.6.1 General Aim

The general aim is to develop and assess the use of a pain detection and measurement tool to assist in bridging the gap between pain reports from the individual in pain and the healthcare provider. This tool will be the basis for a qualitative pain measurement technique. It will comprise of a series of vignettes that will enable the extraction of objective and subjective pain measures of depicted vignette characters with a chronic illness. Resulting data will be analysed within the framework of SDT.

It should be noted that this thesis does not seek to question the validity and usefulness of existing pain evaluation tools but aims to enrich their value with the provision of complementary information generated by way of an SDT framework. Such supplementary information can address the mis-match of pain perception obtained from patients and practitioners and in doing so improve treatment strategies, their delivery, and the confidence of both parties.

1.6.2 Specific Objective 1

The first specific objective of this thesis is to explore and examine potential different pain judgement ratings between groups. For experimental purposes participants comprised of undergraduates (representative of the ordinary public/healthcare receivers) and student nurses (representative of healthcare personnel/providers).

1.6.3 Specific Objective 2

The second specific objective is to explore and examine participants' potential different pain judgement ratings of the four separate pain conditions.

Essentially, objectives 1 and 2 seek to either support or refute the proposed usefulness of the integration of vignette methodology and a SDT analysis framework within the context of pain perception.

1.7 Structure of Thesis

The intention of this structure is to provide a comprehensive overview of the research programme and methodology that underpins the development and assessment of a pain detection and measurement tool to assist in the disparity of pain reports from healthcare providers and healthcare receivers.

This thesis is structured as follows:

Chapter 2

Chapter two presents the current definitions of pain and briefly outlines some of its physiological and psychological aspects.

Chapter 3

Briefly reviewed in this chapter are the various theories and models of pain that have evolved chronologically from Descarte's Specificity Theory (cited in Aydede, 2005) to the contemporary 21st century Social Communication model of Pain (Craig, 2009).

Chapter 4

This chapter introduces the concept of pain assessment, measurement, and pain control. Some of the main criticisms of and challenges to current pain assessment and measurement tools are discussed. The psychophysical measurement methodology of SDT is presented and its relevance to pain measurement outlined.

Chapter 5

The advantageous uses of vignettes in psychological research are outlined in this chapter. How vignettes are constructed and designed is discussed. The benefits of eliciting data with regard to pain perception by the use of this methodology are also examined.

Chapter 6

This chapter outlines the methodological procedures, experimental and instrumentation design of the research. Chapter 6 also discusses ethical considerations.

Chapter 7

Study 1 and 2 are introduced and reported in this chapter. Participant details, procedure, experimental controls, resulting data and analysis, and a brief procedural discussion for each study are also presented.

Chapter 8

The general results, relative to the aim and objectives of this thesis, are outlined and presented in this chapter.

Chapter 9

A general discussion of the findings resulting from this thesis is presented in this final chapter. Strengths and limitations of the research are also examined. Future research, relevant to this study, is proposed.

2. WHAT IS PAIN

2.1 Overview & Introduction

2.1.1 Overview

The current definitions of pain are presented in this chapter. The physiological and psychological perspectives of pain are also briefly described. An understanding of these perspectives is important as the aim of this thesis is to develop a pain measurement tool that will address the discrepancies that result from subjective differences between healthcare providers and receivers.

2.1.2 Introduction

What is pain? Why do individuals experiencing pain, and those who view such individuals (i.e. healthcare providers, families, and carers etc), react to pain the way they do? These questions are central to the understanding of, and challenges to, the detection, measurement, and assessment of pain.

There are wide variations in the way individuals perceive the same object, situation or experience. An individual can perceive their pain experience from similar stimuli in a variety of ways; pain may be tolerable on one occasion yet unbearable on another occasion (Basbaum & Jessell, 2000). Similarly, context and environment can affect pain intensity, with the same physical *painful* stimulus producing different responses in different people (Basbaum & Jessell 2000). It has also been found that the same stimuli can result in different pain experiences in newborns because of situational differences when stimuli are presented (McGrath, 1994). To define pain therefore is fraught with difficulty and its assessment and treatment complex and challenging.

Individual subjectivity contributes to the difficulties of treating pain from a clinical perspective and creates problems for healthcare providers. They cannot equally empathise with each individual as some individuals experience more pain than would be expected, while others experience less. Individuals who experience less pain than expected have been found to be more psychologically resilient and experience more positive daily emotions than those who experience more pain than expected (Ong, Zautra & Reid, 2010). Health providers themselves perceive another's pain experience differently depending on their own subjectivity, culture and expectations (Craig, 2009). These issues are explored in more depth in the Social Communication model of pain (Chapter 3; Section 3.7).

2.2 What is Pain?

Pain is subjective and personal to the individual experience. The word pain and how an individual perceives their experience relative to that word is learnt through early life experiences. The term *pain* is generally used for the subjective perception of pain (International Association for the Study of Pain – IASP, 1979; taxonomy on pain, as cited in Turk & Rudy, 1986) but in this, and in future chapters, the term of pain is used in its general sense. There are many definitions for pain but the general accepted one is proposed by the IASP and defines pain as 'an unpleasant sensory and emotional experience arising from actual or potential tissue damage or described in terms of such damage' (IASP, 1994). This definition has guided the majority of pain research to date. The IASP adjoin their pain definition with notes that broadens this and other definitions, and helps to describe pain more comprehensively.

> Pain is always subjective. Each individual learns the application of the word through experiences related to injury in early life. Biologists recognize that those stimuli, which cause pain, are liable to damage tissue. Accordingly, pain is that experience we associate with actual or potential tissue damage. It is unquestionably a sensation in a part or parts of the body, but it is always unpleasant and therefore also an emotional experience. Experiences, which resemble pain but are not unpleasant (e.g. pricking) should not be called pain. Unpleasant abnormal experiences (e.g. dysesthesias) may also be pain but are not necessarily so because, subjectively, they may not have the usual sensory qualities of pain (IASP, 1994).

McCaffery (1979, p. 8) incorporates a more subjective perspective into her definition of pain: 'pain is whatever the experiencing person says it is, existing whenever the experiencing person says it does'.

The sensation of a process is the receiving of information through the senses, but the *making sense* of seeing, hearing, touching, smelling and tasting is a perceptual process (Basbaum & Jessell, 2000). Grahak (2007) also argues that pain is a perceptual process as it comprises of sensory and affective components. Basbaum and Jessell (2000, p.472) describe pain as 'a percept … an unpleasant sensory and emotional experience associated with actual or potential tissue damage'.

Acute and chronic are two classifications of pain. Acute pain is a persistent pain that is generally externally caused (Basbaum & Jessell, 2000). It is associated with injury (e.g. a broken bone), an illness (e.g. mumps), or surgical trauma involving tissue damage (e.g. appendicitis). Acute pain begins suddenly and can be severe but normally lasts a short period of time (Basbaum & Jessell, 2000). There is an expectation of a complete cure.

Chronic pain is prolonged, and generally caused by internal factors (Gatchel, 2004). It does not involve tissue damage and often lasts long after the healing process. It is experienced as persistent, deep, dull and diffuse, and tends to increase in intensity over time and lasts at least three months (Gatchel, 2004). Episodes of pain that occur over months or years with some pain free periods are referred to as chronic recurrent pain (Gatchel, 2004; 2005; Gatchel, Yuan, Madelon, Perry & Turk, 2007). This type of pain is associated with chronic illnesses such as rheumatoid arthritis and multiple sclerosis with pain management the basis for most treatments. Chronic pain and chronic recurrent pain affects between 10 and 20 percent of adults in the general U.S. population (Gatchel et al. 2007), 19 percent of the European population (Breivik, Collett, Ventafridda, Cohen & Gallagher, 2006) and 36 percent of the Irish population (Raftery et al. 2011). Measurement of acute and chronic pain is discussed in more depth in Chapter 4 (Detection & Measurement of Pain).

2.3 Physiological and Psychological Aspects of Pain

For the purpose of this thesis both physiological and psychological aspects of pain perception are considered. While they are most often inextricably entwined they can be treated as distinct from each other. This is important when considering how individuals evaluate and assess another’s pain as a pain experience can be empathised with from both a physiological and psychological perspective (Saarela, Hlushchuk, Williams, Schürmann, Kalso & Hari, 2007) (see Section 2.3.8 and also Chapter 5, The Use of Vignettes in Pain Detection and Measurement, Section 5.5).

From a physiological perspective, pain perception occurs in, and is mediated mainly by, the thalamus in the brain (Carlson 2004; Vanhaudenhuvse, Boly, Balteau, Schnakers, Moonen, Luxen et al. 2009). This area is a type of relay station where the perception of all sensory stimuli is received and then projected to specific areas in the brain. Once pain is perceived the body assesses and treats itself by the release of natural opiates (Carlson, 2004). Severe pain is often accompanied by pupil dilation, changes in blood pressure and heart rate, increased rate and depth of breathing, changes in skin and body temperature, and sweating (Carlson, 2004).

Research has shown the same brain regions are activated, with neural processes appearing to overlap, when perceiving others in pain and experiencing pain one-self (Saarela et al. 2007). Such 'pain' does not have to be pain caused by a physical stimulus but may be social pain (Panksepp, 2003; 2005). The term 'social pain' applies to 'emotional' pain resulting from harm or threat to ones' social standing; a death, humiliation, shame and hurt feelings are subtypes of social pain (Panksepp, 2003). The 'pain' caused by various social situations has been found to neurologically imitate physical pain. For example, the emotional pain that accompanies grief, and intense loneliness, shares the same neural pathways that are produced as a result of the sting of physical pain (Panksepp, 2003; 2005). The social pain of ostracism has been revealed to be neurologically similar to physical pain, as fMRI[1] images, taken when participants were excluded from a virtual ball tossing game, have shown social and physiological pain pathways originate in the same region of the brain (Eisenberger, Lieberman, & Williams, 2003). Characters in stories may similarly initiate comparable neurological activation in participants invited to give pain judgements. The same brain regions activated during first-hand pain experiences when others in pain are observed may be activated when others in pain are cognitively attended to by alternative means (via vignettes); as previously mentioned such 'pain' does not have to be induced by physical stimuli (Lamm, Dacety & Singer, 2011).

From a psychological perspective, it is well documented that there are many factors such as thoughts, memories, attitudes, emotions and kinetic behaviour that affect pain perception (Main & Watson, 1999; Melzack & Wall, 1965; 1996; McGrath, 1994; Melzack, 1993; and Martin, Carlson & Buskist, 2009). Conversely, pain affects thoughts, memories, attitudes, emotions, even movements and behaviour (Basbaum & Jessell, 2000; Carlson, 2004). This illustrates how all-pervasive the cycle of pain can be.

Gatche et al. (2007) maintain there are different emotions, most often negative, involved in the affective component of pain. Examples of these include anxiety, depression, and anger. Rest and sleep are also factors that influence individual's pain experiences. Emotion can play a negative role in individuals with chronic pain.

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[1] fMIR functional magnetic resonance imaging is a neuroimaging technique used to study activity in the brain by the measurement of blood flow in the brain. This can show which brain regions may be related to particular mental operations (Reber & Reber, 2001, p. 289)

This is discussed further in Chapter 3 within the Gate Control Theory of Pain (section 3.4).

Grahek (2007) questioned the IASP's definition of pain in which the sensory, affect, and behavioural components are inextricably entangled, when he recognised that these components can exist as separate entities. The sensory, affect, and behavioural aspects of pain can be segregated and seen as distinct factors within the pain experience when two particular pain syndromes are examined.

The first pain syndrome, pain asymbolia, is characterised by the dissociation of the sensory-discriminative component from its affective, cognitive, and behavioural components. The second syndrome, congenital analgesia, is an absolute dissociation but in the opposite direction; that is the total dissociation of pains' affective components from its sensory-discriminative component.

2.3.1 Pain Asymbolia Syndrome

Pain asymbolia (i.e. pain dissociation) occurs when an individual perceives pain but that pain does not result in distress. In other words, individuals, with this syndrome, typically report they have pain but are not bothered by it. Grehek (2007, p.1) maintains that pain asymbolia is 'pain' but without the 'painfulness'. This syndrome can occur as a result of brain injury, lobotomy, cingulotomy, or morphine analgesia. Grahek (2007) reviewed an extensive study of six individuals with this syndrome carried out by Berthier, Starkstein & Leiguarda (1988). These individuals were able to distinguish between a sharp and a dull painful stimulus during Berthier et al's (1988) experiment. They smiled, laughed, and engaged the experimenter in conversation but they did show typical physiological reactions such as increased heartbeat, abnormal dilation of eye pupils, sweating, and heightened blood pressure. Although autonomic responses were seen in these individuals, cognitive and behavioural responses were abnormal by their absence (Grahek, 2007). This indicates that the cognitive representation of pain as a threat and danger, one of the protective functions of pain (i.e. the affective-cognitive component that initiates aversive behaviour), may not exist in this condition. These individuals can 'feel pain but are not in pain'. Conversely, individuals with congenital analgesia can be 'in pain but not feel pain'. The differences between the two conditions highlight the need for the pain experience to be holistically assessed.

2.3.2 Pain Congenital Analgesia

The second dissociation syndrome examined by Grahek (2007), pain congenital (i.e. present at birth) analgesia, occurs where individuals cannot 'feel' pain. Although all harmful and potentially harmful stimuli do not cause pain, stimuli are usually sensorally noticed as sharp cuts, hard blows, hot surfaces, loud sounds etc. Grahek (2007, p. 98) defines congenital analgesia 'as a loss of sensitivity to pain'. Contrary to pain asymbolia, Grahek (2007, p. 1) describes this syndrome as "'painfulness' without the *pain*." The affective-cognitive and behavioural components are evident in individuals with this syndrome but such individuals are prone to severe injuries as they are unable to detect if they have been injured (e.g. a broken bone, burn or cut) (Grahek, 2007). Although the sensory modalities (including the sense of touch) in those with this syndrome are intact, their pain system is completely shut down. Whilst fear of pain is one of the most effective motivators of human behaviour, and pain inducing stimuli may trigger species-typical escape and withdrawal responses (i.e. these stimuli *hurt* and are subsequently to be avoided), those who suffer from congenital analgesia, have no ability to feel pain and suffer an abnormal amount of injuries such as cuts and burns (Grahek, 2007). Similar to pain asymbolia, one of the protective functions of pain is missing, but in this case it is the sensory-discriminative component.

Pain Asymbolia and Pain Congenital Analgesia illustrate how the sensory-discriminative, affective-cognitive, and behavioural components of the pain experience can be disconnected from one another. The separation of the various components demonstrates the difficulty in the assessment and measurement of pain in individuals with these syndromes.

Psychological factors, while not totally disassociated from physiological factors in those not afflicted with these syndromes, can play a disproportionate role in pain perception and subsequently in its assessment and measurement. These issues are briefly explored further in section 2.3.3.

2.3.3 Chronic Pain Diagnosis/Psychological Factors

The affective-cognitive component of pain, according to Kehoe, Barne-Holmes, Barne-Holmes, Cochrane & Stewart (2007), is important when assessing chronic pain as psychological factors play a central role in its diagnosis. Kehoe et al (2007, p. 288) maintain that

> 'A diagnosis of chronic pain is not straightforward. It is not given on the consideration of specific regional sensation. Nor does a specific level of pain severity give a chronic pain diagnosis. It is the extent of intrusion or disablement into an individual's lifestyle.'

Gatchel (2005) refers to chronic pain as bi-directional, a personal interpretation of pain sensation. Chronic pain generates lifestyle changes that cause stress, which in turn intensifies pain that generates more lifestyle changes etc. This personal and psychological interpretation of perception of pain, rather than its sensation, is vital to a valid pain assessment, as each individual is unique within their own particular pain experience.

2.3.4 Past Experience

Past experience impacts on an individual's perception of their own pain experiences and others' pain experiences. Past experience enables learning that subsequently helps an individual to know what to do or what to expect when a similar experience occurs again; the past prepares for a similar event at another time. The memories of the severity of pain, its cause, how long it lasted, and if relief occurred or not, will all affect that individual's response to pain when it reoccurs. Giummarra, Georgiou-Karistianis, Nicholls, Gibson, Chou & Bradshaw (2011) found that amputation related pain memories impacted on the phantom limb pain experiences of amputees following surgery. These individuals also displayed poorer mood and adjustment to the limitations of their amputation compared to those without such memories.

Knowing what to expect can both help and hinder coping mechanisms. Fear and anxiety may be created by pain in those who have not previously experienced pain and these emotions may prompt future expectations of similar painful experiences.

2.3.5 Knowledge

When individuals have good knowledge regarding the issues surrounding his/her pain experience (i.e. health literacy – the capability to ask for, understand and make use of health information etc) better health outcomes are more likely (Briggs, Jordan, Buchbinder, Burnett, O'Sullivan & Chua et al, 2010). This is relevant to individuals with illnesses such as diabetes, rheumatoid arthritis, asthma, and other chronic illnesses (Briggs et al, 2010). The willingness and ability to use that knowledge has also been linked to better health outcomes.

2.3.6 Culture

Culture affects pain experiences and pain behaviour and is associated with how and where it fits within the standards of an individual's society, the social context in which occurs, and importantly how such behaviour is both perceived and understood (Thomas, 1997). This topic, related to the Gate Control Theory of pain, is discussed in more depth in Chapter 3 (section 3.4).

2.3.7 Mindfulness

The cognitive act of conscious mindfulness and other forms of meditation have been shown to reduce pain. Self report studies indicate that mindfulness and meditation co vary with levels of expressed pain. These studies are supported by fMRI evidence (Zeidan, Martucci, Kraft, Gordon, McHaffie & Coghill, 2011). Zeidan et al. (2011) found that meditation appeared to reduce pain-related activation of different regions in the brain. Fifteen participants underwent fMRI before and after mediation training accompanied by painful heat stimulation. Reduction in participants' pain intensity (of up to 40%) was found to be associated with decreased activity in regions in the brain involved in the cognitive regulation of pain. This suggests that a specific cognitive action, mediation in this case, can influence pain perception from an affective perspective.

These findings provide insights into the manner that mediation can alter the subjective experience of pain.

2.3.8 Empathy / Perception of Others' Pain

Reber & Reber (2001, p. 239) define empathy as a 'cognitive awareness and an understanding of the emotions and feelings of another person'. Singer & Lamm (2009, p 82) maintain that 'empathy occurs when an observer perceives or imagines someone else's (i.e. the target's) affect and this triggers a response such that the observer partially feels what the target is feeling'. Empathy may also be referred to as a 'shared representation of self and other' (Ochsner, Zaki, Hanelin, Ludlow, Knierim, Ramachandran et al, 2008. p. 144) and the 'understanding of another person's experience that draws on *mirroring systems*' (Saarela et al, 2006, p. 230). Mirroring systems are activated motor and sensory brain regions when one individual observes another in a similar situation by presuming feelings or meaning from their nonverbal behaviour.

Saarela et al's (2006) data revealed that when individuals observed pain from the faces of chronic pain patients, their verbal estimated data of the patient's pain intensity correlated with increased activations found in their pain related brain regions. Neural responses activated in these specific areas were found to be in common for the observer and the observed. This suggests that areas associated with the cognitive/affective perspectives of pain, but not with the sensory/discriminative perspective, mediate empathy.

Oshsner et al. (2008) examined neural activity in two separate tasks when examining empathy. While participants were subjected to heat pain and being subjected to fMRI techniques, they watched videos of other individuals being subjected to similar heat pain experiences. Both tasks appeared to increase activation in one pain related brain area (Anterior Cingulated Cortex - ACC), but not equally so in the other examined brain regions. This suggests that pain perception in self and others share only some neural commonalities supporting Saarela et al's (2006) findings.

Gu, Liu, Guise, Naidich, Hof, & Fan (2010) also examined the mirroring of both the ACC and another brain pain related area (fronto insular cortex - FI) to a perceived pain experience in others but they did not induce experimental pain. Participants viewed a selection of colour photographs that illustrated painful and non-painful everyday situations (e.g. non-painful condition - a foot against a door; painful condition – a foot between the door and its jam). These participants were simultaneously subjected to fMRI techniques. Gu et al. observed that FI activation, rather than ACC activation, showed significant increase for painful compared to non-painful images. This suggested a more definitive functional disassociation between the two brain regions in the process of empathy with regard to another's pain.

Saarela et al's (2006) study highlights the fact that in addition to an individual's ability to detect pain from the observation of others' facial expressions, individuals also physiologically appear to react to pain intensity differences during these observations. This is despite the fact that other emotions are more clearly recognised from the face than pain, and that another's pain is often underestimated (Prkachin, Berzins & Mercer, 1994; Kappesser & Williams 2002). These findings are important when considering pain measurement from the third party perspective.

Empathy is examined in greater depth in Chapter 5 (Vignettes and Pain Measurement Sections 5.5 and 5.7.3).

2.4 Summary

This chapter outlined the IASP's definition of pain 'an unpleasant sensory and emotional experience arising from actual or potential tissue damage or described in terms of such damage' (IASP, 1994). The terms of acute and chronic pain were examined. How pain is perceived from a physiological and psychological perspective and the interaction between both perspectives was also explored. The psychological aspects of a pain experience was considered alongside the diagnosis of chronic pain, as well as the two pain disassociation syndromes, pain asymbolia and congenital pain analgesia. The psychological issues of past experiences, knowledge, culture, mindfulness, empathy were also considered in their relevance to the pain experience.

In this chapter pain was presented from both a physiological and psychological perspective with the implication that each perspective is associated with and interacts with separate brain regions. Studies have shown that empathy may be mediated via brain regions associated with the cognitive/affective perspective of pain. It is important to understand the various issues within the physiological and the psychological perspective of pain and the common areas in empathy from a third party perspective as this thesis addresses the area of pain perception from both self and other but via a common source – a specifically designed vignette series.

3. THEORIES AND MODELS OF PAIN

3.1 Overview & Introduction

3.1.1 Overview

The following sections introduce and explore the major pain theories and models relevant to this thesis in their approximate chronological development. The strengths and challenges of each theory and model are also examined. This is followed by Figure 3.3 which outlines the strengths and challenges of each examined theory and model.

3.1.2 Introduction

Evaluation of pain measurement, assessment and management tools requires an understanding of the evolution and main features of the major theories and subsequent models of pain.

This understanding, in all dimensions, improves the ability to evaluate the various assessment and measurement methodologies of individual pain experiences. Pain theories not only determine what is observed in physiology but they also determine, and influence, how people in pain are treated (Melzack, 1993). Inadequacies in pain management may be due to the absence of ongoing pain assessment (Jenson & Karoly, 1991).

Pain theories/models are active, dynamic and constantly evolve in order to account for unaddressed factors that arise from experimental research. Such issues within pain perception, and also within its assessment and treatment, are subsequently addressed by innovative pain measurement techniques, but resulting data often identify and highlight new issues that then need to be further considered. Innovative theories and models *not only* subsume aspects of previous theories and models, they also suggest new issues that arise through pain research. Thus pain theories and models, though not necessary comparable, can and do co-exist in parallel (e.g. the biomedical model and the Operant model as later examined in this Chapter - section 3.3 and 3.5). It is also the case that pain assessment and measurement instruments continue in use, even though more current knowledge might question their value

Contemporary pain theories and models integrate multiple perspectives such as biological, psychological and intra and interpersonal social factors. Pain assessment and measurement methodologies have evolved somewhat in parallel with the development of these pain theories and models but there remain issues within the assessment and measurement of pain that need to be addressed (pain assessment and measurement is examined in Chapter 4). The disparate response to the same pain experience from a healthcare receiver (the patient/client) and their healthcare provider (the doctor/nurse/main carer/family) is an issue of concern which current pain assessment/measurement tools do not appear to address. The current Social Communication model of pain invites the development of a new pain assessment and measurement tool that considers the social interaction of a pain experience as identified and outlined in the model.

Following a short overview, the pain theories and models relevant to this thesis are examined in the following sections:

(3.2) Descartes' Specificity theory

(3.3) The Biomedical model

(3.4) Gate Control theory

(3.5) The Operant model

(3.6) The Bio psychosocial model

(3.7) Social Communication model

3.2 Descartes Specificity Theory

Descartes classical dualistic approach in the 17th century and his Specificity Pain theory viewed a pain experience as being equated directly with peripheral injury (Aydede, 2005). This suggested that the severity or degree of injury determined the extent of pain experienced by the individual (Brannon & Feist, 2000). For example, a needle prick produces minimal pain, whereas a deep gash by a knife causes more tissue injury and is consequently more painful. Pain viewed from the perspective of the Specificity theory assumed that appropriate treatments should eliminate the cause or source of the pain (e.g. surgery or medication). However, this is not always the case despite the advances in surgical procedures, tranquillisers, and pain-relieving drugs.

3.2.1 Strengths / Challenges of the Specificity Theory

Although strength of the Specificity theory is that it can be correct with regard to certain types of injuries, there are many instances that are inconsistent with the simple relationship between injury and a pain experience. Examples of these are the lack of co-variance in pain perception within, and between individuals, phantom limb pain, hypnosis and chronic pain.

Lack of co-variance

The theory does not explain the inter-individual variability found between painful stimuli (an injury) and a pain experience (Adams & Bromley, 1998) as highlighted in pain research in areas such as gender, age, and bio psychosocial factors (Fillingim, 2005). Nor does the theory explain how intense pain is not always proportionate to physical injury. For example, a very small injury can result in severe and long-lasting pain (e.g. a deep burn covering a small area of skin) while a large injury can result in less, little or even no pain (e.g. grazing of skin tissue over a large area) (Carlson, 2004).

Phantom Limb Pain

Specificity theory cannot account for phantom limb pain; felt by individuals in a body part that has been amputated (Carlson, 2004), where there is no physical feeling (i.e. paralysis – usually a result of damage to nerve supply) (Ramachandran, 1993), or not present at birth (Saadah & Melzack, 1994). Up to 70 percent of amputees say that they feel as if their missing limb is still present and causing pain

(Carlson, 2004). This pain can persist and become chronic, despite the healing of the primary site of injury (Melzack, 1973). Experienced pain cannot come from the extremity (finger, arm, or leg etc), as it no longer there or is paralysed, or the limb never existed and so there is no ongoing tissue injury, and within Specificity theory there should be no pain.

Hypnosis

Specificity theory fails to account for the effect of hypnotically assisted surgical anaesthesia. Certain individuals can undergo significant surgical tissue damage without co-variance levels of pain when subjected to hypnosis (Ryan, 2008). These findings support the view that a conscious mental state can override Specificity theory (Mountgomery, Bovbjerg, Schnur, David, Goldfarb, Weltz et al. 2007) and discredit the argument that pain intensity is proportionate to physical injury.

Chronic Pain

There are psychological aspects that cannot be accounted for by the Specificity theory. Beecher (1959) highlighted differences in the reaction component of pain between participants in the clinical setting, and soldiers in the battlefield. He observed that severely injured soldiers reported little or no pain for days following injury, while people with chronic pain indicated extreme levels of pain with no obvious injury. Beecher observed 20 percent of soldiers in field hospitals complained of sufficient pain to require morphine, while in his US practice 33 percent of trauma patients with similar wounds required morphine (Beecher, 1946; 1957).

This predominant model of pain described pain as a by-product of disease, or injury. This implied that once the disease or injury was treated pain would be relieved. Despite the issues of the Specificity theory as addressed above, the perception of pain experienced as being proportionate to physical trauma or pathology remained the dominant perspective until the 1980's even though Melzack and Wall's Gate Control theory, which was largely ignored, was proposed in 1965 (Melzack & Katz 2001). The Biomedical model of pain, examined in the next section, is rooted in Descartes' philosophy of the mind-body dualism which is the conceptualisation of mind and body as separate entities.

3.3 The Biomedical Model of Pain

Pain within the biomedical perspective is solely explainable from a biological perspective and treatable from a medical prospective (i.e. physical interventions such as surgery, or medication) despite the fact that mental and emotional difficulties can occur as a result of chronic pain. The Biomedical model targets treatment of physical injury or disease where a pain experience is seen as a function of that physical injury or disease; this underpins the observation made by Potter and Griffen-Perry (2005) that psychological or social differences has no role within culture and ethnicity. Individuals who suffer from chronic pain are not always considered within the biomedical model and 'are often put in a position of defending the legitimacy of the reality of their condition' (Sweeney, 2010). Chronic pain in illnesses such as Gulf War Syndrome, Fibromyalgia and Chronic Fatigue Syndrome and other associated illnesses, frequently cannot be localised, seen on a scan, or identified from a medical test. Sweeney (2010) highlighted evidence-based diagnostic tests regarding pain, its location, origins, intensity, and length, response to pain management treatments, detection methodologies and indicators. She analysed more than 20 articles randomly selected from *Pain* (i.e. a peer-reviewed international academic journal) published over a 12 month period (2008/2009) and concluded, 'in the 21st century, there is still no viable attempt to understand the subjective experience of pain'.

3.3.1 Strengths / Challenges of the Biomedical Model

While the Biomedical Model facilitates the successful treatment and pain relief for many individuals for particular injuries and resulting pain it does not consider the roles psychological and social factors play in the experience and treatment of pain (Annandale, 1998; Craig & Hadjistavropoulos, 2004; and Sullivan, 2008). Individual subjectivity and social and cultural expectations are considered irrelevant. The model does not acknowledge that a diagnosis that will effect treatment of the individual may be a result of interaction and social communication between healthcare provider and receiver (Annandale, 1998).

Despite the acknowledged significance of psychosocial and behavioural factors associated with chronic pain, conventional pain relieving methods remain focused on medication and surgery. While many individuals are, and have been, successfully treated there are numerous individuals who continue to suffer with chronic pain. Their disability is frequently greater than expected on the basis of physical findings alone. There is a body of research that would indicate a major role for the psychosocial and behavioural factors but the Biomedical models fails to address these factors thereby severely limiting its applicability.

An evidence based study conducted by the IASP (2009) proposes that the Biomedical reductionist approach of medicine is inadequate and fails to account for a large body of data that suggests that pain can be separated into discrete and independent components - psychosocial and physical. The proposed Gate Control Theory in 1965 questioned the Specificity theory and biomedical model and gave credibility to the influence of these psychological and behavioural factors.

3.4 Gate Control Theory of Pain

The medical approach of previous theories is combined with the psychological aspect of the pain experience in the Gate Control Theory; the theory also considers biological *and* psychological aspects in pain, and not just medical aspects (Horn & Munafo, 1997). This is relevant to this thesis as a pain measurement tool encompassing psychological factors is considered. The Gate Control theory suggests that a pain experience relies on the complex interaction of the Central Nervous System (CNS) and the peripheral nervous system as illustrated in Figure 3.1. The peripheral nervous system comprises of nerves outside of the brain, including those in the spinal cord, upper body and extremities, as well as nerves in the lumbar spine region. Each system processes pain signals differently. The pain messages, as shown in Figure 3.1, from the peripheral nerves are transmitted to the CNS and enables identification of the pain causing stimulus. Pain messages begin in nerves related to the injury and proceed along the associated peripheral nerves to the spinal cord and up to the brain (to this point the theory is comparable to the Specificity theory of pain as described in section 3.2.1). Before pain messages can reach the brain they encounter 'a hypothetical nerve gate' in the spinal cord that opens, or closes, depending on the instructions coming from the brain. The 'rivalry' between the ascending pain messages and the descending instructions from the brain determines the action of this 'hypothetical nerve gate' (Plotnik, 1999). This is outlined in Figure 3.1.

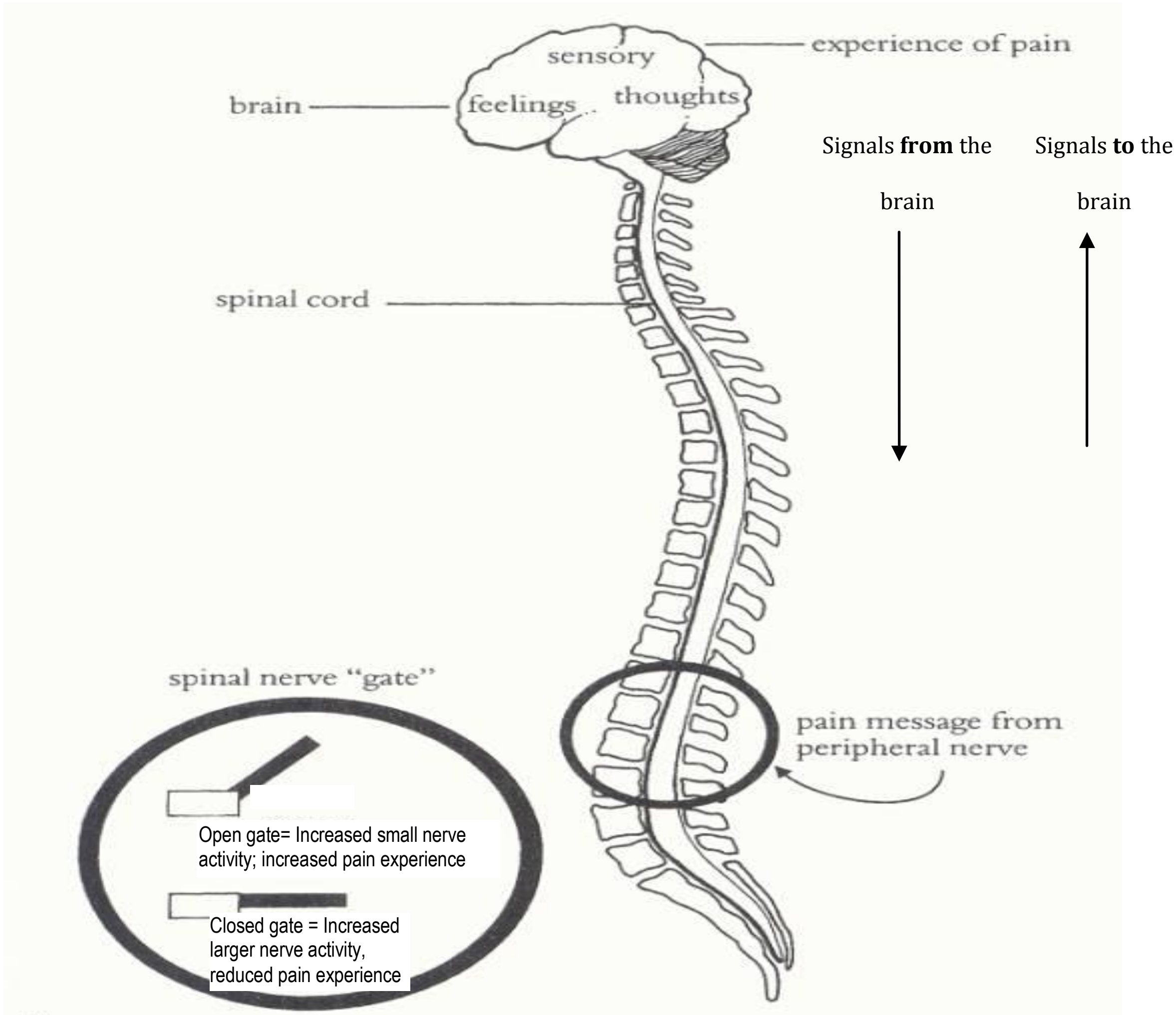

Figure 3.1: Gate Control theory of Pain - A visual representation

Simply put, Melzack and Wall's Gate Control theory represents a 'hypothetical nerve gate' that monitors neural activity. The experience of pain is a function of both the modulation of incoming pain stimuli by other incoming sensory stimuli (touch or pressure) and influences from descending signals from the brain that involve sensory, emotional and affective cognitive factors

These components are the major dimensions of experienced pain and, of interest to this thesis, are also involved in its assessment and measurement. Within these, the extent of pain experienced can be influenced by factors such as rest and sleep, anxiety and worry, depression, and tension and anger (see Appendix A).

3.4.1 Strengths / Challenges of the Gate Control Theory

Variable relationships between injury and experienced pain

The Gate Control theory, unlike the Specificity theory, considers the relationship between injury and experienced pain. The theory proposes that individuals bring their personal understanding, culture, memories and expectations to their own pain experience (Beecher, 1946; Harper, 2006). With regard to personal understanding, wounded soldiers often have no experience of pain until after their involvement in a battle scene (Beecher, 1946). Beecher argued that the strong emotions of front line soldiers associated with being constantly under fire, seeing their comrades killed and injured, poor nutrition, lack of sleep, and exhaustion all blocked out their pain when initially injured. Studies have found that culture has a major influence on how pain is expressed and the meanings given to it (Harper, 2006).

Gate Control Theory Considers the Multidimensional Aspects of Pain

The Gate Control theory proposes that pain is a multi-dimensional experience that must account for emotional effects and various cognitive factors. Despite the fact that this theory was first proposed in the mid-sixties, its authors argue there are inadequate pain treatments available to those in pain three decades later (Melzack & Wall, 1996). Sufka and Price (2002) maintain that it is generally agreed amongst those who have studied pain that the Gate Control theory of pain mechanisms has had an enormously important influence on pain research, and that it has had a heuristic value in understanding pain mechanisms and the controversial issues about these mechanisms.

The Gate Control theory's main limitation is that is too simplistic but Sufka & Price (2002, p. 81) argue that the Gate Control Schematic 'can be more easily understood by medical professionals and others who have tangential interest in pain mechanisms'.

Since the Gate Control theory was proposed in 1965, researchers have determined that neural circuits controlling pain are more complex than were originally proposed. Over the same period that Gate Control theory was developed, the Behaviourist School advocated that 'pain behaviour' is subject to the same operant processes that controls other behaviour. Pain behaviour may be reinforced, or punished, and as such appropriate interventions may be engaged in pain management/treatment programmes as proposed in the Operant model of pain (Fordyce, 1976).

3.5 Operant Model of Pain

Fordyce (1976) argued that as pain cannot be 'seen' all that can be identified about it is based on verbal and or non verbal communication. Turk and Rudy (1986) maintain that such communications are 'behavioural manifestations' and can be reinforced. Viewed from an evolutionary prospective the operant approach to pain suggests that pain behaviour functions as a communicative tool in the request for help and assistance.

3.5.1 Strengths / Challenges of the Operant Model of Pain

Verbal Reinforcers

Operant based interventions, by way of verbal reinforcers, have been shown to be effective in reducing pain responses (Sanders, 2006). One successful reinforcer targeted in operant pain management/treatment is another's' spoken response (Latimer, 1981; Gil, Ross & Keefe, 1988). Pain reports of individuals who suffer with chronic pain can be significantly reduced by systematically reinforcing positive spoken responses (White & Sanders, 1986). Reports of increased pain severity may not be due to the extent of injury or pain stimuli but due to the fact that behaviours within a pain experience are learnt. Such learnt behaviours are then upheld by operant conditioning (Chambers, Craig & Bennett, 2002; Flor, Knost, & Birbaumer, 2002; Linton & Gotestam, 1985 and Lousberg, Groenman, Schmidt & Gielan, 1996)

The major challenge of this model, although it accounts for the behavioural aspect of the pain experience, is that it does not account for the cognitive or physical perspective. The model is very different from the conventional sensory view (i.e. Descartes Specificity Theory – where injury is considered necessary) and unlike the Gate Control theory, affective, cognitive and to a degree, sensory components of the pain experience are ignored. Nonetheless, the Operant model enables a fresh view of pain and its management. The Bio psychosocial model of pain incorporates physiological, psychological and social aspects but also integrates the behavioural components of the Operant model. This Bio psychosocial model is described in section 3.6.

3.6 Bio psychosocial Model of Pain

The Bio psychosocial model, first proposed by Engel (1977), expanded on the Gate Control theory and incorporated the Operant behavioural model by integrating the medical and physical aspects of pain with the cognitive, emotional and behavioural aspects along with the social and physical environmental features of the pain experience (Gatchel et al. 2007).

The Bio psychosocial model treats disease and illness as two separate entities that interact. Illness is seen as the multifaceted interaction of biological, psychological and social factors. These result in an individual subjective experience in which disease is acknowledged (Gatchel, 2004, Turk & Monarch, 2002). Disease is a biological event, a disorder of particular body organs the cause of which are anatomical, pathological, or physiological changes (Turk & Monarch, 2002; Gatchel, 2005). An individual may be diagnosed biochemically (i.e. results from laboratory tests) as having 'disease' but may feel well and healthy. In contrast, laboratory tests may reveal no 'disease' but the individual may feel unwell. The Bio psychosocial model provides a conceptual framework to understand both situations.

The model accounts for the impact of emotional stress and interaction of other psychological factors on symptom reporting. Waddell (1987, p. 637) argues ‘in order to fully understand a person's perception and response to pain and illness, interrelationships among biological changes, psychological status, and the socio cultural context need to be considered.'

The subjective experience of illness linked to the objective biological and anatomical experience of disease is considered in this model of pain. Illness can refer to how a sick person is as well as how their family members actually react to the symptoms of disease. The differences between disease and illness are comparable to the difference between injury and pain. 'Nociception involves the stimulation of nerves that conveys information about tissue damage (or potential tissue damage) to the brain, while pain is the subjective perception of this conveyance' (Gatchel et al. 2007, p. 582). The conveyance of 'pain' information may be thought of as being *filtered* through an individual's emotional history, present psychological state and cultural influences (Gatchel et al. 2007, p. 583). Ones physical environment also impacts on the pain experience.

The physical environment includes factors such as housing conditions, the weather, physical objects (e.g. beds, chairs etc) which affect a pain experience, ones awareness and ability to cope. The social environment refers to the individuals' relationships with those around them, healthcare providers, family friends, colleagues etc. The Bio psychosocial model of pain is a holistic one where all aspects of pain of the complete person are integrated.

The IASP strongly supports the Bio psychosocial model of pain as it champions integrated approaches and maintains these are most clinically effective for those with chronic pain (IASP, 2009). The IASP proposes that the Bio medical model be replaced by the Bio psychosocial model (IASP, 2009). Psychological treatment must be integrated with other therapeutic components, such as physical therapy and medication management, in order to address all the components which comprise the experience of chronic pain. In line with Burton, Kendall, Pearce, Birrell & Christopher-Bainbridge's (2009) research such interdisciplinary treatment programmes, when compared to uni-modal treatment programmes, or no treatment, have shown long term effectiveness by way of improvement in socioeconomic outcome measures (e.g. return to work, legal resolutions and ongoing medical issues etc.) (IASP, 2009).

3.6.1 Strengths / Challenges of the Bio psychosocial Model of Pain

Holistic and Individual Centred

The Bio psychosocial model of pain has enabled chronic pain to be reconsidered where the physical and social environment of the individual is integrated (Gatchel et al. 2007) and the concept of illness and disease is distinctly separate. This model separates out the physical processes underlying disease and health perception with the impact that pain has on that health perception. The illness thereby addresses the disease or injury *and* the individual's capacity to deal with being ill or injured.

A limitation of the Bio psychosocial model, and all the theories and models examined previously, is that the theory does not consider the variability of meaning extracted from healthcare receivers' self-reports by healthcare providers, family members, or other individuals.

The potential for bias in self-report and misperception on the part of healthcare providers, family members, or other individuals is evident in clinical pain research according to Hadjistavropoulos and Craig (2002). While the Bio psychosocial model focuses on the intrapersonal perspective of pain from both a biological and psychological view it fails to 'adequately address the complex social nature of the phenomenon' (Craig, 2009, p. 23). Neither this, nor any of the theories and models previously examined, account for the influence of the interpersonal social interaction (between persons) and how it can impact on an individual pain experience. Craig's (2009) Social Communication model of pain focuses on this 'social' aspect of the Bio psychosocial model from the interpersonal perspective of the person in pain (the observed) and the person observing that individual (the observer).

3.7 The Social Communication Model of Pain

Craig (2009) suggests that the interpersonal 'social' aspect of pain is a critical component in the assessment and measurement of pain. He maintains the biological, psychological and social perspective of the interaction between those in pain and those present must be considered in order to fully assess a pain experience.

Evolutionary theory considers that pain serves as a protective function; from a primal perspective, self interest underlies the view of another's pain – the warning of danger, the understanding of the consequences of certain actions and observational learning (Craig, 2009). Other interests are altruism, the appreciation of danger for others, intervention evaluation and empathy. The social complexities, when dealing with others in pain and care-giving, are 'particularly well developed' in humans (Craig, 2009, p. 24). This ranges from the care of parents towards their children to widespread health care services (Rasiq, Schopflocher, Tawnzer & Jonsson, 2008).

The Social Communication model includes, in addition to the person experiencing pain, the main caregivers (e.g. family members), healthcare practitioners, and any other who may influence the individual's the pain experience (Craig, 2009). This model is illustrated in Figure 3.2 in which *intra*personal sources of influence are separated out from *inter*personal sources of influence on both the observed and the observer.

According to Craig (2009) pain is not just experienced by the person in pain but in the presence of another person (the observer) it becomes a social phenomenon where the experience of both parties together constitutes the totality of the pain experience. The observed *and* the observer bring influences that bear on the pain experience (e.g. different individuals may impact distinctly on another's experience of pain due to differences in their personal history, biological endowment and/or constraints; their sensitivity, biases, knowledge, professional training and personal judgement) (Craig, 2009).

Interpersonal influences account for the immediacy of the experience constrained by its context and environmental setting; the situational context includes both social and physical components; relationships between individuals and clinical or everyday settings must also be considered (Craig, 2009).

Figure 3.2 illustrates this process. The personal expression of pain, initiated by a physical trauma, in 'The Observed' (associated thoughts, feelings and sensations) is encoded by verbal or physical behaviour. This experience is then decoded, assessed and managed by 'The Observer'.

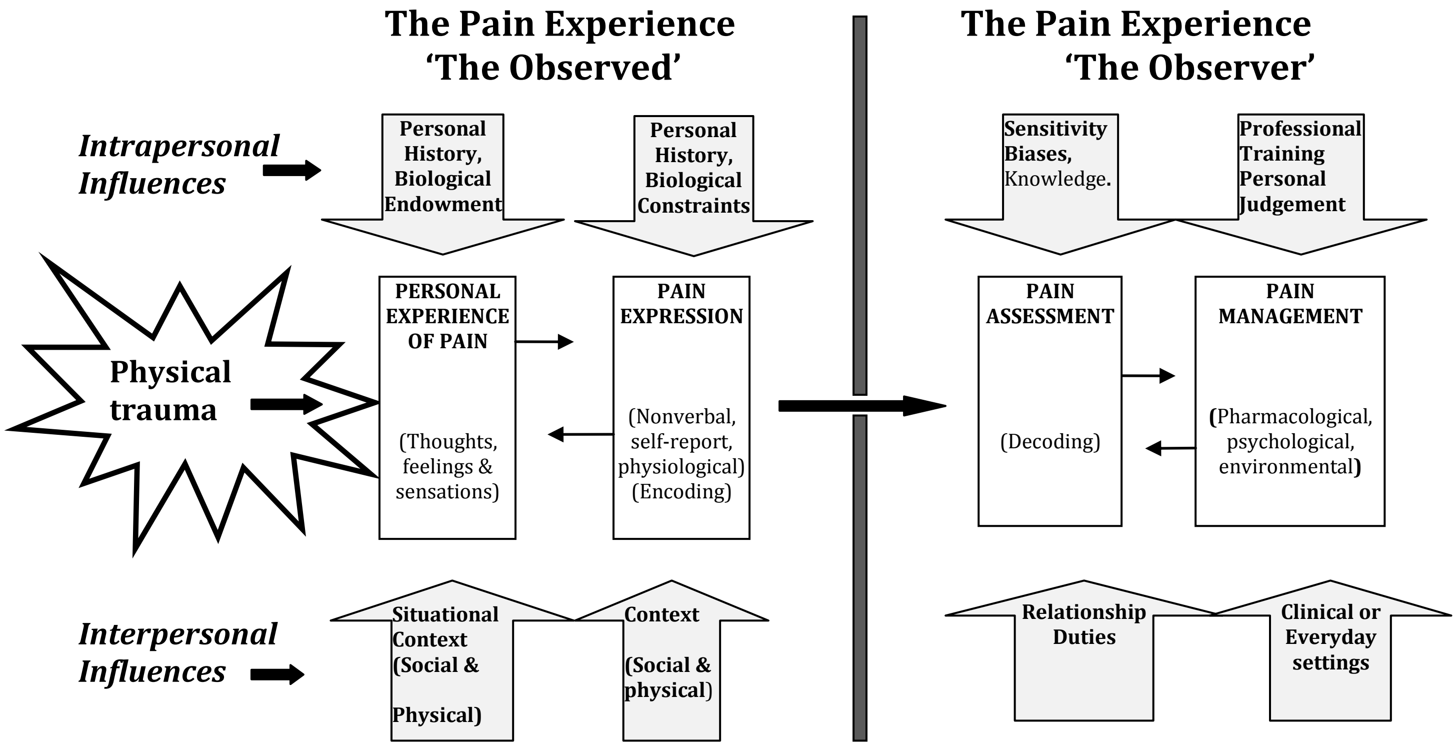

Figure 3.2: The social communication model of pain

'Integrating biological, psychological and social perspectives at the level of interaction between the person in pain and persons present' (adapted from Craig & Korol, 2008, Fig 2-1 p.10*)*

Unlike other vital signs, the measurement of pain is susceptible to bias from *both* the observed and the observer (Craig & Karol, 2008). Subjectivity is a feature for both parties: not only is self-report pain subjective, so too is the estimation of pain by an observer (e.g. a healthcare professional). Marquié et al. (2007) and Marquié, Raufaste, Lauque, Marine, Ecoiffier & Sorum (2003) detected a 'miscalibration' between pain levels reported by healthcare providers and receivers relative to the same pain experience. These researchers found that doctors commonly rate patients' pain levels lower than do the patients themselves and suggested factors such as professional status, gender (in both healthcare receiver and provider) and, in line with Sweeney's 2010 research, perceived *obviousness of the cause of pain* as contributions to this discrepancy.

The interpersonal nature of a pain experience is exemplified in studies that investigate pain tolerance. Individuals endure pain longer when tested by an experimenter of another gender. Highest pain levels are seen for individuals tested by female experimenters (Levine & De Simone, 1991). Levine and De Simone observed that although differences amongst females' pain reports to male and female experimenters were insignificant, significant differences were found between pain reports in genders with females reporting higher pain levels than males. De Simone and Levine concluded that differences appeared to be due to lower levels of pain males reported to female experimenters. No significant differences were found in pain reports from males and females to experimenters of the same gender. This suggests that pain sensitivity differences are not significant, but social context influences its communication.

Kállai, Barke and Voss (2004) revealed gender influences on pain reports and also found experimenter's professional status impacted pain responsivity. Resulting data indicated high professionals (i.e. faculty members in business suits who addressed participants formally) have significantly more authority than low professionals (i.e. student experimenters in jeans/t-shirts who addressed participants informally); also low professionals were rated more likeable. Participant pain endurance was found to be significantly higher in those who reported to high professionals compared to those who reported to low professionals with more participants prepared to endure the pain (i.e. iced water) for the full experimental three minutes. Kállai et al (2004) observed no significant difference within gender in pain threshold, tolerance or intensity ratings contrary to Levine and De Simone (1991) findings. They found that males *and* females endured pain longer when tested by the opposite gender. They also found that female experimenters elicited higher pain intensities for both male *and* female participants. This may be that female gender roles have evolved within the 21st century student population. Another explanation could be possible cultural differences between Kállai et al's (2004) German sample and Levine and De Simone's (1991) American sample. Kállai et al's findings suggest that pain responsivity (i.e. motivation to endure and to report pain) is influenced by the characteristics (i.e. gender, professionalism) of the individual to whom pain is reported.

The Social Communication and the Bio psychosocial models both account for the biological, psychological and the social perspective of pain. The Social Communication model can, in addition, account for the differentiation between the intrapersonal and interpersonal relationships of the observed and observer. These multitudes of factors distinguish this model from other models of pain. This communications framework allows for the understanding of the function of self-report and observational pain measures by considering the context in which individuals in pain suffer, how they are assessed and how their pain levels are measured (Hadjistavropoulos & Craig, 2002).

Hadjistavropoulos and Craig (2002) suggest the experience of the internal state is encoded in specific features of verbal and non-verbal expressive behaviour. An observer uses these behaviours to draw inference about the observed individual's experience (see Figure 3.2). Observers' responses in turn influence the verbal and non-verbal behaviours of the observed and continue in a cyclical manner (Craig, 2009).

In clinical settings there is often a presumption of honesty, creditability and good intent (Hadjistavropoulos & Craig, 2002). The fact that patients with conditions of unknown origin (e.g. non-malignant chronic pain, fibromyalgia, chronic fatigue syndrome) are often distrusted by healthcare providers may reflect the idiosyncratic pain model used by that observer. Patients' credibility and or motives are often questioned if such healthcare providers are directed by the Bio-medical model and there is an absence of an adequate pathophysiological explanation (Hadjistavropoulos & Craig, 2002; Sweeney, 2010).

The interaction between the observed in pain and their observers is fraught with complexities (Craig, 2009). A pain message may be decoded incorrectly due to the observed individual's characteristics that elicit prejudicial attitudes in the observer (Hadjistavropoulos et al. 1996). For example, women and physically unattractive patients, regardless of their subjective pain experience, are more likely to be viewed by healthcare providers, as experiencing more pain than are men and more attractive patients (Hadjistavropoulos, Ross, & Von Baeyer, 1990). When parents, caregivers or clinicians are asked to provide proxy reports estimating pain severity of another, there appears to be a persistent tendency to underestimate the pain of the individual, although occasionally overestimation is evident (Chambers, Reid, Craig, McGrath, & Finley, 1999). For example, 45 patients on a 0-10 scale rated their pain, on signing into a hospital emergency room, as a mean of 4.52 while 48 doctors rated score of these patients was a mean of 3.34 for an obvious cause of pain; pain rating scores for non-obvious cause of pain showed 55 patients rated their pain as a mean of 6.37 and the 48 doctors rated scores of these patients was a mean 4.63 (Marquié et al, 2003). Whether, or not, an observer has professional training, and the extent of their experience, has also been shown to affect the manner in which a pain message is interpreted and decoded (Hadjistavropoulos et al. 2004).

3.7.1 Strengths / Challenges of the Social Communication Model of Pain

The Model considers Interpersonal Influences

The criteria that distinguish Craig's Social Communication model from other theories/models of pain discussed in this thesis is its capacity to account for research data that demonstrates the impact of the physical and verbal social interaction *between* the individual with the pain experience and others may influence the individuals pain experience (i.e. caregivers, healthcare providers, and or family). While the model impacts on the evaluation of the efficacy of existing tools for the assessment and measurement of pain it does not offer recommendations as to how pain communication interaction between individuals could be improved especially the observer's assessment, the 'decoding', of the observed pain expression (see Figure 3.2).

The theories and models of pain examined in this chapter are briefly summarised in Figures 3.3. These briefly outline key strengths and challenges to each theory and model discussed in this chapter. As previously stated, recent pain theories and models consider issues not addressed in preceding theories and models while other theories and models co-exist on a parallel. Figure 3.3 is followed by a textual summary of this chapter.

Theories & Models of Pain	Brief Outline	Strengths	Challenges
Descartes' Specificity Theory	Pain experience severity directly correlates with extent of associated tissue injury.	Can be correct for a particular type of injury and associated pain.	No variance in pain experience and injury between individuals; variance in pain experience and the immediate environment; phantom limb pain experience; surgery under hypnosis; the psychological or the social aspects of the pain experience.
Biomedical Model	The biomedical model pain accounts for pain as being solely explainable and treatable in biological or medical terms. This model of pain is rooted in Descartes philosophy of the mind-body dualism (www.unc.edu) i.e. the conceptualisation of mind and body as separate entities.	Many patients are successfully treated and relieved of pain using this model but only for particular types of injuries and relevant acute pain	Despite advances in medication and surgical interventions many patients remain in chronic pain. This model does not consider psychological, social or cultural elements.
Gate Control Theory	This theory suggests a neurological 'gate' in the spinal cord. This gate blocks pain signals or allows them to proceed to the brain. Pain signals travelling via small nerve fibres' go through the 'gate', The gate is closed to signals sent by large nerve fibres.	Accounts for psychological aspects of the pain experience. Accounts for how stress, excitement, and vigorous exercise may encourage endorphins (endorphin impact is why a sprinter may not notice serious pain from an injury until the important race is completed and why regular low key exercise such a riding a bike can be a good method to control back pain. Accounts for how non-harmful stimuli can sometimes increase or decrease pain. Cognitive therapy, including outside interests, thoughts that enable coping can distract individuals from some types of pain (e.g. chronic pain). Emotional factors are also implied in this theory. .	The Gate Control Theory is limited in that its views are too general. It describes that pain messages can be 'gated' by physical, emotive and cognitive related neural activity but does not expand on the description. From a physical perspective the complexity and magnitude of the dorsal horn CNS interactions and the endogenous pain systems, as seen in electrical stimulation, just cannot be quantified (Sufka & Price, 2002). The quantitative aspect of this model of pain is vital for identifying the relative effect of various pain-reducing treatments. It does not involve the interpretation of the pain experience other than the individual with the pain experience.

Figure 3.3: Summaries of Theories & Models of Pain - Strengths and Challenges

Theories & Models of Pain	Brief Outline	Strengths	Challenges
The Operant Model of Pain	'All that can be known about pain is based on verbal or nonverbal communication behavioural manifestations and are subject to reinforcement' (Turk & Rudy, 1986).	Operant based interventions, by way of verbal reinforcers, have been shown to be effective in reducing pain responses (Sanders 2006).	This model does not consider the cognitive or physical/sensory aspect of the pain experience
Bio psychosocial Model of Pain;	Biological, psychological (i.e. thoughts, emotions, and behaviours), and social factors, are vitally important in the context of disease and illness. The combination of biological, psychological, and social factors represent a holistic view of health.	'Illness' and 'disease' are separated out and both viewed from different prospective; The model is holistic where all aspects of an individual's pain are considered and treated.	This model does not consider the variability of the meaning extracted from that self-report by healthcare providers, family members, or other individuals. The potential for bias in self-report and misperception on the part of observers is evident in clinical pain research according to Hadjistavropoulos and Craig (2002).
The Social Communication Model of Pain.	This model highlights the biological, psychological and the social interpersonal perspective between the observed and the observer. The *intra*personal influence on both the observed and the observers is also considered.	In addition to the strengths of the bio psychosocial model of pain, the inclusion and influence of persons other than the individual experiencing pain (i.e. caregivers, healthcare professions, family members or others) is considered. Physical and verbal social interaction between individuals is considered from an *inter*personal and *intra*personal perspective.	

Figure 3.3: Summaries of Theories & Models of Pain - Strengths and Challenges (cond.)

3.8 Summary

The 17th century Descartes' Specificity theory of pain influenced pain perception, treatment and management up until the late 20th century (Aydede, 2005). Once it was accepted that the relationship between tissue and actual pain report was not directly proportionate, the influence of the theory lessened. Within the Bio medical model, which developed from the Descartes philosophy of the mind/body dichotomy, the association of physical functioning and disease, as a result of physical causes such as injury and infections, remains dominant (Hadjistavropoulos & Craig, 2002; Sweeney, 2010). This is despite Melzack & Wall's (1965) Gate Control theory that considers psychological factors.

Melzack and Casey (1968) stress how sensory, affective, and cognitive aspects are important in the attempt to understand an individual's pain perception. They also stressed the importance for the health provider to consider psychological factors within the pain experience; that is how a patient's individual feelings and pain assessments affect their life with pain, including their physiological functioning. Within the Operant model of pain (Fordyce, 1976) the behavioural components of the pain experience were considered with a focus on behavioural interventions as a pain management/treatment plan.

In the later 20th century, psychological factors, which had previously been disregarded and ignored within the Gate Control theory, became an integral part of pain research with the Bio psychosocial model of pain. This model provides a framework within which to understand the complex relationship between injury/pain stimuli and an individual's pain experience. Attitudes and beliefs of patients are considered with regard to their understanding of their individual situation and circumstances. Patient behaviour can draw out others' responses which in turn can reinforce adaptive, and maladaptive, ways of thinking, feeling and behaving. The Social Communication model of pain accounts for this interpersonal component of the pain experience. This is in addition to the intrapersonal component already catered for in the Bio psychosocial model. This Social Communication model maintains that pain communication is a two way process which can be expressed via different modalities (Craig, 2009).

Patient behaviour can elicit responses from others (family, colleagues etc) that can reinforce both adaptive and maladaptive ways of thinking, feeling and behaving. The Social Communication model of pain accounts for this interpersonal component of the pain experience. This is in addition to the intrapersonal component already catered for in the Bio psychosocial model. This Social Communication model maintains that pain communication is a two way process which can be expressed via different modalities (Craig, 2009).

Craig (2009) argues that pain related social interaction requires social sensitivities and skills if inferences about another's pain are to be accurate. Making judgements about a pain experience requires more than a measure, as information with regard to physical pathology, current life circumstances, and reports of significant others, and physiological information also needs to be accounted for (Hadjistavropoulos & Craig, 2002). This model is more advantageous than previous models when considering pain measurement as it accounts for the variance between the individual in pain and the individual who is observing and assessing the pain being experienced.

3.9 The Issue to be Addressed

Contemporary pain measurement tools do not reflect the impact of the objective, subjective and social factors as presented in the theories and models of pain in this chapter. Most discussion on the assessment of pain focuses on pain intensity per se and does not capture the complexity of the experience (i.e. emotional responses, variety of cognitions and judgements etc.) (Hadjistavropoulos, Hunter & Fitzgerald, 2009). A comprehensive psychological assessment of a pain experience, in addition to pain intensity, should consider and focus on the social context of the observed (e.g. social support systems, stress points, coping strategies etc) and also on the observer (e.g. idiosyncratic pain model subscribed to, pain history, professional expertise etc).

The next chapter (Chapter 4) will explore and evaluate contemporary and current pain assessment instruments and their capacity to meet assessment criteria that derive from the models and theories of pain examined in Chapter 3.

4. PAIN MEASUREMENT

4.1 Overview & Introduction

4.1.1 Overview

This chapter introduces the concept of pain assessment and measurement. It then explores the basis for research into pain control methodology, in conjunction with pain detection. Commonly used contemporary pain measurement tools will also be examined and their strengths and limitations outlined (summarised in Figure 4.1).

This thesis has argued that the efficacy of pain assessment techniques are constrained in part by the theories that motivate their development and that contemporary and commonly used pain assessment techniques cannot address the complexities of the social communication model of pain. This chapter will describe how knowledge of psychophysics; specifically the psychophysical statistical analysis of Signal Detection Theory (SDT), can be used to develop a pain measurement tool capable of reflecting *all* of the pain theories described, including the Social Communication model of pain.

4.1.2 Introduction

Experimental and analytical technique development relative to pain, with regard to sensation measurement (based on participants' responses) has gone hand in hand with theoretical advances in pain measurement (Massaro, 1975). This has facilitated the assessment of unobservable psychological experiences but there still remains difficulty in the objective measurement of pain, as pain, by its very nature, is a personal and subjective experience. It is difficult to quantify pain verbally. This is true of both the observed and the observer. According to Knudsen, Aass, Fainsinger, Caraceni, Klepstad & Jordhoy et al. (2009) there is no generally accepted pain classification based on an individuals' pain perception. 'The same lack of standardisation is true of physiological parameters; pain has come to be viewed as a subjective phenomenon with many features' (Noble, Clark, Meldrum, Henk ten Have, Seymour, Winslow et al. 2005, p. 5). Melzack (1983) refers to the relentlessness intensity of pain as "the salient dimension of pain".

An attempt in pain classification is made by the categorisation of various pain descriptors such as 'shooting', 'fatiguing' and 'unbearable' seen in different verbal pain rating scales and questionnaires (Melzack & Torgeson, 1971). These descriptors are in line with Melzack & Wall's Gate Control theory of pain which combines the medical approach of previous theories with the psychological aspect of the pain experience, and also considers biological *and* psychological factors (Horn & Munafo, 1997). Such descriptors reflect the sensory, affective and evaluative aspects of the pain experience. In conjunction with these pain descriptors, Numeric Pain Rating Scales (NPRS) are widely utilised in pain assessment (Hartrick, Kovan & Sapiro, 2003). There is often little correlation between the pain judgement of the observed and the observer with regard to the same pain experience (Craig, 2009) despite the variety of pain measurement tools available to the individual with the pain experience (aka the healthcare receiver, the patient) and the observer (aka the healthcare provider, primary care giver, family member etc.). In other words, the individual with the pain experience pain and their observer may be seriously 'out of tune' with each other. This can lead to treatment mismanagement and under or over analgesic action.

Since the development of the Gate Control theory in the mid sixties, and the Social Communication model of pain in 2009, there is an increasing awareness of the many factors that account for a pain experience. It is now recognised that medical, physical, cognitive, emotional, and behavioural components, along with the physical and social environment, in addition to the interaction between the observed and the observer all contribute to the perceived mildness, or severity, of an individual's pain experience.

Psychophysical models and techniques such as SDT have existed since the 1950s (Allan & Siegel, 2002). SDT provides a framework that is capable of supporting the multitude of factors that contribute to pain experience highlighted in Craig's (2009) Social Communication theory of pain (including social influence between observers and the observed). Yet pain assessment and measurement tools have not, to date, utilised the full power of SDT. Existing pain measurement instruments fail to accommodate the social interaction between observed and observer and what the observer brings to the observed pain experience.

Research has shown that the under, and over, estimation of pain is common by both parties (i.e. observed and the observer) (Hadjistavropoulos et al. 1990 Hadjistavropoulos et al. 1996; Chambers, Giesbrecht, Craig, Bennett & Huntsman, 1999; Hadjistavropoulos & Craig, 2002; Hadjistavropoulos et al. 2004; &

Sweeney, 2010). Healthcare providers, in theory, have to rely on and put trust in their patient's self assessment of their pain, yet the evidence would consistently suggest that this is not always the case (Davies & McVicar, 2000).

Nurses do not always accept, or act upon, patient's self-reports of pain; consequently the implementation of therapeutic pain control is not always appropriate to patients' pain ratings (McCaffery & Ferrell, 1997). Studies that compare the observed and the observer ratings of individual's pain experience highlight disparities in the paired assessments. The Nurse's Visual Analogue Scale (VAS) pain ratings correlate generally with patients as a group (see Section 4.3.1 for full description of VAS), but Grossman, Sheider, Swedeen, Mucenski and Piantadosi (1991) found that individual agreement was poor: seven percent of nurses agreed with a VAS of 7-10 (severe pain), yet 82 percent agreed with scores of 0-2 (mild pain). It appears that current pain assessment and measurement tools either do not have adequate validity or there are serious inconsistencies in how nurses and their patients approach pain perception from their different perspectives (of a healthcare receiver and a healthcare provider). The key pain measurement tools presented in this chapter are pain intensity rating scales (visual, verbal and numerical), multidimensional questionnaires, using standardised descriptors and psychophysical methodology. These tools have not necessarily evolved chronologically but occupy overlapping time periods and can be seen as 'mutually reinforcing, often conflicting and occasionally complementary' (Noble et al, 2005, p. 5).

4.2 Pain Measurement Incongruity

Research has shown significant variance in pain report of the same experience between the observed and observer (Marquié, et al. 2003) recommending that pain judgement and ratings should be interpreted by considering pain behaviour, and health literacy, etc (e.g. MacLeod et al. 2001; Marquié et al. 2003; and Kappesser, et al. 2004; 2006). Health literacy, as stated in Chapter 2, section 2.3.5, is the capability to ask for, understand and make use of health information (Briggs et al 2010). There appears to be less examination of this recommended interpretation and how that might additionally, or alternatively, be a source for bias and error in resulting data. Pain self-report is subjective and the estimation of a pain experience and the interpretation of self-report data by a healthcare professional is also subjective as seen in Marquié et al's, (2003) study. Their study recorded emergency room arrival and discharge VAS pain ratings from 200 patients and 48 doctors. They found doctors with more expertise underestimated patients' pain to a greater extent when compared to novices. The extent of underestimation varied depending on the doctors gender, and whether the patients cause of pain was obvious or not (i.e. laceration, broken leg vs. disease not immediately detectable or visible). This research indicates that pain ratings by healthcare providers are influenced by non-medical factors (e.g. gender, obviousness of pain). These findings are supported by similar research (Hodgkins, Albert & Daltroy, 1985, and Todd, Lee & Hoffman, 1994). Craig (2009) also reports instances of pain report incongruity between healthcare receivers and providers.

There are three basic approaches to pain measurement; these are self-report, observational and physiological (Walco, Conte, Labay, Engel & Zeltzer, 2005). These approaches generally positively correlate. Walco et al observed a high degree of consistency within self-report, behavioural, and physiological parameters in 48 children between 3-18 yrs with cancer while undergoing lumbar punctures. Puntillo, Miaskowski, Kehrle, Shannard, Gleeson and Nye (1997) found moderate-to-strong correlations between behavioural and physiological markers and nurses ratings of pain intensity; patients' self-report intensity pain ratings were higher but not significantly so. Notably, correlations were more often seen between the amount of analgesic administered and nurses' pain ratings than with patients' own pain ratings. Labus, Keeffe and Jenson (2003), utilizing meta-analytic techniques[2], when examining 29 studies, found an effect size (and 85 effect sizes) revealing a moderately positive association (z= .26) between self report and behavioural observations of pain intensity. Labus et al. concluded that direct observations of self report and pain behaviour were more likely to be significantly correlated when those with acute pain were studied (z= .35) compared to those with chronic lower back pain (z =.30).

These approaches, and the associations found between them, have informed the use of an 'observational' approach with vignette characters as patients in the methodology in this thesis.

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[2] 'Combination of findings from a number of studies to determine whether significant trends emerge; a computed weighted mean is identified with more weight given to some studies and less given to others. For example, weighting might be related to sample size. More generally there are other differences between the studies that need to be allowed for, but the general aim of a meta-analysis is to more powerfully estimate the true "effect size" as opposed to a smaller "effect size" derived in a single study under a given single set of assumptions and conditions'. (Reber & Reber, 2001, p. 432).

4.3 Pain Measurement Tools

It is important to quantify an individual's perception of pain. When an individual feels their pain can be 'measured', it gives them a sense of control and impacts positively on their coping abilities (Cork, Isaac, Elsharydah, Saleemi, Zavisca & Alexander, 2004). Pain measurement also provides the means by which to assess treatment efficacy, and prognosis of the patient (Cork et al. 2004).

There are many standard pain assessment tools in contemporary use employed by clinicians and healthcare workers in various settings. These comprise of visual analogue scales (VAS), verbal pain rating scales (VPRS) and numerical pain rating scales (NPRS).

Knudsen et al. (2009) in their study of pain experienced by cancer sufferers, reviewed available pain assessment tools. Their analyses failed to identify a pain assessment instrument that could adequately address the entire major pain domain for palliative care patients. Jenson (2003) and Holen , Hjermstad, Loge, Fayers, Caraceni, De Conno et al. (2006) maintain that for the ongoing monitoring the domain of pain intensity, a NPRS, a simple VAS, or VPRS is appropriate. On the other hand, tools to assess other major domains have been found to be lacking (Jacobson, Møldrup, Christrup, & Sjøgren, 2009). Jacobson et al. in support of the Social Communication of Pain model, mention patients' pain communication, and their pain medication management compliance.

Most frequently used methods for assessing and measuring pain are the VAS, the VPRS, and the NPRS (Jenson & Karoly, 1991). These basic pain assessment tools in common use are comprehensively discussed with their strengths and limitations explored in section 4.3.1.

4.3.1 Visual Analogue Scales of Pain Intensity (VAS)

The VAS measures acute and chronic pain and has been validated in several studies (Katz & Melzack, 1999; Carlsson, 1983; Scott & Huskisson, 1976). A VAS comprises of a 10cm line, with start and end points of *no pain* and *the worst pain* as illustrated in Figure 4.1. A VAS may also have specific labels with intensity denoted by numbers or adjectives and these are referred to as Graphic Rating Scales (GRS).

Figure 4.1: Visual Analogue Pain Rating Scale

When applying the VAS, individuals indicate which point on the line best indicates their pain level. The length from the *no pain* (i.e. start point) to the mark made by the individual is scored as their particular pain level. The scale is measured in millimetres (1 – 10) and so is considered to have 101 points. Research has found that VAS directly correlates with other pain measures (by self-report) (Downie, Leatham, Rhind, Wright, Branco & Anderson et al. 1978; Elton, Burrows & Stanley, 1979; Jenson, Karoly & Harris, 1991; Jenson, Karoly, O'Riodan, Bland & Bynes, 1989; and Zimmerman, Duncan, Pozehl & Schmitz, 1987) and pain behaviour (Walsh, 1984). The large number of response categories (i.e. 101 mm points) enables a greater sensitivity to pain intensity changes than measures with more limited numbers of response categories (Jenson & Karoly, 1991). VAS's of pain intensity are usually (but not always) more sensitive to treatment change than are the four or five point VPRS (Joyce, Zutshi, Hrubes & Mason 1975).

VAS for specific populations

Communication skills may vary between different populations (e.g. age, gender, cognitive abilities etc). There are difficulties when assessing pain in younger individuals (i.e. infants and children), and those who cannot effectively communicate. The Paediatric Pain Scale (Wong & Baker, 1988) VAS is commonly used with children and is also appropriate for adults. Figure 4.2 illustrates this pain scale.

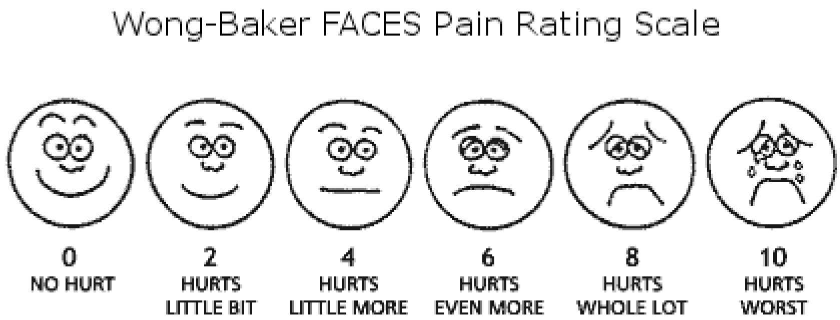

Figure 4.2: VAS Wong Baker FACES pain rating scale

'Smiley'FACE pain scale used in Chambers & Craig's (1998) study to investigate children's response to various pictorial pain scales

The Wong and Baker Faces Pain Scale (WBS) combine pictures and numbers with faces that include a smiling face that represents no pain to a sad/crying face that represents the worst pain. The WBS has already been validated in many studies for chronic and acute pain. In determining a relationship between the VAS and the WBS, the WBS been validated for children presenting to an emergency department by the association of VAS mean values for each face of the WBS (Garra, Singer, Raira, Chohan, Cardox & Chisena et al. 2010).

Strengths & Limitations of Visual Analogue Scales of Pain Intensity (VAS)

WBS Scale

The WBS does not comprise of difficult words, abstract visual concepts, or numerical values, so it is appropriate for children and for those who have cognitive difficulties with literacy/numeracy. The WBS correlates well with other self-report measures (Spafford, von Baeyer & Hicks, 2002) and is rated highly by parents and nurses (Chambers et al, 1999). Tomlinson, von Baever, Stinson & Sung (2010) found the WBS quick and easy to use, incorporates adequate psychometric properties, is inexpensive to reproduce, and its greatest strength is its wide acceptability, being preferred to all other faces pain scales by children of all ages, parents, and health practitioners.

It should be noted that the WBS is used in conjunction with a numeric pain rating scale. This may be more for the benefit of clinicians/medical practitioners' benefit for scoring purposes than for individuals using the scale for pain assessment. Face pain scales are essentially visual but they are most often an amalgamation of a VAS and a NPRS and not the conventional visual analogue scale.

Visual Analogue Scales are limited by a number of factors which include:

Comprehension of an Abstract Concept

The VAS is restricted by the fact that the scale can present difficulties for some patients as it requires comprehension of the abstract concept of the VAS line (Jensen & Karoly, 1991) and some individuals may not understand how to rate their pain when presented with a straight line. Nearly a fifth of all patients cannot complete a VAS and find it confusing (Woods, 2004). The VAS requires the ability to relate pain intensity as a distance from the start point of zero. The line (most often 10 cm.) is the response range, and some might find it hard to relate a distance on paper to their pain perception with accuracy.

Practical Requirements

The VAS requires the use of a pen and paper, consequently in a clinical setting there may be practical limitations of this method of pain assessment. Best use of a VAS is a complicated process and requires a certain level of cognitive skill making is unsuitable for those who are very ill, have physical, visual, or cognitive difficulties, those with impaired consciousness and those who have difficulties with the language used (Rowbotham & Macintyre, 2003).

Data Analysis

Despite the fact that VAS scores can be treated as ratio data, scoring involves more steps than other measures (Jensen & Karoly, 1991). This type of data analysis requires more time expense than analysis of data obtained from a numeric rating scale and adds an additional source of error (Ferraz, Quaresma, Aquino, Atra, Tugwell & Goldsmith, 1992).

One Dimensional Measure

A pain rating of '7' on a 0 to 10 VAS scale is only one aspect of a single dimension of pain despite Breivik, Borchgrevink, Allen, Rosseland, Rolmundstad & Breivik-Halls et al's (2008) assertion that acute pain can be reliably assessed with one-dimensional NPRS or VAS tools. No information with regard to how the pain has changed over time or the distress caused to the individual about this level of perceived pain is revealed with the use of this scale. The VAS does not reflect multiple dimensional pain measures, as required by Kehoe et al's (2007) 'profile' of pain (i.e. assessment of distress of pain, physical pain, influence on sufferers, and levels of social impairment). Nor can the VAS gather evidence for Jensen and Karoly's (1991) specific subjective pain factors that comprise the various dimensions of chronic pain (i.e. pain affect, pain relief, and pain quality), with the exception of pain intensity. Compared to the VAS the VPRS is easy to assess, and can be performed without the need of pen and paper.

4.3.2 Verbal Pain Rating Scale of Pain Intensity (VPRS)

A VPRS consists of adjectives that describe varying degrees of pain severity reflecting two extremes of pain (e.g. from *no pain* to *the worst pain*); sufficient adjectives should be available so individuals can indicated the intervening extent of pain experienced. VPRSs are scored by listing the descriptive adjectives by pain severity. Each descriptive scored dependent on its rank (e.g. *no pain* =0, *mild pain* =1, *moderate pain* =2, *severe pain* =3, and *very severe pain* =4 etc). The number associated with the descriptor chosen reflects the pain intensity score.

Strengths & Limitations of Verbal Rating Scales of Pain Intensity (VBRS)

Reduced Measurement Bias compared to the VAS

There is less measurement bias in the use of VBRS when compared to the VAS (Gracely, 1992). Individuals choose a pain descriptor based meaning rather than the scale location (e.g. the point nearer to *least painful* or *most painful*) in their engagement with a VBRS which results in a decrease in measurement bias (Gracely, 1992).

Ease of Use and Comprehension

Verbal rating scales can be administered with ease as they are generally understood and may be less stressful than written responses when in the middle of a pain experience. Consequently, 'compliance rates for VPRSs are as good as, or better than, those obtained for other measures of pain intensity under most conditions' (Gracely, 1992, p. 298).

Verbal Rating Scales suffer from a range of limitations which include:

Individual Difference in Semantic Understanding of Pain Descriptors

The equal intervals in the rank scoring of the VPRS do not necessarily reflect individuals' subjective understanding of the pain descriptors used. For example although individuals may perceive the degree of pain intensity between pain levels in different ways, intervals are scored as if the differences are the same. A change on a five point scale might reflect a 10 percent or a 60 percent change. This would depend how the individual perceives the interval as represented by the pain descriptors. VPRS scores may then represent 'average' pain intensity amongst individuals rather than a score for one particular individual.

Data Analysis

Data obtained from VPRS signify *ordinal* (ranked) data. However, VPRS scores are frequently treated as *interval* data (i.e. the difference between a 2 and a 3 is viewed as the same as that between a 3 and a 4) or *ratio* data (i.e. interval data with a true zero point) and analysed by parametric, rather than nonparametric, statistical techniques (Jensen & Karoly, 1991).

Linguistic Difficulties

Verbal Pain Rating scales may be difficult for those with limited vocabulary or cognitive difficulties, and may have too few response categories, or too many, compared to the VAS or NPRS. The scale may not be presented in the individual's first language or the pain descriptors may not be within their vocabulary of understanding.

Forced Choice

Individuals may feel constrained when forced to choose one word or phrase whether or not they feel that word or phrase describes their particular pain intensity.

4.3.3 The Numeric Rating Scale (NPRS)

Individuals are asked, on the presentation of a NPRS, to rate the intensity of their pain on an 11 point scale (0 – 10 called the NRS-11), or on a 101 point scale (0 – 100 called the NRS-101), with the understanding that 0 represents *no pain*, and 10, or 100, *pain as bad as it can be*. NPRS's are extremely easy to administer and score (can be treated as ratio data), and widely used by clinical practitioners for the assessment of pain (Hartrick et al. 2003). Their use is applicable to a wider population than the VAS (i.e. geriatric and young patients) (Murphy, McDonald, Power, Unwin, MacSullivan, 1988). According to Jensen, Karoly & Bravers (1986, p. 199) 'the simplicity of the measure may be one of the reasons for the high rate of comparative compliance with the measurement task'. When more sensitivity to changes in pain intensity is required, the NPRS-101, as opposed to other measures with fewer response categories, may be used. Verbal pain descriptors, such as those from the Melzack's McGill Pain Questionnaire (1975), are typically incorporated into its instructions for use (Melzack's MPQ is discussed later in this section). Such instruction are outlined in an example of an NRS-11 used in a local hospital (July 2008 – St. John's Hospital, Limerick) shown in Figure 4.3.

0	1	2	3	4	5	6	7	8	9	10

No Pain The Worst Pain

'Discuss pain as a broad concept that is not restricted to a severe and intolerable sensation, for example: "Pain refers to any kind of discomfort anywhere in your body. Pain also means aching and hurting. Pain can include ***pulling, tightness, burning, knifelike*** *and other unpleasant sensations".'*

Figure 4.3: Numeric Rating Scale (NRS-11).

TEACHING THE PATIENT/FAMILY HOW TO USE A PAIN RATING SCALE

St. John's Hospital, Limerick - for patient use on discharge (July 2008).*

Visual Analogue Score/Pain Assessment Scale *Taken from McCaffrey & Pasero, p.74, 1999.

Strengths & Limitations of Numeric Rating Scales of Pain Intensity (NRS)

An advantage of the NPRS, similar to the VAS and VPRS, is that it is easy to administer, straightforward to score and compliance with the measurement task is high. The NPRS-1-101 (with 101 response options) can be more sensitive to differences between categories than the NPRS1-11 (11 response options). Although the NPRS can be used to measure pain intensity over various time intervals, individuals may remember the number they chose previously thereby biasing and influencing their response of current pain intensity. Average (group) scores are not automatically treated as ratio data.

The strengths and limitations of each of these pain assessment scales are summarised in Figure 4.4.

Pain Measurement tool	Brief Outline	Strengths	Limitations
VAS Visual Analogue Scale	Individuals are asked to indicate on a 10cm line, distance from start point to indicated point used to measure pain levels on an intervals; extreme pain descriptors are shown at each end of the line; Wong-Baker FACE pain scale is an amalgamation of VAS and NPRS.	▪ Quick and easy to administer; ▪ Can be used to measure pain intensity at intervals, unlike the VPRS and NPRS, location of previously drawn cross less likely to be recalled reducing evidence practise bias in current reporting of pain intensity; ▪ Many ('infinite') response categories; ▪ Good evidence for validity; ▪ Correlates with other self-report measures.	▪ Scoring is complex, source of error; ▪ Evidence has shown that some children and older people have difficulty using VASs (higher failure rates); ▪ Requires motor control; ▪ Requires abstract concept of VAS line; ▪ Only measures one dimension of pain experience; ▪ Does not allow for the perspective of the observer to be considered.
VPRS Verbal Pain Rating Scale	Adjectives that describe different pain levels are presented to patients who are asked to tick the box that best indicates their pain level which are then scored (least painful = 0, most painful = 5). Highest scores reflect more intense pain.	▪ ; Quick and simple to run ▪ Simple to score; ▪ Evidence based validity; ▪ Compliance with measurement task is high (few failures); ▪ Descriptors can be presented randomly, less bias of any scale location if assessment repeated.	▪ Can be hard for those whose vocabulary is limited; ▪ Less response categories than VAS or NRS; ▪ No ratio qualities in scores when scored with ranking method ▪ Choice if forced if there is no adequate pain descriptor on the scale. word forced; ▪ When measuring pain over time, patients may remember adjectives/pain descriptors used and bias new pain report; ▪ Small scale may not detect subtle changes in pain levels; ▪ Does not allow for the perspective of the observer to be considered.
NPRS Numeric Rating Scale	Patient rates their mildness/severity of their pain (i.e. between 0 (no pain) and 100 (severe pain)). Highest scores indicate more severe pain.	▪ Quick and simple to run; ▪ Simple to score; ▪ Suitable for most populations; ▪ Evidence based validity; ▪ High compliance with measurement task (i.e. few failures); ▪ Can be used to measure pain intensity at intervals over time; ▪ Many ('infinite') response categories.	▪ Average (group) scores may not automatically be treated as ratio data; ▪ pain ratings over time may be influence reports of previous pain intensity similar to VPRS; ▪ Limited number of response categories if the NPRS-11 is used; ▪ NRS-11 may be less sensitive to treatment effects than VASs ▪ One dimensional – used for intensity of pain only; ▪ Does not allow for the perspective of the observer to be considered.

Figure 4.4: Synopsis of the 3 basic Pain Rating Measurement Tools Strengths and Limitations

4.3.4 VAS, VPRS and NPRS – Conclusion

The three pain rating measurement tools examined in these preceding sections show assorted strengths and limitations in their usefulness.

Various studies have found these three tools demonstrate good evidence of validity (Teo, Tan, Lim, Tan, & Yee, 2011; Mohan, Ryan, Whelan & Wakai, 2010). Teo et al. (2011) reviewed one-dimensional pain assessment tools (i.e. visual analogue scale, numerical pain rating scale, verbal descriptive scale and the Wong-Baker Faces scale). Teo and her colleagues found positive correlations between all tools, and concluded the three pain assessment tools are valid measurements of pain intensity. These findings were consistent in all studies that Teo et al. (2011) reviewed, and included medical and surgical disciplines (i.e. emergency departments; post surgery; orthopaedic; oncology) with different ethnic groups.

A number of the studies reviewed illustrated patient preference for particular pain rating scales (Teo et al, 2011). Although the VAS was used as the gold standard, or validated reference, the majority of patients found VAS difficult to understand. Surgical patients particularly found VAS physically problematic. Teo et al. (2011) found NPRS's to be the preferred and easiest pain assessment tool amongst patients but found the WBS was the preferred tool when all three one-dimensional scales were compared. In support of Teo et al's (2011) findings Mohan et al (2010) found agreement between VAS and verbal NRS pain ratings in an Irish emergency department.

Mohan et al's (2010) study sought pain ratings from 123 emergency department patients on arrival and every 30 minutes for two hours afterwards, using both VAS and verbal NPR scales. They found strong correlation between scales and found age, gender, and education level influenced that correlation. Older female patients, in addition to those with third level education, who expressed a preference, were more likely to prefer a verbal NPRS rather than the VAS.

Although this body of evidence illustrates the VAS, VPRS, and NPRS validity, there remains limitations to their use (see Figure 4.4 Strengths and Limitations of VAS, VPRS and NPRS). The incorporation of specific features from each tool can result in better pain assessment, from both the healthcare receiver and healthcare provider's perspective. For example, the WBS combines the visual and numerical and is the preferred pain scale for many, combining the strengths of both scales. This amalgamation is especially beneficial for those patients for whom other pain scales may represent cultural and, or, linguistic differences. Narayan (2010) found that differences in culture and language significantly impact pain assessment with minority patients and health providers. Health providers are challenged when dealing with those in pain from different cultures and whose first language is different from them.

There will always be an issue with what pain assessment scales measure as pain is subjective and co-variance between the scales is not typically considered in resulting data. This highlights the need for a pain assessment tool that will measure, from a third party perspective, whether pain is perceived or not, in a situation where there is no pain experienced. This would enable an accurate calculation of pain perception probability when there is pain experienced. Amalgamation of the mentioned strengths, along with the incorporation of communicative pain descriptors and with the use of a SDT framework for data analysis, (examined later in this chapter) will be shown to enhance pain detection and measurement and to result in a sensitive and powerful pain measurement tool.

4.4 Communication: The Language of Pain

Harper (2006) argues that culture has a major influence on how pain is experienced and linguistically expressed (see section 3.4.4). Keesing (1981) maintains that although language generally allows for intra-cultural communication, it can be inadequate when communicating a personal and subjective pain experience that is complex and challenging to quantify from a qualitative or quantitative perspective. This communication inadequacy may result from the dissimilar semantic understanding of pain descriptors within different cultures. Language inadequacy, in the expression of pain, is evidenced by the metaphorical manner pain is typically expressed despite the fact that similar words describe pain experiences in almost every pain assessment across different languages (Melzack, 1973). The taxonomy (i.e. linguistic classification within a particular topic) and metaphors for pain, particularly in western society, are frequently associated with weapons and aggression and may involve terms that cause damage to the body (i.e. gnawing, splitting, and stabbing etc).

Harper (2006) examined pain behaviour in the Royal Air Force in the United Kingdom and observed that pain expressions were often within the classes and subclasses as detailed by Melzack and Torgenson (1971); words such as shooting, stabbing, and hot (sensory); fatiguing, exhausting, and frightful (affective); and discomforting, unbearable and killing (evaluative) as found in the McGill Pain Questionnaire, the original (MPQ – Appendix B) (Melzack, 1970) and the short form (SF-MPQ – Appendix C) (Melzack, 1984a). These expressions are not restricted to military environments and according to Morris (1991), they are part of the general language, as used in current western culture during the experience of pain and when in distress.

4.4.1 Melzack's MPQ (McGill Pain Questionnaire)

Melzack developed a new approach to pain description and measurement during his pain clinics in 1953. He observed particular pain descriptors were regularly used for different pain syndromes by a wide range of patients from widely divergent backgrounds (Melzack 1993). He was initially unable to categorise these words as, at that time, pain was deemed to be a sensation as

Descartes Specificity theory of pain was still dominant (Chapter 3, section 3.2). Affective and emotional words used in Melzack's pain clinics did not belong in a sensory system. Melzack was influenced by Torgerson's new 'multiple group discriminant analyses' and realised pain descriptors could be classified into clusters: sensory, affective, and evaluative. He felt 'these dimensions of experience would provide a parsimonious framework for subgroups of words of different qualities that could be ranked on an intensity scale' (Melzack & Torgerson, 1971, cited in Srinivasa, 2005, p.201). Torgerson and Melzack later collaborated and in 1971 produced the Present Pain Intensity (PPI) scale which consists of 78 pain descriptors (Melzack & Torgerson, 1971). The 'clinical' pain assessed in Melzack's studies was pain experienced by patients during the disease process and from injuries as opposed to experimentally induced pain in a laboratory environment (Melzack & Katz, 2001). This was important as most previous pain research, other than the pain research published in 1959 (see Chapter3; section 3.2.1), had been conducted within a laboratory environment (Melzack & Wall, 1996). The MPQ was first published for use in 1975 (Melzack, 1975) and its short form (SF-MPQ) in 1987 (Melzack, 1987). They remain in regular use for clinical trials (Terajima & Aneman, 2003). The pain descriptors from the MPQ are presented in Figure 4.5.

1	Flickering	6	Tugging	12	Sickening	18	Tight
	Quivering		Pulling		Suffocation		Numb
	Pulsing		Wrenching	13	Fearful		Drawing
	Throbbing	7	Hot		Frightful		Squeezing
	Beating		Burning		Terrifying		Tearing
	Pounding		Scalding	14	Punishing	19	Cool
2	Jumping		Searing		Gruelling		Cold
	Flashing	8	Tingling		Cruel		Freezing
	Shooting		Itchy		Vicious	20	Nagging
3	Pricking		Smarting		Killing		Nauseating
	Boring		Stinging	15	Wretched		Agonizing
	Drilling	9	Dull		Blinding		Dreadful
	Stabbing		Sore	16	Annoying		Torturing
	Lacinating		Hurting		Troublesome		
4	Sharp		Aching		Miserable		*PPI*
	Cutting		Heavy		Intense	*0*	*No Pain*
	Lacerating	10	Tender		Unbearable	*1*	*Mild Pain*
5	Pinching		Taut	17	Spreading	*2*	*Discomforting*
	Pressing		Rasping		Radiating	*3*	*Distressing*
	Gnawing		Splitting		Penetrating	*4*	*Horrible*
	Cramping	11	Tiring		Piercing	*5*	*Excruciating*
	Crushing		Exhausting				
		Brief		*Rhythmic*		*Continuous*	
		Momentary		*Periodic*		*Steady*	
		Transient		*Intermittent*		*Constant*	

Figure 4.5: Descriptors from McGill Pain Questionnaire

Main measure in the MPQ are pain rating index, number of words chosen; and present pain intensity based on a 1-5 intensity scale (see Figure 4.7). How pain changes over time is also scored. Healthcare receivers when presented with the MPQ are asked to choose words from each group that best describe their pain. The value (ranked value) for each descriptor depends where it is in its word set. For example, an individual is asked to choose the level of their experienced pain from one of five word sets relating to a sensory perspective as shown in the word set Figure 4.6. The pain rating index is represented by the sum of the rank values.

Pinching (1); Pressing (2); Gnawing (3); Cramping (4); Crushing (5);

Figure 4.6: Sensory Pain Descriptors – one of the 20 word set Example of Pain Descriptor Word Set from McGill Pain Questionnaire: MPQ (Melzack 1975)

No Pain (0); Mild (1); Discomforting (2); Distressing (3) Horrible(4); Excruciating (5);

Figure 4.7: Present Pain Intensity Scale from MPQ (Melzack 1975)

The short form of the MPQ (i.e. SF-MPQ) was developed as an alternative to the original MPQ as the original questionnaire was found to be lengthy, complex and timely to complete (between 15 to 20 minutes for completion) (Choinière & Amsel, 1996). Participants in Choinière and Amsel's study were critical of the difficulty involved in engaging with the questionnaire and the length of time it took to complete. Dudgeon, Rauberta and Rosenthal (1993), in their study of individuals with cancer, found the SF-MPQ correlated with the original MPQ, and, on average, took between two to five minutes to complete. Although the MPQ was developed in the 1970's, and the SF-MPQ in the 1980's, they still remain the main instruments for pain assessment (Terajima & Anneman, 2003; Kałwak, Stupak, & Bochave, 2011).

Kalwak et al (2011) argue the word sets (i.e. pain descriptors) within the SF-MPQ should be wider in order to more accurately describe a pain experience. Their concern is in regard to the translation of the qualitative features of the 'words' within each word set into numerical values. Individuals often report that pain descriptors used in scales, such as the MPQ, do not reflect the way 'they feel, and may lead to serious misunderstandings' (Kalwak et al, 2011, p. 9). Kalwak et al obtained their data from semi-structured interviews with 15 individuals with chronic pain during which they explored their pain experiences and coping strategies. .

While the MPQ, and SF-MPQ, take into account the different perspectives of pain (i.e. sensorial, emotional and evaluative) similar to the basic VAS, VPRS and NPRS, they do not allow for the different perspective of the healthcare receiver and healthcare provider to be assessed.

To summarise the MPQ, and also its short form, Figure 4.8 briefly outlines their properties, strengths and limitations.

Main Properties of Questionnaires		Strengths	Limitations
MPQ -SF	15 pain descriptors (sensory, affective)- throbbing, shooting, sickening; Participants indicate pain severity of descriptors (i.e. none, mild, moderate, severe); Includes a measure of pain intensity (e.g. 0=no pain, 2 = discomforting, 5 = excruciating); Includes a 10cm VAS with anchor points of 'no pain' and 'worst possible pain'.	Takes minutes to complete; Unlike the VAS, VPRS and NPRS, the SF-MPQ can give relevant data regarding the impact of a specific treatment on the three components of pain (i.e. sensory, affective and evaluative); Scales strongly associated with MPQ scale scores; Additive responses give scores reveal for the three pain components and also total scores; High validity in different languages (French, Norwegian, Greek, Dutch, and Turkish) and populations (terminally ill, those with cancer, those with acute and chronic pain).	Different scoring methods create difficulties; Simple ranking may be used; Scores may be biased due to biased responses or misunderstanding of the instructions; Does not allow for the perspective of the observer to be considered.
MPQ	78 pain adjectives organized into 20 sub-groups; 1-10 = Sensory; 11-16 Affective; 16= Evaluative; 17-20 = Miscellaneous; Subjects select one word that describe their pain from each sub category; Health providers/receivers and students gave numerical values to pain descriptors in the development of this test; Pain Rating Index (uses the assigned numerical values), number of words chosen, and Present Pain Intensity (1-5).	Additive responses give scores reveal for the three pain components and also total scores; MPQ demonstrates reliability for assessing pain presenting with a variety of diagnoses; Individual can take the test themselves or may be conducted by a health provider; gives a quantitative pain score; Research shows test is valid compared to simpler one-number pain scales; A Short version of this test also exists; Popular over a long period of time.	MPQ can take up to 20 min to complete if not familiar with scale; Familiarity with pain descriptors necessary; Adjectives may not sufficiently describe a particular type of pain (e.g. joint pain); Does not allow for the perspective of the observer to be considered; Limited data on reliability.

Figure 4.8: McGill Pain Questionnaires (MPQ) and Short Form McGill Pain Questionnaire (SF-MPQ) Major properties Strengths and Limitations outlined

4.5 Psychophysical Methodology in Pain Measurement

Psychophysics paved the way for the development of a new methodology of measurement by the separation of sensation and cognition. It is this methodology that is used as a framework for the pain measurement tool developed in this study. Psychophysics examines the connection between stimuli and sensation, or more specifically, the relationship between physical stimuli and relationships of physical stimuli properties to behavioural responses and sensory perceptions. Price, Riley, Wade, Turk, Melzack (2001) and Noble et al (2005) assert that contemporary pain measurement methodologies evolved from psychophysics.

4.5.1 Psychophysics

The relationship between stimulus and sensation was initially examined by way of three classic experimental methods developed by Gustav T. Fechner in 1860 (Massaro, 1975). These methodologies are briefly outlined with their strengths and limitations in Figure 4.9.

Fechner's Experimental Methods*	Outline	Strengths	Limitations
1. Method of Constant Stimuli	Typically, between five and ten stimulus intensities are selected and randomly presented numerous times; participant reports whether s/he can detect them. Resulting data are plotted on a graph illustrating percentage of detection; the point where the stimulus is detected 50% of the time is taken to be the absolute threshold.	Most accurate method (most easily reproducible)	Very time consuming
2. Method of Limits	A stimulus is presented that is obviously above the threshold; participants are asked to detect the stimulus. Intensity is adjusted down by fixed intervals until participant no longer detects it. This is repeated many times with intervals both ascending and descending. "Cross-over" point is take to be the absolute threshold.	Conducted quicker than Method of Constant Stimuli There is no consistent point along the continuum where participants' responses change	Results can be eaffected by response Method of Constant Stimuli is more accurate.
3. Method of Adjustment	Stimulus intensity is adjusted by the participant until it can just be detected.	Easiest to do Less boring for participant	Least accurate of the 3 methods

*None of these experimental methods allowed for the prediction of participants sensations relative to stimulus intensity

Figure 4.9: Fechner's classic experimental methods; Method of Constant Stimuli/Method of Limits/Method of Adjustment.

Adapted from Massaro (1975)

These three experimental methodologies do not allow sensations to be predicted exactly by stimulus intensity, as had been assumed by Fechner in 1860 (Massaro, 1975). The data reflected the probability that a stimulus-exceeded threshold was directly related to stimulus intensity. This threshold concept could be applied if modified from an all-or-none to a probabilistic model (Massaro, 1975). Fechner redefined 'threshold' as a point where participants detect stimuli 50 percent of the time. While this definition assumes that threshold values vary, the threshold concept is maintained. Fechner's data indicated that these values vary in a very specific fashion. The probabilistic threshold was found to be affected by participants' attitudes (Massero, 1975); as participant's criterion or motivation in their responses greatly affected Fechner's results. When participants were given specific instructions to respond only positively when *very certain* of detecting a stimulus, they had a much higher 'probabilistic threshold' than those who were given no instructions. This suggested a decision rule that was held more, or less, consistently throughout.

Although experiments for the estimation of sensory thresholds were provided by the Methods of Limits, of Adjustment, and of Constant Stimuli (see Figure 4.9), these experiments did not completely disconnect decision criterion used and sensitivity of participants. There is no evidence to support the existence of Fechner's sensory thresholds as there is no definitive point where a stimulus is perceived (Massaro, 1975). His three experimental methodologies presented stimuli in each trial which meant they (the stimuli) were either detected, or not.

The fact that a stimulus was always present meant that participants could say they had detected the stimuli, when, in fact, they may not have. Their decision, with regard to detection, depended on their current motivation and attitude – this was better understood, and quantified, with the introduction of stimulus absent trials. Participants have no idea whether signals are actually present, when trials that contain no stimuli are randomly presented amongst signal trials (containing the stimulus), other than what is reflected by their own sensory system sensitivity. What was needed was a framework that would account for decision making criteria and motivation. This was provided by the concept of SDT, a statistical decision-making model that came from the field of electrical engineering (Wald 1950)

4.5.2 Signal Detection Theory

Signal detection theory was specifically named because of its application in modelling the detection behaviour of signalmen who man radar equipment (MacMillan & Creelman, 2005, p.22-24; and Tanner & Swets, 1954). Detection is the ability to filter out the true signals from constant background noise that is present in the information presented to the person making the decision (Green & Swets, 1966; MacMillan & Creelman). Signal Detection Theory was first applied to perception where individuals distinguished *signals* (stimuli) from *noise* (no stimuli). Noise is the term that is applied to the randomness of the neural system. There are random variations in the intensity of the nervous system whether a signal is present or not. Such variations can determine, or not, the detection of a faint or confusing stimulus or signal. Internal neural noise may exist in the brain of a weary or recently qualified doctor—or be external noise in a complaining patient. Numerous irrelevant and or unrelated symptoms, talking too quickly, under or over estimation of discomfort by patients can be noise masking a signal (e.g. new disease, pain etc) and making that signal more difficult to detect.

Other research areas have been examined with the application of SDT '(recognition memory (old and new items), lie detection (lies and truths), personnel selection (desirable and undesirable applicants), jury decision making (guilty and innocent defendants), industrial inspection (unacceptable and acceptable items), information retrieval (relevant and irrelevant information) and others' (Stanislaw, & Todorov, 1999, p. 1139). The theory can also be applied to health issues such as diagnosis of medical conditions (diseased and well patients) and levels of pain (painful and non painful experiences).

What is Signal Detection Theory?

Signal Detection Theory is a framework within which to decisions made in uncertain or ambiguous situations can be examined. For example, a signal detection approach was used to examine gender differences in pain perception in Taiwan in order to assess the sensory and non-sensory dimensions of pain perception. The results indicated both an enhanced sensory discriminability in women when compared to males and a more stoical response to pain in males compared to women (Soetanto, Chung, & Wong, 2004).

The central assumption in SDT is that there is no fixed threshold or barrier below which an individual never detects a stimulus, nor is there a fixed threshold or barrier above which an individual always detects a stimulus. A response to a stimulus may be either yes or no, but the participant's information upon which that response is decided can be incomplete, vague and sometimes even conflicting.

Signal Detection Experiments and Trials

Data can be gathered for SDT analysis in a variety of ways. There is the assumption 'that a certain stimulus leads to a certain sensory experience which can be scaled, rated or ranked, on a continuum' (Lloyd & Appel, 1976, p. 80). In other words the 'evidence' a participant extracts from a signal within a trial may be quantified. A trial is a single 'unit' in which a stimulus is either presented or not, and a response required. The most commonly required responses are yes/no (i.e. signal *and* noise trials, and noise trials with no signal included), a rating choice (i.e. requiring a graded response as opposed to the requirement of a simple *yes* or *no* response) or a forced-choice task (i.e. each trial presents one signal stimuli and one or more noise stimuli; participants must indicate which stimulus was the signal). After each trial, participants indicate whether a signal stimulus was presented or not (e.g. whether, or not, a tone was heard; whether, or not, a word was previously studied; and whether, or not, pain was experienced).

Responses to trials in an SDT experiment are either correct or incorrect and there are four response possibilities – yes and no when there is a signal present and absent as opposed to the conventional experimental responses of yes or no when a stimulus is customarily present. Experiments that use traditional pain assessment techniques can therefore only reflect half of the data. The exploration of pain perception applying SDT examines whether, or not, a pain stimulus is present in trials that involve, or do not involve, a pain signal.

The relative frequency of the four SDT responses is not independent. For example, when a signal is present, the proportion of *correct hits* and the proportion of *incorrect rejections* must add up to one. The response has to be either yes or no (e.g. a tone was heard or it was not heard, a pain was experienced or it was not experienced). When a participant correctly detects a signal that is present that is a *correct hit.* When a signal is absent, the proportion of *incorrect hits* and the proportion of *correct rejection* add up to one. Again, the response has to be either yes, or no. Therefore, all the information in an SDT matrix is outlined by the proportion of *correct hits* and *incorrect hits*.

An individual's decision about when to say yes or no can change. An individual who wants to avoid an *incorrect hit*, for example, might be extra careful never to say yes unless absolutely and definitively sure a signal had been detected. Two examples are illustrated in Figures 4.10 and 4.11 which highlight the consequences of decision making choices.

Figure 4.10 presents the four decisions available to healthcare providers whether or not, to prescribe analgesia dependant on whether, or not, they perceive their patient is in pain or pain free.

	Decisions with regard to prescription of analgesia Signal Present	Signal Absent
Yes	Patient in pain receives analgesia; *CORRECT HIT*	Patient not in pain receives analgesia; *INCORRECT HIT*
No	Patient in pain does not receive analgesia; *INCORRECT REJECTION*	Patient not in pain does not receive analgesia *CORRECT REJECTION*

Figure 4.10: Cost/benefit in medical analgesia decision making

If pain medication is in short supply a healthcare provider may not prescribe analgesia unless s/he is confident the patient is in pain in order to avoid giving medication to a patient who may not really require it. It is possible that a patient may not be prescribed medication when s/he really requires it.

Figure 4.11 illustrates the four decision options with regard to surgical intervention. Surgeons have to decide whether or not to carry out an appendectomy dependant on whether or not they perceive the necessary symptoms in their patients.

	Decisions with regard to Surgical Intervention Signal Present Appendicitis	 Signal Absent No appendicitis
To operate	Necessary appendectomy performed *CORRECT HIT*	Unnecessary Appendectomy performed *INCORRECT HIT*
Not to operate	Necessary appendectomy not performed *INCORRECT REJECTION*	Appendectomy not performed *CORRECT REJECTION*

Figure 4.11: Cost/benefit in surgical intervention decision making

The ‘noise’, in addition to random variation of neural activity in this scenario could be differences in results of patients’ blood tests (maybe because of less-than perfect assessment reliability); unimportant yet visible shadows in X-rays inherent in their imaging; or a busy operating room schedule. Such ‘noise’ may mask the surgeon’s view of the ‘signal’ – an inflamed appendix. Interestingly, the diagnosis of acute appendicitis is in fact difficult and in many cases undiagnosed appendicitis (*incorrect rejection*) and unnecessary appendectomies (*incorrect hits*) occur each year (Rao, Rhea, Novelline, Mostafavi & McCabe, 1998).

The surgeon on deciding that the diagnostic test results are satisfactorily irregular to reflect his/her patient’s pain, has decided the results reflect a signal and not noise; that is the results of the various diagnostic tests probably reflect appendicitis. If surgery is carried out but no evidence of appendicitis is found, the surgeon judged a signal (an inflamed appendix) was present in a noisy environment when, in fact, it was not present. In addition to random neural activity, the surgeon may have been swayed by the combination of the patient’s description of his/her symptoms, the blood test that was near to abnormal but still within normal range etc. The surgeon decided that the benefit of surgery was greater than the cost of not performing the surgery, despite not being 100 percent certain whether the patient's appendix was inflamed or not. *Incorrect hits* generally occur when the consequences of an incorrect rejection (no surgery but inflamed appendix) are perceived to be far greater than the consequences of an *incorrect hit* (surgery but appendix not inflamed).

If the surgeon has a bias toward an appendicitis diagnoses, that bias results in a liberal criterion; that is a *correct hit* if appendicitis is present and an in*correct hit* if not. If the surgeon feels that symptoms do not indicate appendicitis his decision is based on a conservative criterion and is a *correct rejection* once appendicitis is not present and *an incorrect rejection* if it is. The surgeon's cost benefit analysis influences his/her bias, that is the option of an *incorrect hit* (i.e. surgery but appendix not inflamed) and the option of an *incorrect rejection* (i.e. no surgery but inflamed appendix). There may be different costs and benefits associated with particular responses in the analgesia and surgical intervention scenarios.

Benefits:

a) Correct hit A patient in pain who receives analgesia has an expectation of a good recovery and should require little or no medical intervention;

Surgical intervention facilitates those who present with symptoms of appendicitis and will normally make a complete recovery;

b) *Correct Rejection* A pain free patient who does not receive analgesia will avoid any potential side effects from the medication and will avoid financial expense;

c) *Incorrect hit* Surgery may be the safer option when patients present with pertinent symptoms even though on hindsight a patient's appendix is found not to be inflamed.

Costs:

a) *Incorrect rejection* A patient in pain, who receives no analgesia, may experience a long recovery, and may need to spend more time in hospital with an increased need for medical assistance;

A surgeon who considers his/her patient not to have definitive symptoms and decides not to perform an appendectomy may have a very ill, or dead, patient as his/her appendix may be inflamed;

b) *Incorrect hit* A pain free patient who receives analgesia may incur unnecessary expense, and further medical intervention as a result of adverse side effects of the unnecessary medication;

There is a time cost in the OR schedule if a surgeon finds s/he has performed an unnecessary appendectomy; the patient will have undergone unnecessary invasive surgery that requires similar recover period to a patient who underwent necessary surgery.

Incorrect hits occur more often when consequences of *incorrect rejections* are perceived to be greater than consequences of *incorrect hits* (Allan & Siegal 2002). This is when a liberal decision criterion (or bias) occurs. The analogy of the surgeon's decision to operate, or not, (figure 4.11) illustrates this point. The negative consequences of an *incorrect rejection* (i.e. patient in pain with no analgesia; no surgery but inflamed appendix) are usually seen to be far greater than the negative consequences of an *incorrect hit* (i.e. a pain free patient in receipt of analgesia; surgery but appendix not inflamed). An individual's response bias and sensitivity influences all decision making outcomes. These influences can be exploited in the design of a tool to assess decision making criterion in the area of pain perception.

Decision Making Outcome: Response Bias and Sensitivity

Most decision-making tasks occur under conditions of uncertainty. SDT proposes that decisions can only result in one of the four possible outcomes as previously discussed. The theory proposes that there are two psychological components, or processes, in detecting a signal; a sensory and decision-making stage as illustrated in Figure 4.12. Initially, sensory evidence is collected with whether a signal is present or absent (the first two parts of figure 4.12). The cognitive process of decision-making then occurs. Response behaviour is decided dependant on whether the senses process the incoming evidence as noise only, or, a signal and noise.

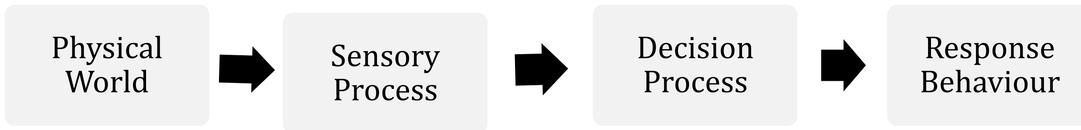

Figure 4.12: Information process when detecting a signal Adapted from Heeger, 2003

Response Bias

Every individual exhibits a 'response bias' defined as the minimal level of internal certainty required by an individual to decide that a signal is present (Heeger, 2003). This is the level of evidence required prior to deciding a signal is present. Applying a particular criterion to evidence extracted by an individual promotes a particular response choice. This is a key strength of SDT; the separation of the response determinants of detection; willingness to report (response bias), and physiological sensitivity. SDT asserts that decisions under uncertain or vague conditions are made on the criterion of the individual's response, i.e. their particular criterion or their individual bias. Response bias, or criterion levels, in SDT are signified by beta (β). The criterion is the point above which a signal is detected, whether it is there, or not, a *correct* or *incorrect hit* and below which a signal is not detected, whether it is there, or not – *an incorrect* or *correct rejection*. The degree of which one response is more probable than another is referred to as a response criterion and can be as liberal, conservative, or neutral. The criteria of a liberal response are where an individual is more likely to say a signal is present under any circumstance (the surgeon who is more likely to operate). This will result in a large number of *correct hit*s but will also reflect a larger number of *incorrect hit*s. A more conservative response is where an individual is more likely to say a signal was not present under any circumstances (the surgeon is less likely to operate). This will result in a smaller number of *correct hit*s but also a smaller number of *incorrect hits*. Research, such as Clark and Yang's (1974) acupuncture study, has shown that individual response bias is independent of sensitivity.

Clark and Yang (1974), explored acupuncture associated with pain sensation with the use of SDT. They maintain that the majority of those who use acupuncture believe in it and report less pain after this pain treatment. In support of their anecdotal conviction they found the number of pain responses, and pain intensity, reported were less in the acupuncture condition compared to the control condition. However, there was no change in participants' sensitivity to pain. Clarke and Yang concluded that subsequent to acupuncture sessions people were less likely to report pain but sensitivity remained the same as before the session.

Sensitivity

Sensitivity refers to an individual's degree of ease or difficulty in their discrimination of a target stimulus from background events. Intense signals can be detected easily if a signal neural response far outweighs noise neural activity, conversely, when there is no signal there is no additional neural activity. Ambiguous signals create difficulty in decision making. Sensitivity levels are influenced by internal and external noise. Internal noise can exist within the brain of a weary or newly qualified doctor. External noise can be found in patients' numerous unrelated complaints amongst symptoms in the investigation of a pain experience. The more noise the more difficult it is to detect whether a signal is actually present or not (e.g. a new disease, notable change in an existing condition, pain intensity etc). According to Oliver, Bjoertomt, Greenwood and Rothwell (2008), patients with neurological difficulties appear 'noisier' than other patients; this may be due to the long period of their condition and medically unexplained symptoms.

External noise can be controlled but internal noise cannot. Internal noise fluctuates constantly as neurons send information to the brain even when there are no stimuli present. When present, stimuli evoke neural responses, and decisions are required as to whether that activity reflects noise alone, or, noise and a signal. On any one occasion, background noise may be either high or low, so an individual may subsequently experience a stimulus differently on one occasion from another, due to the background neural noise difference. Sensitivity in SDT is referred to as d-prime (signified by *d'*). Previous findings are forced to be re-evaluated when the separation of affective and sensory components in decision making is considered in analyses.

Signal Detection Theory Analysis – A Different Perspective

Allan & Siegal 2002 applied SDT analysis to datasets from various studies examining clinical depression where conventional methodology indicated individuals with clinical depression can have impaired short-term memory (Herskovic, Kietzman & Sutton, 1986; Miller & Lewis, 1977; Potts, Bennett, Kennedy & Vaccarino, 1997 cited in Allan & Siegal, 2002), suppressed chemosensory sensitivity (Potts et al. 1997) and perform poorly in learning and memory tasks (Miller & Lewis, 1977). However, these conclusions are based on findings that indicate individuals with clinical depression make fewer *correct hits* than do typical individuals (Miller & Lewis, 1977). With regard to the individuals who had poorer performance in recognition memory tasks and poor chemosensory sensitivity, STD analysis revealed a change in response bias rather than an actual change in memory ability or taste sensitivity (pleasant tasting material - Dunbar & Lishman, 1984, and sucrose detection tasks - Amsterdam, Settle, Doty, Abelman & Winokur, 1987; and Settle & Amsterdam, 1991). This indicates that although individuals with depression make fewer *correct hits* than typical individuals they also make fewer *incorrect hits* (Herskovic et al, 1986; Miller & Lewis, 1977; Potts et al. 1997). These studies show no differences, between individuals with depression and those without, in terms of their sensitivity in regard to the tasks set in the various experiments. It may be that these individuals, because of their depression, are less likely to give positive responses whether it is correct or not.

The fact that a sensory experience experimental data can be re-interpreted in this way highlights the need for pain and its measurement tools to be reassessed and re-evaluated. Many of the pain scales do not address the holistic perspective of a pain experience but SDT analysis is a possible framework for the development of such a tool that could address the sensory and the cognitive component of pain.

Signal Detection Theory and Pain

Signal detection theory facilitates the quantification of the differences between signal and noise, and noise. A pain signal may be regarded as a time-varying quantity; i.e. pain quantified over a time period. Noise is the background or context in which the pain signal is embedded. Noise is thus a confounding variable, capable of distorting the information implicit in the pain signal

Various emotive states are factors known to affect the amount of pain a patient may experience. The emotion of fear, when associated with cancer, is thought to affect pain perception as revealed by Black (1975) and Woodford and Fielding (1970) when they illustrated that some patients do not report pain until *after* their initial diagnosis. Not experiencing pain before diagnoses can be seen as an *incorrect rejection* (the cancer is present, but pain, the signal, is not detected). The experience of pain after diagnosis can be seen as a *correct hit* (the cancer is present, the pain, the signal, is detected). The overcompensating emotional elated state seen in athletes can hide an injury, even as severe as tissue damage (*incorrect rejection*, the pain, the signal, is present but not detected), until their performance is actually over when the injury is felt (*correct hit*, the pain, the signal is detected) (Wall, 1979).

A pain assessment tool can be designed using an SDT approach. Assessment of the affective and sensory elements of pain can be brought together within an SDT framework and presented to individuals via a manner that is non-invasive. Such an experimental design, from a SDT perspective, comprises of trials that contain either a signal and noise stimulus, or a noise stimulus that individually can be presented to each participant. Unlike conventional methodologies of data collection such trials can elicit one of the *four* possible responses required for SDT analysis. Data obtained can inform with regard to individuals who perceive, or not, pain where there is no signal/stimulus present as well as those who perceive pain, or not, where there is a signal/stimulus present.

4.6 Summary

The extent of the advancement of experimental and analytical techniques with regard to sensation measurement is comparable to the theoretical advances in pain measurement (Massaro, 1975). Beecher's (1957) 'reaction component' of pain is comparable to the emotional stress and other psychological factors that impact on individual pain experiences as highlighted by Gate Control Theory. Pain experience both in its impact and respite has been, and continues to be, experimentally and clinically assessed by verbal self-reporting via numbers, visual scales and language. Such tools have become incorporated into each other (e.g. numerical scales/Wong Baker Face Scale; numerical scales/Melzack's pain descriptors, see Figure 4.3) etc., and some have been designed for specific populations (e.g. infants, young children, non-verbal patients (post operative, sedated etc), and those with cognitive difficulties). There is ongoing difficulty with delineation between pain measurement by the observed and the observer. The issue of the influence of interaction between persons and pain assessment has been addressed in Craig's Social Communication of pain (2009) from a theoretical perspective, but from a pragmatic perspective there remains a gap in the plethora of available pain assessment tools.

The overview of SDT in this chapter illustrates the possibility of the use of SDT analysis in pain perception. Signal detection theory can 'quantify' the pain rating an individual extracts from a particular stimulus, in addition to determining their decision making criterion. The principles of SDT may also be applied to decisions based on non-sensory qualities of stimuli such as a cognitive response to language. It is perfectly feasible to apply an SDT analysis to stimuli that incorporate accepted pain descriptors (e.g. Melzack's pain descriptors) in conjunction with a Numerical Pain Rating Scale.

There are criticisms of SDT but according to Allan & Siegal (2002, p. 418) 'the theory is the pre-eminent model for understanding how the response criterion (or bias) determines the types of mistakes or decisions individuals make when judging whether a signal is, or is not, present in a noisy environment'. Two errors are unavoidable: *an incorrect hit* and *an incorrect rejection*. One advantage of the use of this theory is the forced re-interpretation of existing experimental data as previously discussed (Herskovic, et al. 1986; Miller & Lewis, 1977; Potts et al. 1997). This permits a new perspective on the sensory versus affective discussion (sensory vs. non-sensory) with regard to pain perception. SDT may therefore be applied to pain perception. The medium through which SDT data can be extracted, levels of pain can be examined; and third parties can respond to can be especially designed experimental vignettes. The use of vignettes in pain detection and measurement is explored in the next chapter.

5. THE USE OF VIGNETTES IN PAIN DETECTION AND MEASUREMENT

5.1 Overview & Introduction

5.1.1 Overview

Conventional pain measurement scales do not account for all aspects of the pain experience. Vignette methodology is suggested as a medium through which some of these unaccounted for aspects may be incorporated (e.g. observer/observed respond to same pain experience, inclusivity of complete profile of pain). This chapter provides a critical overview of the technique and research in the field of vignette methodology, rationale for use and the relative advantages of the use of vignettes in the areas of health, and more specifically within the area of pain perception. The extent to which the pain experience being explored affects the exploration itself is examined. The development, design, interpretation of and response to vignettes will also be explored.

5.1.2 Introduction

Vignettes are short hypothetical descriptive scenarios about a character(s) depicting a particular social situation and are in use since the 1950's (Gould, 1996). They contain precise references to the salient aspects of an individual's decision-making, or judgement, with regard to the characters depicted within the descriptive social situation portrayed (Hazel, 1995). Written narratives are common in vignette presentation but mixed media (pictures, videotapes, music, interactive computer software etc) may also be used (Barter & Renold, 1999a). The pictorial form of vignette methodology is particularly valuable in research where young children are concerned (e.g. WBS (1988) - Paediatric Pain Scale, Chapter 4). Pictorial vignettes, accompanied by text, have also been found useful for elderly people (Ouslander, Tymchuk & Krynski, 1993). Subsequent to vignette presentation, individuals are asked to respond to structured or semi-structured questions by questionnaire or focus interview. Data are then analysed by qualitative and/or quantitative means. Sections 5.2 – 5.7 will illustrate how the advantages outweigh the disadvantages within vignette methodology.

5.2 Vignette Methodology

Vignette methodology is the subject of research and examination in itself (Hughes & Huby, 2001; 2004). Vignettes enable perceptions, beliefs, and meaning to be explored within particular situations. This methodology is a particularly valuable alternative for areas of sensitivity where other means of inquiry are unsuitable (Barter & Renold, 1999a). However, the difficult relationship between what participants believe and their behaviour must be considered especially if using vignettes exclusively (Barter & Renold, 1999a). This problem may be described in terms of the difference between actions prescribed for the *characters* in a vignette and those enacted by the perceiver in a similar 'real life' situation. These differences can vary and depend on the particular research and vignettes being used. Some research has shown that resulting data from vignettes reveal how individuals act in reality but other studies have shown this not to be the case (Rahman, 1996). How individuals might *actually* act is reflected in a study of female carers' coping strategies (Carlson, 1996). The results demonstrated high levels of congruence between responses to vignettes and actual behaviour where carers dealt ineffectively with conflict. Conversely, respondents to vignettes depicting domestic violence, who are themselves victims of domestic violence, state they would leave their violent relationship and get help (Carlson, 1996). The 'recommended' action often differs from reality: many studies have shown this is often not how those who are really victims of domestic violence actually respond to their situation (in McGee, Garavan, de Barra, Byrne, & Conroy, 2002; Education Inc. Centre for Abuse Relationship Awareness). Although Hughes (1998, p. 384) argues that not enough is known about 'the relationship between vignettes and real life responses to be able to compare the two', the use of vignettes in a multi-methodological approach to research can clarify such concerns by the understanding of the extent to which responses speak about behaviour in everyday life. 'Different research methods have value in their own right. They are complemented when they are combined in a systematic and conscientious fashion' (Mc Kiernan, Guerin, Steggles & Carr, 2007, p 279).

5.3 Rationale for the use of Vignette Methodology

Various needs within social research can be satisfied by the use of vignettes (Barter & Renold, 1999a). Behaviours in context can be examined; actions in context can be explored; that is actions can be understood within specific situational contexts where particular variables can be revealed (Barter & Renold, 1999a). Vignettes can provide a non personal space that is not threatening to the participant and can facilitate the exploration of difficult or sensitive experiences compared to the 'normality' of the vignette (evidence for this is reviewed in section 5.3.1). Hughes (1998), maintains that when participants are invited to respond to vignettes from a third-party perspective (how they feel a *third person* would respond as opposed to how they think *they* might respond to the situation), and the vignette is non-personal, that perspective is non threatening. This facilitates identification of differences between participants in their responses. With regard to pain, practitioners and patients can simultaneously respond to a common vignette with their particular perspective on pain perception.

Rationale for the Use of Vignettes Specifically In the Area of Pain

Vignette methodology in conjunction with the use of SDT analysis offers the opportunity to include consideration of personal biases in pain experience and assessment. This is despite that fact that it is not known whether the vignette series used in this study represent personal issues (with regard to pain) for participants (whether they are healthcare practitioners or healthcare receivers). The use of this methodology is grounded in the fact that vignettes facilitate isolation and manipulation of the degree of sensorial and affective aspects of pain by way of pain descriptors within fictional scenarios depicting events and characters. Sensorial pain descriptors that range from tugging (mild pain) to wrenching (severe pain) and affective pain descriptors from punishing (mild pain) to killing (severe pain) are embedded in the vignettes used in this research. Illustrated in Figure 5.1 are two vignette scenarios which include these descriptors.

Mild/Severe Pain descriptors illustrated in vignettes presented below

- GROCERY SHOPPING -

However, shopping seems to take a long time today. After getting the groceries the basket is *tugging/wrenching* his arms and he sorry he didn't get the trolley. Carrying the basket is really annoying his wrists. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. His arms were *punishing/killing* him.

- GETTING UP IN THE MORNING -

He can see his breath, as the air is cold. He has a *fearful/suffocating* feeling in his body. With immense stiffness, he reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks awfully slowly to the kitchen to have his breakfast. His legs are very *dull/heavy* today.

Figure 5.1: Vignette Scenarios illustrating mild and severe pain descriptors

5.3.1 'Difficult' or 'Sensitive' Topics

Vignettes can introduce topics that in other methodologies participants might have difficulties responding to from their own personal perspective. Examples of such topics include death by suicide (Kalafat, Elias, & Gara 1993; Kalafat &

Gagliano, 1995); sexual standards (Bettor, Hendrick & Hendrick, 1995); violence in relationships (Carlson, 1996); drug injecting (McKeganey, Abel, Taylor, Frischer, Goldbert & Green 1995; McKeganey, Abel & Hay, 1996); deviance (Kirmayer, Fletcher & Boothroyd, 1997) and rape (Luddy & Thompson, 1997; Furnham & Boston, 1996).

It is straightforward to respond to a vignette objectively (when related to a depicted character) as opposed to subjectively (when related to oneself) in the examination of difficult, sensitive and moral enquiring issues (Barter & Renold, 1999a; Hughes, 1998). Similarly, individuals are likely to find it straightforward and easy to respond objectively, rather than subjectively, to inquiries about pain perception. For example, Igier, Mullet & Sorum (2007) observed their participants (nurses, student nurses and nurses' aides) found it easy to respond objectively to their vignettes with regard to their pain perception of depicted patients. Igier et al. maintained the use of actual nurses, typical cues, and credible situations enabled the nurses to pain judgements easily. The researchers did not include patients as participants in their study; if they had done, resulting data may have highlighted different pain indicators coming from their perspective as compared to that of the healthcare providers.

5.3.2 The Area of Health

In addition to 'difficult' topics, vignettes are commonly used in healthcare research, specifically for the examination of judgements and decisions, of both healthcare providers and receivers but not necessarily together in the same study (e.g. Igier et al. 2007; Lawton, Gardner, & Plachcinski, 2010; Ouslander et al. 1999). The methodology also enables the simultaneous examination of different groups' interpretations of a 'uniform' situation. This is a definitive advantage in the process of experimental design and decision-making with regard to instrumentation employed in the study of pain. Those in receipt of healthcare (e.g. hospital patients), those that provide healthcare (e.g. nurses, doctors, other health practitioners, family primary carers etc), and the general population, may be simultaneously surveyed revealing differences in levels of conflict, or concord, between sides involved within a specific area of healthcare. Differences in the levels of discord or harmony can also provide an understanding of the differences in interpretation by the disparate groups. Examples of studies employing vignettes in each of these groups are illustrated in the following studies.

Individuals in Receipt of Healthcare

Vignettes, as a research methodology, enable data to be obtained from a broad range of populations in receipt of healthcare. The following examples briefly illustrate how vignette methodology can be used in two particular populations; new mothers, and the elderly.

Lawton et al. (2010) aimed to establish whether the depiction of a negative relationship between a pregnant woman and her community midwife during antenatal care, combined with a bad outcome of that care would lead to (i) a higher level of attribution of responsibility and (ii) a greater likelihood of making a complaint. Vignettes were employed to ascertain ratings of responsibility, blame, and response actions in the ante-natal care the new mothers had received (e.g. how likely they would be to speak to the midwife, appropriateness of midwife's behaviour, how much was midwife to blame (totally – not at all); overall rating of the care received in that vignette (very good – very bad) etc). The findings suggested that judgements about the quality and safety of care pregnant women receive and their willingness to make a complaint is affected by the perceived relationship with their healthcare provider and good outcome of their care. The vignette series revealed that while complaints correlate with negative outcomes they are not a good way of detecting routine poor quality care (Lawton et al. 2010). Vignette methodology in Lawton et al's (2010) study enabled an inclusive picture of the childbirth experience to be presented to participants when compared to a traditional questionnaire. While specific issues were mentioned in the vignette series, participants were not specifically questioned about them (e.g. implications of the use of the analgesic Pethidine in labour, internal examination prior to childbirth etc).

Ouslander et al. (1993) explored the views of elderly patients with regard to different treatment options (feeding tubes) by presenting them with pictorial story-books and accompanying texts (previously referred to in Section 5.2). A number of elderly adults (mean age 78 years) from a day centre and a residential nursing home were asked to determine their own feeding tube choices (i.e. to accept or forego this procedure). Vignettes in a story-book format and accompanied by relevant pictures that depicted an irreversible and severely impaired state of health were presented to participants. The text in the story was in simplified language. Fifty percent of the elderly adults each decided to accept, and forego, tube feeding in the situation as presented in the vignette. Ouslander et al. (1993) argued that the use of understandable hypothetical clinical vignettes that describe risks, and benefits of medical procedures, in appropriate formats that engage specific participant samples (e.g. children and elderly individuals) should be encouraged. They concluded that such vignettes are easier to understand, are more engaging, and elicit more informative data from these populations as opposed to other measurement tools (questionnaires, visual analogue scales etc).

Individuals who Provide Healthcare

Vignettes facilitate data to be obtained from populations within the area of healthcare providers. Igier et al (2007) investigated nurses, student nurses, and nurses' aides decision-making, and judgements in pain evaluation of patients with osteoporosis with the use of vignettes. This study is relevant to this research as it utilised vignettes in the examination and identification of differences between the three groups of healthcare providers' pain judgements. Five pain indicators were incorporated into the vignettes – facial grimaces, abnormal body position, and restriction of movement, pain complaints and potential depression. Results indicated three important factors in the three groups' pain judgement decisions: - social contact difficulties, avoidance of changing positions and movements. Differences seem to be exacerbated by personal salience of information as nurses emphasised more on the difficulty in making social contact when compared to students or aides.

The presentation of vignettes facilitated the simulation of the scene as it may be in real life. Two vignette examples from Igier et al's (2007) are presented in Figure 5.2.

- Translated from French -

> Madame Durant, 78 years old, and has osteoarthritis. Madame Durant's face appears relaxed. She does not seem to avoid certain movements or certain positions. Madame Durant does not spontaneously complain of pain. It does not seem difficult to establish contact with her.

What amount of pain does Madame Durant seem to you currently to be feeling?
No pain --*Extreme pain*

> Madame Pelissier, 75 years old, and has osteoarthritis. Madame Pelissier's face grimaces from time to time. Her movements are rare and slow. She seems to avoid certain positions. Madame Pelissier complains of pain when someone else is present. She seems to avoid relationships with others.

What amount of pain does Madame Durant seem to you currently to be feeling?
No pain --*Extreme pain*

Figure 5.2: Vignette taken from Igier et al. (2007).

This study indicated that nurses are more likely than student nurses and nurses' aides to be aware that those in pain are 'caught up in their pain, uninterested in social interaction, and prone to depression' (Igier et al. 2007. p. 547). Understanding of the importance of difficulty with social contact may require skill and more understanding that comes with experience, and or explicit teaching. This may be why the nurses were more attentive to these particular factors. Each sign of pain contributed separately and additively to pain levels the patients were perceived to be experiencing. This is important to note as these results suggested that no one cue had undue influence over another.

The study was limited by a number of design issues which may have influenced resulting data. The levels within each indicator varied within the vignettes and this changed the shape of the relationships between them. There was no analysis conducted with regard to different age groups, neither within the nurses nor within the other two groups. This was despite the measured demographic detail of age as opposed to nursing experience (notable when considering that Katsma and Souza (2000, p. 89) suggest that older nurses may experience ‘empathy burnout’). The abstract concept of a visual analogue scale of 19cm (as opposed to the conventional 10 cm) was used with start points of ‘no Pain’ and end point of ‘extreme Pain’. The fact that the distance on the scale used for data analysis purposes was the measurement between the left anchor (extreme pain), rather than the right anchor (no pain), may have had an influence. Each participant was asked to respond to the full series of vignettes which totalled 48. Despite these limitations, the use of typical cues in plausible situations in the vignette series alongside the fact that participants appeared to have little trouble in making judgements illustrates the advantageous use of this methodology. Decision making within the area of depression, by general practitioners and other levels of healthcare providers, has also been explored by the use of vignettes (Ross, Moffat, McConnachie, Gordon, & Wilson, 1999).

In conjunction with the Depression Attitude Questionnaire (Botega, Blizard, Wilkinson, & Mann, 1992) vignettes enabled the detection and evaluation of depression with differentiation between genders. Personal cues and background information that are present in real life doctor/patient consultations are absent in vignettes as it would be difficult to standardise simulated patients. This reduces the bias by presenting characters that are identical in all but the variable being examined. The age of the patients in the vignette series in Ross et al's (1999) study was restricted to 22 as they maintained that younger patients, particularly males, are at risk of non-detection of depression and suicide. The standardised vignette series enabled a closer exploration of the impact of General Practitioners' attitudes toward depression (Depression Attitude Questionnaire- Botega et al. 1992).

The General Population

Vignette methodology has also been used to research and conceptualise health-related attitudes within the general population. Denk, Benson, Fletcher and Reigel (1997) examined attitudes of the general public with regard to decisions made about end-of-life medical issues. Denk et al.'s vignette series describe patients who are critically ill with various medical conditions and social characteristics (e.g. age, contribution to illness – substance abuse or not, life expectancy and quality etc). One of the vignettes is presented in Figure 5.3.

> A 45-year-old mother or father has been run down by a drunk driver and requires artificial life support to survive, costing about $200,000 per year. She will probably live another 2–5 years that way, but will be totally paralyzed. The patient is not competent to decide about treatment, and the family is divided about going ahead. Private insurance will pay most of the cost.

Figure 5.3: Vignette from Denk et al (1997, p. 98). 'How do Americans want to die? A Factorial Vignette Survey of Public Attitudes about End-of-Life - Medical Decision-Making'

Denk et al. (1997) asked participants to decide whether continue or discontinue healthcare. They found that older white, mainstream Protestant (or non-religious) participants were more likely to recommend the discontinuation of healthcare. Participants also indicated they were in favour of stopping treatment, if the vignette character had made, or was prepared to make, a living will. Denk and his colleagues concluded the use of vignettes in their study 'minimized maturation and question-order effects, efficiently sampled the universe of potential vignettes, and allowed analysis by vignette and respondent characteristics simultaneously' (Denk et al. 1997, p. 75). Denk et al.'s (1997) study illustrates the flexibility of vignettes; a variety of data can be obtained as a function of the specific requirements of the research. The use of vignette methodology here illustrates the benefits of the 'third-party perspective', in that the discourse and ethical considerations, centred on end of life decisions, are sensitive, emotional, complex and a subject of research within itself (Piva, Garcia & Lago, 2011; APA, 2011; Oberle & Hughes, 2008; Schaffer, 2007). These benefits of vignette methodology are comprehensively examined, amongst other advantages, in section 5.4.

5.3.3 Pain Perception – Vignettes Incorporating SDT

Igier et al. (2007) investigated healthcare providers' decision-making, and judgements, in pain evaluation with the use of a vignettes series but used the same base rate for all participants in their data analysis. A base rate is used as a foundation against which specific manipulations are evaluated (Reber & Reber, 2001). Igier's et al.'s research differentiated participants by their professional status (i.e. nurses, student nurses or nurses' aides). Participant's experience, knowledge, emotion, and culture or pain status were neither considered in the resulting data nor employed as criteria to measure their pain perception. SDT was 'incorporated' into the vignette design (by way of the presentation of vignettes with and without pain indicators) for patients with or without Osteoporosis.

This thesis argues that the identification of criterion levels of participants' responses with regard to their nursing experience, knowledge and other variables would force a re-interpretation of the data and possibly lead to different conclusions. A redesigned vignette series from Igier et al.'s (2007) study would includes four possible responses (1) the presence of a pain experience, (2) or not, when an individual has osteoporosis, (3) the presence of a pain experience, (4) or not, when an individual does not have osteoporosis as illustrated in the matrix in Figure 5.4.

	Signal Present *Patient diagnosed with Osteoporosis*	Signal Absent *Health Patient*
Yes	*Patient with Osteoporosis* CORRECT HIT *Pain indicators*	*Healthy Patient* INCORRECT HIT *Pain indicators*
No	Patient with Osteoporosis *INCORRECT REJECTION* No Pain Indicators	Healthy Patient *CORRECT REJECTION* No Pain Indicators

Figure 5.4: An SDT Matrix incorporating Igier et al.'s (2007) study

5.4 Advantages of Vignette Methodology

There are numerous advantages in the use of vignettes. These include the extraction of information from individuals with regard to their attitudes beliefs and perceptions from a qualitative perspective as opposed to a quantitative perspective. Some data collection methods can require the use of qualified and trained personnel, sometimes on a one-to-one basis and can prove rigid, complex, and expensive in time and financial resources (Hughes & Huby, 2001). Such methods are conventional and can include individual and focus group interviews (structured or unstructured), case studies, on site observational studies, survey questionnaires and controlled experimentation (Hughes & Huby, 2001). Vignettes are less expensive (in time and financial resources) than traditional observational studies (Wilson & While, 1998). Gathering data, when employing vignette methodology, can be conducted speedily and can also be used to collect wide-ranging quantity of data from large samples with high response rates; Flaskerud (1979) had a high response rate of 80 percent while other researchers found even higher compliance rates (Taylor, Skelton & Butcher, 1984; Forrester, 1990). These rates exceed expected response rates from conventional questionnaires. Twenty percent response rates are considered the average from questionnaire (Burgess, 2001, p.4). Vignettes, as an additional tool, can enhance or may be used as an alternative methodology to conventional tools. A selection of the benefits of vignettes is discussed here in alphabetical order and briefly summarised in Figure 5.8 in the chapter's summary (Section 5.8).

5.4.1 Focus of Discussion

Vignettes can provide focal points for discussion, both in individual interviews and as prompts within group discussions (Hughes, 1998; Sim, Milner, Love & Lishman, 1998). They can also provide direct particular pointers in the topic, or area, being investigated. For example, Sim et al. (1998) compiled a five-stage vignette to examine how requirements are defined among individuals with disabilities and those without. Presentation of the vignette topics was controlled in the focus interview. This allowed a specific framework for the analyses of the data across different focus groups.

5.4.2 Flexibility

The use of vignettes allows the flexible design of an instrument responsive in a unique way to specific issues or concerns; an example of such is Denk et al.'s 1997 study of *Americans' Attitudes about End-of-Life.* Vignettes can be designed to simulate specific elements of the research topic being studied (Finch, 1987) and can be manipulated in order to give priority to some aspects of a scenario in 'real life' over others (e.g. age, gender, etc).

5.4.3 In-Depth Knowledge

It is not necessary that participants have extensive knowledge with regard to the topic under investigation (Liker, 1982). In fact, vignettes may be used to 'extract participants' automatically generated meanings' (Hughes & Huby, 2001, p. 384). Bendelow (1993) noted that visual images of pain draw out immediate and spontaneous responses irrespective as to what participants know about the visual imagery used. For example, the imagery used in Bendelow's study consisted of 12 pieces of classical and modern art produced between the 17^{th} and 20^{th} century that depicted physical and emotional pain experiences.

5.4.4 Mundane 'real life' Events

Research indicates that vignettes need to reflect 'mundane reality' rather than exaggerated scenarios. Such vignettes can enable more understanding with regard to how individuals might behave in specific situations (Hughes & Huby, 2001). Neff (1979) suggests a negative correlation between lack of reality reflected in a vignette and likelihood of actual behaviour of participants. The more 'imaginary' vignettes appear the less likely participants' responses will, in reality, correspond to actual behaviour (Neff, 1979). Care must be taken in vignettes design with regard to the delicate balance between participants' real lives and vignette 'reality'. Research indicates the ordinary and mundane is reflected with more transparency when there is less prominence on vignette characters' peculiarities and on catastrophic occurrences (Finch, 1987).

An advantage of realistic scenarios depicted in vignettes is the detection of the subtleties, nuances, and personal saliencies of which only those involved are aware (Sumrall & West, 1998). For example Mansell, Poses, Kezis & Duefield (2000) presented vignettes to healthcare receivers to establish whether particular illnesses and clinical decision-making style influenced or predicted preferences for their own decision-making involvement. The 'reality' of people's lives can be portrayed by the depiction of mundane occurrences.

Some vignettes may not appear 'mundane' or 'realistic' to one population but may be very 'mundane' and 'realistic' to another. For example, McKeganey et al's (1995) vignette series that explored preparedness to share injecting equipment may be viewed as unrealistic by those not familiar with the world of drug users. See Figure 5.5. This vignette series was commented on as being very realistic and ordinary by the participants during McKeganey et al.'s (1995) study some of whom were regular drug users.

Imagine that you are standing on a street corner. In your pocket you have a set of works that you used earlier the same day. Someone that you don't know very well comes up and says that he/she is strung out, that he/she's got drugs to hit up but no tools. He asks if you have a set on you. Would you: -

1. *Tell him get lost*
2. *Tell him you have a set of works but you can't give them to him/her.*
3. *Give him/her a set of tools but tell him/her they are your only set you want them back.*
4. *Tell him/her he/she can use the works in your pocket but you don't want them back.*

Figure 5.5: Vignette taken from McKeganey et al. (1995) p. 1255. 'The preparedness to share injecting equipment: An analysis using vignettes'

Such realism and 'mundane ness' within the world of this particular population can elicit very rich data from its participants.

5.4.5 Rich Data

Hughes and Huby (2004), and Bendelow (1993), argue that the voices of respondents/participants are more richly captured within vignette-generated data than traditional questionnaire data. They suggest participants respond to vignettes with enjoyment and even creativity. Bendelow (1993) maintains participants can feel the experience of responding to a vignette is therapeutic and their responses assist their experiences to be put into perspective.

A richly descriptive scenario quickly captures the socially situated context that surround a particular study topic and permits participants to respond within that context (Hughes, 1998). This improves data quality. Questionnaires do not provide the same situated context.

5.4.6 Less Social Desirability Responses

The use of vignette methodology can help overcome the obstacle of social desirability responses (SDR's) (Glidden, 2008) as illustrated by Gould (1994). What precautions nurses take in dealing with blood and or body fluids from patients that include those with HIV was examined. A high percentage of nurses stated that though general precautions should be taken when dealing with all patients, they would take more care with a patient with a transmittable viral infection. Gould (1996) maintains that SDR's could have affected findings if other data gathering methodologies had been used as SDRs have been found to affect resulting data from questionnaires. Van de Mortel (2008) reviewed over 14,000 questionnaire-based research studies and found 43 percent of results from were influenced by SDRs. Outcomes in 45 percent of studies that used a Social Desirability scale (n =31) were not influenced by SDRs. Reduced socially desirable response patterns may be found by the 'distancing effect created by vignettes between participants' real lives and the 'reality' portrayed within the vignettes' (Hughes & Huby, 2001, p.384). This 'distance' can be seen in Gould's (1994) infection control study mentioned at the beginning of this section.

5.4.7 Snapshot View

Hughes (1998, p.383) suggests that a situation 'snapshot', within a vignette, allows distance and space within which to provide 'a discursive interpretation within the context of the vignette'. He also proposes that the context in which the vignette is situation can be used to explore key influential aspects under examination. 'Vignettes need to include sufficient context for respondents to have an understanding of the situation being portrayed but be vague enough to 'force' participants to provide the additional factors which influence their decisions' (Barter & Renold, 2000, p. 310). West (1982, cited in Finch 1987) argues that in relation to a non-directional application of vignette methodology 'fuzziness is strength' and ambiguity may be viewed constructively as a personal space where participants can define their own perspective.

5.4.8 Third Party Perspective

Vignette methodology permits a 'de-personalisation that encourages the respondent to think beyond his/her own circumstances; (this is) an important feature for sensitive topics' (Schoenberg & Ravdal, 2000, p. 63 & Finch, 1987). This is an important aspect especially where participants are asked to respond from a third party perspective. This 'de-personalisation' can be seen to reflect, in some way, the patient-practitioners divide that exists in pain perception as highlighted in the Social Communication Model of Pain (see Section 3.7). Such responses can create a 'distance' between the vignette and the participant (Hughes, 1998) and it is this 'distance' that makes enquiries about sensitive research topics less menacing but inclusive of the different groups who are asked to comment on a 'uniform' situation (see Section 5.3.2).

This space, or distance, between the vignette and the participant can also help to 'unpack individuals' perceptions, beliefs, and attitudes to a wide range of social issues' (Hughes, 1998, p. 384). For instance, when Friedenbert, Mulvihill and Caraballe (1993) asked their participants to respond in the 'third person' as research consultants they found that the distrust initially felt by the participants of the researchers was substantially eased. This de-personalisation is vital within the area of pain perception research, as when a participant responds to vignette characters s/he can relate to and empathise with the character depicted (issue of empathy is addressed in section 5.5)

5.4.9 Variable Manipulation

A key strength of vignette methodology is simultaneous variable manipulation (Gould, 1996). For example, Forester and Murphy (1992) explored the attitudes of nurses towards patients with AIDS and those with related risk factors (i.e. sexual orientation, drug abuse etc) by the simultaneous manipulation of particular variables in their vignette series.

(i) AIDS –v– non-AIDS diagnosis;
(ii) Sexual orientation (i.e. homosexual –v– heterosexual);
(iii) Having –v–no history of intravenous drug abuse.

Nurses responded to the Prejudicial Evaluation Scale and the Social Interaction Scale. Results indicated that an AIDS diagnosis or intravenous drug abuse history, but not sexual orientation, increased nurses' negative attitudes towards the the vignette characters aka patients. Analysis of the data also indicated a decreased stated willingness of nurses to interact with such patients. This lack of willingness to interact may influence pain management and pain communication and represents a situation where a pain assessment tool to differentiate healthcare providers' and receivers' perspectives is particularly valuable. Attitudes towards the care of patients with HIV/AIDS remain varied throughout the world (Pickles, King & Belan, 2012) so Forester and Murphy's study conducted 20 years ago can still be considered relevant today despite nurses' education and improved HIV/AIDS treatment.

5.5 Empathy/Third Party Perspective/Evaluation of Others Pain

Empathy is described as the 'process of understanding a person's subjective experience by vicariously sharing that experience while maintaining an observant stance' (Zinn, 1993, p.307). It is also a 'balanced curiosity leading to a deeper understanding of another human being; stated another way, empathy is the capacity to understand another person's experience from within that person's frame of reference' (Bellet & Maloney, 1991, p.183). Participants employ empathy when responding to vignettes as they interpret a scenario or situation from either the perspective of the depicted character or their own. 'A varied range of responses are elicited when individuals face others in pain' (Goubert, Craig, Vervoort, Morley, Sullivan, Williams et al. 2005, p.285). These include ignoring the individual's pain and their distress, compassion, and inclinations to comfort, or help. When listening to someone's description of pain there is, in a sense, an element of listening to a vignette. As a practitioner listens to a patient describe their pain, they may be constructing a vignette dependent on both their own circumstances and that of their patient. For example, if a doctor (a non-smoker) sees a patient who presents with a hacking and painful cough that doctor's 'vignette' might include the self inflicted pain of a drug addict whereas a child who lives with a smoker might induce a different story; if the doctor is a smoker the 'vignette' constructed might be quite different again.

Empathy, as defined by Goubert et al. (2005, p. 285), may also be construed as a 'sense of knowing the experience of another person with cognitive, affective and behavioural components; and depends on both bottom-up and top-down cognitive processing'.

5.5.1 Empathy - Bottom-up Processing

Facial expression of the observed individual is a significant bottom-up cognitive determinant in one individual's empathy towards another in pain (Williams, 2002; Botvinick, Bylsma, Fabian, Solomon, & Prkachin, 2005). Individuals, who observe others in pain first infer pain with the use of the others' facial expressions then supplement this inference with verbal and nonverbal behaviours related to pain (Deyo, Prkachin, & Mercer, 2004). Reactions that are uncontrolled also serve as powerful pain cues to the observer (Hadjistavropoulos & Craig, 2002) (e.g. particular movements or lack of).

Hiding pain can also be a cue for observers to assess others pain (Williams, 2002).

5.5.2 Empathy - Top down Processing

Empathy is influenced by top-down cognitive processes. This involves the observer's individual concept of pain and his/her experience and expectations with regard to pain. Observers' belief about whether pain being experienced by others is mild, moderate or severe may also affect empathy (Goubert et al. 2005). Prior pain experiences generally result in willing empathic responses in the observation of individuals in a similar situation (Jackson, Meltzoff & Decety, 2005) consequently; vignette respondents' pain experience history may result in an empathic response that correlates with that history. Verbal and nonverbal behaviour distinctively related to pain can also cue the observer to a pain experience (Goubert et al. 2005). The top-down cognitive process related to decision-making and interpersonal judgement is implicated in empathy. Empathy therefore may be considered to be part of the decision-making process with regard to pain perception of a depicted vignette character.

5.6 Vignette Development, Design and Construction

The development of vignette methodology is complex and needs careful consideration. Research indicates that there are many extraneous variables that need to be controlled or addressed when it comes to the construction of scenarios and their corresponding probe devices (judgements, decisions, questionnaires etc). Internal validity (Gould, 1996), the nature of participants (King, Murray, Salomon & Tandon, 2004; Chambers & Craig, 1998; Hughes, 1998; Weisman & Brosgole, 1994) and the research topic (Sequin & Ambrosio, 2002) are necessary issues considered in the design and construction of a vignette series. Vignette construction must also reflect researchers and their consultants' personal and professional experiences (Kalafat et al. 1993; Barry & Green, 1991) in addition to actual case studies and individual experiences (Rahman, 1996; Friedenbert et al. 1993).

In short, the design of a vignette tool needs to incorporate or be constrained by findings and best practice from professional practitioners, existing literature and previous research (Cheek & Jones, 2003; McKeganey et al. 1995; Levkoff & Wetle, 1989). The following paragraphs explore the impact of such constraints/research on vignette construction.

5.6.1 Internal Validity

The internal validity of vignettes refers to the degree to which vignette content captures the research topic under question (Hughes & Huby, 2004). Internal validity is considered high when the impact of extraneous variables are controlled and the only variable influencing resulting data is the one being manipulated (Gould, 1996). For example, when attempting to identify whether a vignette character is in pain and the given details of the depicted character relate to educational qualifications and employment details, as opposed to physical capabilities and state of mind, then that vignette is low in internal validity. Conversely, if a vignette series that examines pain perception includes Kehoe et al's (2007, p. 288) aspects of the 'profile of pain', (the distress of pain, physical pain and its influence on suffers); the internal validity of such vignettes is high.

These specific factors are supported by recent findings into pain research (Kehoe et al. 2007) as well as Igier et al's (2007) study (see Section 5.3.2 – Individuals who provide Healthcare) where comparable factors were found to be most important in their participant's evaluation of patients' pain levels. Examples of vignettes with very low internal validity and high validity are illustrated in Figure 5.6.

Vignette with low validity

Ger is 70 years old. She is a lady with good education and is a retired teacher. She complains of pain from time to time. .

What amount of pain does Ger seem to you currently to be feeling? Please indicate this on the line between 'no pain' and 'extreme pain'

No pain ---Extreme pain

Vignette with high validity

Carrying the basket is really making 60 year old Chris's wrists feel miserable. Her arms were in agony. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt worn out.

Please indicate the level you feel Chris is, or is not, experiencing pain

1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ 10 □

No Pain *Pain as bad as you can*

Figure 5.6: Vignettes illustrating low and high internal validity

Hughes and Huby (2004) suggest that vignettes be piloted and that professionals are invited to assess the extent to which vignettes are representative of the relevant situation. Such procedures can strengthen the internal validity of vignettes, especially when the study requires them to be as realistic as possible (Gould 1996; Flaskerud, 1979).

5.6.2 Nature of Participants

It is important to match vignette design to specific participant groups (Weisman & Brosgole, 1994). Children, those who are intellectually challenged, or those belonging to specific populations should be considered in order to obtain best quality resulting data. Research indicates that similarity between vignette characters and respondents, familiar scenarios and language, and the consideration of cognitive ability via the length of vignette presented are also important (King et al. 2004; Chambers & Craig, 2007; Hughes, 1998; Weisman & Brosgole, 1994).

Children

The design of vignettes for use in research in children must be appropriate to their cognitive abilities. Chambers and Craig (1998) used a series of line drawn faces adapted from the WBS paediatric pain rating scale in an exploration of pain perception with regard to various medical procedures amongst children. The cartoon-like faces represented a range of expressions from a straight line or upturned mouth (neutral or smiley = *no pain*) to a down turned mouth (frown + tears = *the worst pain*) (see Chapter 4, section 4.4.1). This pictorial pain scale accompanied a story that depicted a child receiving an injection. The type of face used was found to significantly influence children’s pain perception.

Chambers and Craig's (1998) upturned lined smiley faces as a *no pain* anchor elicited higher scores for *no pain* when compared to straight lined neutral face anchor. This highlights the importance of the form of vignette for particular populations that is used in surveys and how subtle differences in content affect responses.

Vignette Character Names

King (2007) and King et al. (2004) suggest that, when feasible, character names on each vignette match participant's culture and gender; the implied gender of the vignette character's name should be the same as the participants. King (2007) suggests that gender neutral names can also be appropriate (e.g. Lee, Pat, Terry, Chris etc). This helps to enable respondents to more readily identify with the depicted vignette character. For example a stereotypical Irish undergraduate may have difficulty identifying and empathising with characters with names such as Ryunosuke (Japanese) or Chimutengwende (Zimbabwe).

Familiar Language

Participant specific/familiar language in the framing of scenarios is key to an accurate understanding of the situations as presented in vignettes (Hughes, 1998). Such situations can be as diverse as toddlers' and children's fearfulness of medical procedures (Chambers & Craig, 1998) to adults AIDS related drug injecting behaviours (Hughes, 1998). For example (and in addition to the pictorial perspective) the WBS pain scale uses the word 'hurt' as opposed to 'pain'. Baker, Lefkowicz, Keller, Wong and Culler (1996) observed that children as young as three understand the word hurt; they also suggest that the word for pain used by the child that is familiar (e.g. 'owie' or 'ouchie') should be used as an alternative. This approach can also be used with drug injectors who employ their own vocabulary. For instance buying drugs is referred to as 'scoring', or the injecting of drugs is referred to as 'banging', shooting' or 'hitting' (Hughes, 1998, p. 388). Participants 'get into' the stories (i.e. vignettes) when they understand the vignette character's situations. This was seen 'throughout the interviews ...in the ways people responded as their respondents were seen to be 'tutting', nodding or shaking their heads – while the vignette was read out' (Hughes, 1998, p. 391). The language employed in vignettes should reflect the particular situation being depicted and that most frequently used by respondents.

Cognitive Ability

The cognitive ability of the target participants may influence the salience or interpretation of the vignette as observed by Weisman and Brosgole (1994). Facial affect recognition in conjunction with responses to textual vignettes between two groups of children was compared to illustrate how different populations respond to particular types of vignettes. One group of children comprised of those who were intellectually challenged and the other group comprised of atypical children. Weisman and Brosgole (1994) observed that both groups were equally proficient in their responses to short and simple vignettes but those with learning difficulties had difficulty in their concentration span when responding to textually longer vignettes.

Finch (1987) recommends three or less manipulations within a vignette as she found that more was too confusing for young children to remember (aged 6 yrs-12 yrs). She also suggested that vignettes for adolescents can be up to 300 words but 150 or less for younger children.

5.6.3 Vignettes and Research Topic

The issue of the particular research topic of pain perception is considered here. As previously noted vignettes should mirror issues that occur with some frequency in respondents' lives (Sequin & Ambrosio, 2002) and with mundane scenarios that avoid unusual characters and events (Barter & Renold, 1999). Pain perception, by way of vignettes, has previously been explored via visual imagery (e.g. photographs, paintings) (Bendelow, 1993) and line drawings (Chambers & Craig 1998) and also textual scenarios (Igier et al. 2007; Miceli & Katz, 2009; Peabody et al. 2004).

Research Topic within an Irish Context

The area of pain perception is particularly relevant in an Irish context as recent research reveals that residents in 36 percent of Irelands' households experience or report the experience of chronic pain (Raftery et al. 2011). This figure is substantially larger than the Irish data in a large-scale European-wide study in

2006 (Brevik et al, 2006) where chronic pain prevalence in Ireland was 13 percent. Raftery et al. (2011) maintain differences in prevalence rates internationally may be caused by (i) methodological differences across studies and (ii) the definition of chronic pain. Four hundred and twenty eight of the 1,204 (40% of original sample) participants met the criteria for chronic pain (i.e. pain lasting longer for 3 months); 43 percent (n =231) of these reported their pain began from unknown circumstances. Chronic pain therefore meets with Sequin and Ambrosio's (2002) requirement that the use of vignettes mirror issues that occur with some frequency in respondents' lives.

5.7 Interpretation and Response to Vignettes

This chapter so far has addressed the design and development of vignettes. There is little recent research into this area (a search for 'vignettes' in keywords, titles and abstracts of peer reviewed articles in CINHAL, PsychARTICLES, MEDLINE and Social Sciences Full Text/H.W. Wilson) databases between the years of 1996 – 2011 resulted in 36 articles. Eight of these explored the development and utilisation of vignettes - see Appendix D. Vignette methodology also includes a probe device. This section explores the impact of probe design on participant responses to scenarios. Participants' responses to vignettes can be elicited in a number of ways depending on the purpose of the research and the topic being investigated. Evidence suggests that the nature of responses subsequently depend on three particular issues; vignette questionnaire design, participants' response perspectives, and how participants interpret vignettes as this may or may not result in particular response challenges.

5.7.1 Vignette Questionnaire Design;

There are advantages to the use of open and closed follow-up questions that normally accompany vignettes. Closed questions are more commonly used with the quantitative applications of vignettes (Coleman, Ganong, Killian & McDaniel, 1999) while open questions elicit responses which may provide a more realistic estimate of reactions to real life situations (Kalafat & Gagliano, 1996). This enables a cognitive space to identify the particular vignette situation from the personal perspective of the respondent (Renold, 2002).

> It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat extremely slowly turns over and presses the snooze button for another 10 minutes. He slept really badly last night. The bedroom is dark. Ten minutes later he pushes back the bed covers and very carefully sits up on the bed. With his hands Pat cautiously lifts his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He has a suffocating feeling in his body. With immense stiffness, he reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks awfully slowly to the kitchen to have his breakfast. His legs are very heavy today.

Open question

What level of pain do you feel Pat is experiencing?

____

____

____

Closed question

Please indicate what level of pain you feel Pat is experiencing?

1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ 10 □

No Pain ... *the worst pain imaginable*

Figure 5.7: Vignette illustrating open and closed subsequent question

The use of both open-ended and closed-ended questions can be beneficial (Perkins, Hudon, Gray, & Stewart, 1998; Rahman, 1996; Finch, 1987) and retain higher participant interest levels than those who are presented with either open or closed questions (Rahman, 1996). However, the questioning approach adopted depends on the research design and also shapes the data obtained (Hughes & Huby, 2004).

5.7.2 Participants' Response Perspectives

Specific research aims determine the manner in which participants are invited to respond to a vignette series. Generally participants engage with a specific situation that may or may not involve some form of moral dilemma by stating what they would do/how they feel/what they think or what they imagine a third person (i.e. the vignette character) might do/how they feel/what they think and sometimes both. There is fundamental difference between inviting participants about what someone else 'ought' to do in a particular circumstance and what they themselves would do. Responses to vignettes do not always predict behaviour (e.g. female carers' coping strategies; behaviour of victims of domestic abuse – see Section 5.2). This issue does not arise in this thesis as participants were invited to judge/decide whether, or not, a vignette character is experiencing pain.

5.7.3 Participants' Interpretation of Vignettes

How participants interpret and respond to vignettes is a grey area and little researched (Finch, 1987) Little is known about the factors or mechanisms which might influence responses to vignettes; assumptions participants make during their interpretation of vignettes and whether specific elements within vignettes trigger particular responses have not been identified (McKeganey et al. 1995). Finch (1987) maintains that vignette methodology enables participants to define the meaning of the situation presented themselves as opposed to definitive and answer constrained questionnaires. Participants can be concerned with the lack of information contained in vignettes when asked to respond to them – providing an insufficient base for response (Hughes, 1998; Wilson & While, 1998) but Parkinson and Manstead (1993) argue vignettes cannot fully capture the elements of reality that are under study and it is this aspect which can be considered one of the main advantage of vignette methodology. All the necessary information participants wish to draw on cannot be included in a vignette as fundamentally the context of the vignette is selective; this can simplify the principles and concepts which are under study (Rossi & Alves, 1980).

When information is lacking in vignettes the manner in which participants deal with this can also provide valuable data (Hughes & Huby, 2004). For example, Hughes' (1998) research into drug injecting/HIV risk/safer behaviour found that some participants, who were drug injectors, reported the vignette scenarios they were asked to respond lacked detail. The participants were then forced, in their responses, to draw on their own and their peer's experiences. Participants also drew from events contained within the vignettes to help with their interpretation of the situation under study. Participants' interpretations of vignettes are supported when they, themselves, have had experience of the situation (Hughes, 1998). For example, Hughes found his participants, who were drug injectors themselves, had no difficulty in either their interpretation of and their response to a vignette when the character depicted in the vignette abused drugs and needs and injection.

Evaluation of Another's Pain

Research indicates a positive correlation between an individual's verbal and neural reaction and the observation of another's' pain experience via photographs (Gu et al. 2010), videos (Saarela et al. 2006), and the faces of those experiencing chronic pain (Oshsner et al. 2008). These findings may be considered in the interpretation of textual vignettes when depicted characters' movements, physical discomfort and feelings etc are described via pain descriptors taken from the validated and reliable McGill Pain Questionnaire.

5.8 Summary

The pain detection and measurement tool being developed in this thesis employs vignette methodology. Vignettes are hypothetical scenarios; usually short, but may be of variable length. Participants are requested to respond to the same vignette, but with modifications relevant to the topic being investigated. It is this myopic and selective view of reality that makes vignette methodology an important research tool for this research. Participants' conflicts with regard to the research topic may be eased by the simplification of selective representations of the world. Though there is continuing discussion regarding the 'reality' portrayed by vignettes, as a research methodology vignettes are not used as a means to simulate complete reality and so participants can respond to a topic 'outside' of their own consciousness.

Vignette methodology is a particularly valuable research tool as variables are easily manipulated. This methodology has many advantages over more traditional methods of obtaining data with regard to human behaviour (these are summarised and presented in Figure 5.8).

Some examples of the key benefits in the use of vignettes are ‘difficult’ topics which can be addressed sensitively when compared to questionnaires or interview methods of inquiry; vignettes do not require in-depth knowledge by respondents, and social desirability is reduced.

Advantages of Vignette Methodology	
1. Focus of discussion	Provides a focus of discussion within individual interviews; be used as prompts within group discussions (Hughes, 1998; Sim et al, 1998); provide direct particular pointers in the topic, or area, being investigated.
2. Flexibility	Responsive in a unique way to specific issues or concerns; simulate specific elements of the research topic being studied (Finch, 1987).
3. In-depth knowledge	Does not demand that participants have in-depth knowledge about the topic being examined or investigated (Liker, 1982).
4. Mundane 'real life' events	Need to reflect 'mundane reality' rather than exaggerated scenarios. Scenarios depicted in vignettes may be constructed from mundane events, which according to Hughes and Huby (2001) can enable more understanding with regard to how individuals might behave in specific situations; realistic scenarios depicted in vignettes can help detect the subtleties, nuances (Sumrall & West, 1998), and personal saliencies of which only 'insiders' are aware.
5. Rich Data	Voices of respondents/participants are more richly captured within vignette-generated data than traditional questionnaire data (Hughes & Huby, 2004; Bendelow, 1993) as participants respond to vignettes with enjoyment and creativity.
6. Less Social Desirability Responses	Vignette methodology can help overcome the obstacle of social desirability responses (Glidden, 2008).
7. Snapshot view	A situation 'snapshot' within a vignette, offers participants distance/space within which to provide 'a discursive interpretation within the context of the vignette' (Hughes, 1998, p.383). The situated context of a vignette can be used to explore main influencing factors.
8. Third party perspective	Vignette methodology permits a 'de-personalisation that encourages the respondent to think beyond his/her own circumstances; (this is) an important feature for sensitive topics' (Schoenberg & Ravdal, 2000, p. 63 & Finch, 1987).
9. Variable manipulation	One and or many variables within a vignette series can be simultaneously manipulated (Gould, 1996).

Figure 5.8: Summary of Advantages of Vignette Methodology

Research has shown that the development and construction of vignettes is complex. The effectiveness of this methodology is a function of the degree to which it addresses the many potential confounding factors discussed in this chapter. These include:

- Internal validity (Gould, 1996);
- Contingency of vignettes with participants (Chambers & Craig, 2007; King et al, 2004; Hughes, 1998; Weisman & Brosgole, 1994);
- Appropriateness to the research topic (Sequin & Ambrosio, 2002);
- Factors identified in existing literature and previous research (Cheek & Jones, 2003; MckKganey et al. 1995; and Levkoff & Wetle, 1989).

The many advantages of vignette methodology and considerations presented above underline the rationale for the use of the vignette series that is being constructed for this thesis.

5.9 Aim of Thesis

This thesis aims to explore the space that is the linguistic and conceptual divide, between the healthcare receiver and healthcare provider and the decisional criteria on pain evaluation by the incorporation of a methodological and theoretical framework of vignettes and SDT.

A pain detection and measurement tool will be developed and assessed. This tool will have the potential to bridge the gap between pain reports from the individual experiencing pain and their observer (e.g. a healthcare provider, carer and or family member). It will be the basis for a qualitative pain measurement technique and will comprise of a series of vignettes that will enable the extraction of objective and subjective pain measures of depicted vignette characters with a chronic illness. Resulting data will be then analysed within the framework of SDT.

6. METHODOLOGY

6.1 Overview and Introduction

6.1.1 Overview

This chapter describes the methodology that underpins the two studies conducted. The studies aim to address some issues that arise from the deficits in available pain assessment tools; namely that they fail to reflect the impact of the social interaction on pain perception and assessment (see chapter 4).

The two studies employ a specific vignette series with an accompanying questionnaire. In line with issues raised in chapter 5, the vignette series depict scenes that have relevance for two target populations, (reported in section 6.3.3 and 6.3.4). The ethical issues involved with both studies are examined in section 6.2.

6.1.2 Introduction

The Model of Social Communication of Pain (Craig, 2009) (see Chapter 3, Section 3.7) identifies the need to acknowledge that the experience and the expression of pain typically involves a two way communication between the individual (with the pain experience) and one or more observers (e.g. family members, health professionals. Current pain assessment tools do not appear to embody this two way conversation, nor do they reflect:

a) The impact of the 'pain conversation' on the sufferer's pain experience;
b) The observers' perception of pain;
c) The issue of credibility between sufferer and observer.

This can lead to a misunderstanding or mis-calibration in pain level assessment that may have serious consequences for the individual in pain. Good pain management is in part a function of the accuracy of pain assessment.

The two studies conducted for this thesis aim to address the issue of the mis-calibration in the assessment of a pain experience by parties involved in a pain assessment: namely the person experiencing and reporting pain (e.g. a patient) and the person assessing pain using a tool (e.g. a health practitioner).

The Psychological Society of Ireland's (1999) Code of Ethics was observed in the design and performance of the two studies and is discussed in the next section.

Vignette methodology and Signal Detection Theory analysis of resulting data underpin these two studies. The rationale for their use may be found in Chapter 1 (section 1.5) and Chapter 5 (section 5.3) for vignettes and Chapter 1 (section 1.4) and Chapter 4 (section 4.1.2 and 4.6.2) for SDT analysis.

6.2 Ethical Considerations

6.2.1 Ethical Guidelines

Ethics can be defined as a 'set of moral principles by which we conduct ourselves' (Howitt & Cramer, 2005 p.98). Sieber (1993, cited in Morrow, 2009, p.1) suggests that ethics relate to 'the application of a system of moral principles to prevent harming or wronging others, to promote the good, to be respectful, and to be fair'. Resnik (2009, p. 1) defines ethics as 'norms for conduct that distinguish between acceptable and unacceptable behaviour'. Researchers need to be aware of the research ethics relating to him/her self when conducting research. S/he also needs to be aware of the obligation and responsibilities towards participants who partake in their research and whose basic rights have to be protected. This study has been conducted in a respectful manner that reflects these ethical considerations. The researcher adhered to the most stringent interpretation of the ethical guidelines and ensured that contemporary best practice was observed throughout.

The Code of Professional Ethics, as outlined by the Psychological Society of Ireland (PSI) (1999), was followed in the procedures of this study.

6.2.2 Ethical Principles

The ethical principles guiding this study are consistent with those proposed by the Psychological Society of Ireland. The PSI's principles cover all aspects of ethical considerations when carrying out research with human participants. The four overall ethical principles, which subsume a large number of specific ethical standards, were adhered to. These comprise of respect for the rights and dignity of the person, competence, responsibility and integrity.

Participants were made aware of their rights, which included informed verbal consent, voluntary participation, confidentially, privacy, integrity and that no harm would come to them. Participants were given the choice of being, or not being, involved in the study. There were no benefits by way of credits or grades associated with their participation. Participation was entirely voluntary. As required by the PSI (1999) the researcher advised participants they could withdraw from the research at any point without fear or promise of consequences. The researcher fully informed participants of the purpose, and methodology, of the proposed study, how the research data would be analysed, and how the findings would be disseminated.

6.2.3 Confidentiality & Anonymity

An important consideration in any research is the participants right to confidentiality and anonymity. Participants in this study were informed, prior to participation and again at debriefing, that all data would be used only within the research, and that their identity would remain anonymous.

Included in the demographic section of the questionnaire was the statement *I am in good health* to which participants were given the option to respond to

(Appendix E). Participants' anonymity, and their personal information, was protected as the statement did not require revelation of personal health details.

6.2.4 Debriefing

Participants were informed of the true purpose of the study after participation (see Appendix E). It was explained that the use of the research title 'Linguistics: An Investigation into the Use of Adjective Patterns' was to prevent any priming or influence that the actual title 'Painful Decisions: An Exploration of Pain Assessment (from the perspective of others) within a Signal Detection Theory Framework' may have caused. Participants were also given the researchers and Faculty Supervisors contact details should they have any concerns with regard to the research or wish to view a copy of the research results and or an opportunity to discuss them.

6.3 Design

6.3.1 Experimental Design

The studies employ a between subject design therefore there was no practice or carryover effects. Participants were randomly assigned to one of four experimental conditions. There was one independent variable with four conditions; a series of vignettes which depicted four pain levels (i.e. no pain, mild, moderate and severe pain). The dependent variable was the pain judgement data obtained subsequent to vignettes being read by participants.

These data were measured on a Likert scale (1 – 10), with a start point of *no pain* and an end point of *pain as bad you can imagine*.

It was predicted that inferential statistics would reflect a positive correlation between the extent of participants' pain perception and the four ascending pain conditions and that signal detection theoretical analysis would indicate enhanced sensitivity to the pain levels.

The design involved four experimental controls to ensure attention accuracy, independence of observation and influence, stated purpose of the research and age/gender manipulation of depicted vignette character. These controls are further explained in the procedure Section 7.2.4.

6.3.2 Materials

The materials consisted of a series of vignettes and a short questionnaire. The vignette series described characters in two everyday domestic activities (Appendix F) and comprised of 32 vignettes. One vignette (and accompanying questionnaire - Appendix G) was given to each participant. The vignettes simulated the signal and noise, and noise trials, of an SDT experiment. Those that contained pain descriptors represented 'signal and noise' trials and those that contained no pain descriptors represented 'noise' trials. Each trial was represented by one vignette and the participant's subsequent response.

6.3.3 Vignette Series

The vignette series reflected four pain conditions, no pain, mild pain, moderate, and severe pain, similar to the pain levels in Melzack's MPQ-SF (Melzack, 1984) (Appendix C). The first, middle and last descriptors of the sensory, affective and evaluative ratings in the MPQ-SF were employed as these were felt to reflect mild, moderate and severe levels of pain. All conditions were presented within two different scenarios. As mentioned in chapter 5 (section 5.4.4) best practice for vignette design is reflected by commonplace occurrences within a mundane reality. When there is less emphasis on a character's eccentricities and disastrous events this reality is portrayed clearly (Finch, 1987). Getting up in the morning and grocery shopping are activities of the 'everyday' and were employed in this vignette series. An example of each vignette scenario is presented here:

Getting up in the morning *No pain condition / 20 yrs / Male*

It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat turns over and presses the snooze button for another 10 minutes. He's feeling lazy. The bedroom is dark. Ten minutes later he pushes back the bed covers and without delay sits up on the bed. Pat swings his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks quickly to the kitchen to have his breakfast.

Grocery shopping *Severe Pain Condition / 60 yrs / Female*

Sixty-year-old Chris is grocery shopping as she's cooking dinner for some of her family tomorrow evening. She only needs a few items such as fresh vegetables, meat, and cat food. She did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today she's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a very long time today. After getting the groceries the basket is pulling her arms and she's sorry she didn't get the trolley. Carrying the basket is really making her wrists feel miserable. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. Her arms were in agony. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt worn out.

Figure 6.1: Sample Vignettes

Each scenario was presented in a paragraph of less than 200 words. Within each pain condition, vignette characters (Pat or Chris) were presented as being male or female, and 20 or 60 years of age. This resulted in a vignette series of 32 permutations (4 conditions x 2 scenarios x 2 gender x 2 age) (see Appendix F).

The ecological validity, of both scenarios, was verified in advance of the experiments. To be ecologically valid, vignettes must approximate the real-life situation that is under investigation. Two individuals, each with a different chronic illness, read through the vignette series and said from their particular perspective; both scenarios seemed 'realistic' and 'believable'.

A complete profile of pain, as per Kehoe et al. (2007), which included factors such as the physical distress of pain, the emotional distress of pain, and social impairment was incorporated into the design of the vignette series. This was done by the inclusion of Melzack's MPQ pain descriptors from the sensory/physical perspective (e.g. dull, tugging, pulling, heavy and wrenching), affective/emotional (e.g. fearful, frightening, suffocating and killing).

Evaluative and miscellaneous factors of pain via pain descriptors from the MPQ were also integrated into the vignette design (Appendix B & C). This ensured internal validity of the vignette series. No pain descriptors were included in the 'no pain' condition and pertinent descriptors from each factor were used in the mild, moderate, and severe pain conditions. Where there were three or five pain descriptors, the first, middle, and last descriptor were chosen to represent mild, moderate and severe pain.

This enabled participants to detect, or not, a pain experience and if detected to assess its extent. These descriptors are illustrated in Figure 6.2.

Pain Level	Sensory	Affective	Evaluative	Miscellaneous
Mild Does not interfere with most activities. Able to adapt to pain psychologically and with medication.	Dull[1]* Jumping Pricking Sharp Pinching Tugging[2]*	Fearful[1]* Punishing[2]*	Annoying[2]*	Tight Cool Nagging
Moderate Interferes with many activities. Requires lifestyle changes but patients remain independent. Unable to adapt to pain.	Flashing Drilling Cutting Gnawing Pulling[2]** Hurting**	Frightful [1]** Cruel	Miserable [2]**	Drawing Cold Agonizing [2]**
Severe Unable to engage in normal activities. Patients are disabled and unable to function independently.	Heavy[1]*** Shooting Lacerating Crushing Wrenching [2]***	Suffocating [1]*** Killing [2]***	Unbearable[2]***	Tearing Freezing Torturing

Figure 6.2: Outline of each pain level and associated pain descriptors from MPQ Lowest, mid and highest ranked descriptors in MPQ major pain categories

[1] Vignette scenario 1 * mild pain ** moderate pain *** severe pain;
[2] Vignette scenario 2 * mild pain ** moderate pain *** severe pain

The increased difficulty of various everyday life experiences for those experiencing pain was reflected by pain descriptors incorporated into each pain condition of the vignette series (e.g. general activity, walking ability, normal work, and sleep). These in turn encompassed the three factors of Kehoe et al's pain profile. This is illustrated by the pain descriptors and indicators that relate to the physical distress of pain in the activities of walking and sleeping, in addition to affective and evaluative aspects of pain in Figure 6.3.

	No Pain	*Mild Pain*	*Moderate Pain*	*Severe Pain*
Sleep Impairment	▪ Feeling lazy	▪ Didn't sleep well last night	▪ Slept badly	▪ Slept really badly
General Activity & Ability	▪ Turns over ▪ Sits up without delay ▪ Quickly ▪ Swings his/her legs	▪ Slowly turns over ▪ Gradually sits up ▪ Walks slowly ▪ Stiffly ▪ Lifts his/her legs	▪ Turns over very slowly ▪ Gingerly sits up ▪ Walks very slowly ▪ Very stiffly ▪ Gently lifts his/her legs	▪ Turns over extremely slowly ▪ Very carefully sits up ▪ Walks awfully slowly ▪ With immense stiffness ▪ Cautiously lifts his/her legs
Affective/ Emotional Indicators		▪ Doesn't feel great ▪ Arms were punishing him/her ▪ Shopping takes a long time today ▪ S/he feels tired	▪ Feels frightful ▪ Pulling his/her arms ▪ Shopping takes a very long time today ▪ S/he feels worn out	▪ Suffocating feeling ▪ Wrenching his/her arms ▪ Shopping takes forever today ▪ S/he feels shattered
Sensory/ Physical		▪ Legs feel dull ▪ Tugging his/her arms	▪ Legs are hurting ▪ Pulling at his/her arms	▪ Legs are very heavy ▪ Wrenching his/her arms
Evaluative		▪ Annoying his/her wrists	▪ Makes his/her wrists miserable	▪ Makes his/her wrists unbearable

Figure 6.3: Vignette pain descriptors from MPQ and pain indicators relative to sleep, physicality and pain evaluation.

6.3.4 The Questionnaire

The questionnaire (Appendix G) began with two demographic questions (i.e. gender and age) and a statement relating to participants' health status:

Please tick if appropriate *'I am in good health'* ☐

These were followed by two pain judgement statements that related to the vignette characters:

'Pat is experiencing pain' ☐ *'Pat is not experiencing pain'* ☐

The pain judgement measure utilised a Likert scale. Lower scores indicated a perceived lesser pain experience, and higher scores indicated a perceived greater pain experience. There was a question relevant to each vignette scenario to verify participants had closely read and attended to the detail within the vignette.

The two studies that incorporated this design and utilised this vignette series and questionnaire are reported in Chapter 7

7. STUDY 1 AND STUDY 2

7.1 Introduction

The purpose of the two studies was to garner initial evidence for the hypothesis that pain judgement data, when subjected to SDT analyses, indicates enhanced sensitivity to all levels of pain. The fact that the vignette series contains vignettes that do not include a 'signal', that is a pain descriptor, facilitates differentiation between participants' responses whether they perceive, or not, that the vignette character is experiencing pain and to what extent. This theoretical framework for data analysis also allows for differentiation between populations.

The two target participants groups comprised of Arts/Education undergraduates (Study 1) and student nurses (Study 2). The rationale for the use of these two populations is that research indicates that caring professionals (i.e. Healthcare providers) assess 'characters in pain' differently than do non healthcare professionals or healthcare receivers (Hodgkins et al. 1985; Todd et al. 1994; Marquié, et al. 2003; and Craig, 2009). Potential differences between these two cohorts may strengthen the case for the need of further research.

Participants, materials, procedures, experimental controls, data input and analysis in both studies are reported where pertinent in Study 1 and Study 2. A brief discussion follows both studies; Study 1's discussion will inform modification(s) required in Study 2. Chapter 8 will report the general findings of the thesis and a general discussion will follow in Chapter 9.

7.2 Study 1 / Overview

This first pilot study identified procedural difficulties and anomalies which are discussed in section 7.4. Highlighted issues and concerns are then addressed in Study 2.

Study 1 was subjected to four experimental controls to ensure attention accuracy, independence of observation and influence, stated purpose of the research and age/gender manipulation of depicted vignette character. These controls are examined in section 7.2.4.

The following sections (7.2.1 – 7.2.5) examine participant details, materials used, procedure followed, experimental controls, data input and analysis methodologies. Results of this study are presented in Section 7.3 and discussed in Section 7.4.

7.2.1 Participants

A convenience sample of 579 Arts/Education undergraduates, which comprised of 486 (84%) females and 93 (16%) males, completed this experiment. Four hundred and fifty nine (79%) undergraduates were between 18 and 22 years of age, 111 (19%) between 23 and 40, and nine (2%) over 40 (one did not respond to this question). Five hundred and sixty one (97%) indicated they were in good health. Eighteen (3%) did not respond to the statement 'I am in good health'. The undergraduates were recruited during University tutorial sessions.[3] All those recruited in tutorial sessions participated in the study. Approximately 25 percent (a differential of 0.5%) responded to each pain condition.

7.2.2 Materials

The specially designed vignette series (sections 6.3.2 and 6.3.3; Appendix F) and accompanying questionnaire (section 6.3.4; Appendix G) were used in this study via PowerPoint slides and hard copy.

7.2.3 Procedure

One vignette and a questionnaire (as described in Section 6.2) (see Appendix F & G) were presented to between 12 and 20 undergraduates within 36 groups during university tutorial sessions. Undergraduates were told this was a linguistic study that related to the investigation of adjective pattern use, asked for their verbal consent to participate, and were told they could leave at any stage during the survey process (Appendix H). They were asked to complete the demographic questionnaire. After reading the vignette, undergraduates were asked to respond to a verification question to ensure their understanding of, and attention to, the vignette's detail (experimental control – section 7.2.4). They were then asked to respond to the two pain judgement data statements as presented in Figure 7.1. This

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[3] Certain intellectual standards are required to fulfil university entrance requirement. Consequently, it was assumed undergraduates were able to (i) read the vignettes as required by the survey, (ii) carry out instructions in the completion of the pain judgement questionnaire, and (iii) have a clear cognitive understanding of the vocabulary used in both vignettes and the questionnaires.

was to ensure participants had the opportunity to respond to both a positive and a negative question with the objective of minimising any bias.

1) Pat is experiencing pain

1□ 2□ 3□ 4□ 5□ 6□ 7□ 8□ 9□ 10□

No pain *pain as bad as you can imagine*

2) Pat is not experiencing pain

1□ 2□ 3□ 4□ 5□ 6□ 7□ 8□ 9□ 10□

No pain *pain as bad as you can imagine*

Figure 7.1: *Pain judgement data statements Experiment 1 & 2*

7.2.4 Experimental Controls

Four experimental controls were in place during the course of this experiment, three procedural and one embedded in the vignette design.

(i) The first experimental control ensured that vignettes were accurately read and understood by the undergraduates.

PowerPoint presentations of 15 of the 32 vignette series were made to 359 (62%) undergraduates (15 tutorial groups of between 22 and 26). The final slide of the each presentation asked a relevant question and sought written verification from each undergraduate that the vignette was read, attended to, and understood. Examples of these relevant questions are outlined below.

Scenario 1:

Getting up in the morning '... *Pat is looking forward to seeing his brother who is to call today; he's not seen him for a week or two. He must remember to give him his birthday card and present when he arrives...'*

Verification sought – 'What did Pat have to remember to give to his brother?'

Scenario 2:

Grocery shopping '...*Chris is grocery shopping as he's cooking dinner for some of his family tomorrow evening. He only needs a few items such as fresh vegetables, meat, and cat food. He did a bigger shop earlier in the week but forgot the cat-food...'*

Verification sought – 'What did Chris forget to buy earlier in the week?'

Undergraduates were then invited to respond to the pain judgement scale (see Figure 7.1).

The 220 (38%) remaining undergraduates were surveyed with a hard copy vignette accompanied by the same verification question. Therefore, these undergraduates had opportunity to corroborate their verification answer. No significant differences between PPT and hardcopy responses to the verification question were found (i.e. 90% correct responses; 1%

incorrect; and 9% did not respond). This indicated that, in general, undergraduates read, understood, and attended to the vignette detail.

(ii) The second experimental control was to ensure independence of observations and influence. Within each tutorial group, undergraduates were given vignettes that depicted different pain levels in order. In addition, each vignette illustrated alternate scenarios. This ensured that undergraduates in proximity to each another read different vignettes and, by virtue of physical space, any influence on resulting pain judgements was reduced.

(iii) The final procedural control was the stated purpose of the survey. When vignettes were presented to the undergraduates, whether by PPT presentation or hard copy, the purpose given was the investigation of the use of adjective patterns.

(iv) In contrast to the three procedural controls the final experimental control was contained within the vignette design itself.

a. Gender - The generic names of 'Pat' and 'Chris' facilitated diffusion of pre-existing gender influence towards pain judgement in the opening section of each vignette. Characters were depicted as either female or male in equal proportion in the latter section of each vignette.

b. Age - Characters were presented as being either 20 or 60 years old in equal proportion throughout the vignette series.

On completion the undergraduates were thanked for their time. The purpose of the experiment with regard to language centred on pain was fully explained. How the data would be treated and analysed was also explained, and questions from participants were addressed. The researcher's and University Faculty's contact e-mail addresses were provided for future queries. Undergraduates were informed that full results of the study, on completion, would be available to them (see Appendix E).

7.2.5 Data Input and analysis

Data Input

Resulting data was coded (Appendix I), inputted into a Statistical Package for the Social Sciences (SPSS) dataset, and checked for errors. All out of range scores were checked from the original raw data and corrected where necessary. Specific values were assigned to missing data and reported where appropriate (e.g. where participants chose not to report their health status or age).

Data Analysis

(i) Descriptive Data Analysis

Descriptive analysis explored differences between undergraduates' responses to the four pain conditions, and between responses to the different vignette scenarios, ages, and gender of the depicted characters. Descriptive analysis identified the necessary criteria required to conduct SDT analysis (i.e. mean response scores within each pain level).

(ii) Inferential Statistical Data Analysis

One-way between-groups ANOVA

The one-way between-groups analysis of variance (ANOVA) was used to enable identification of any statistical differences between the mean responses to the four pain conditions. The effect size of any differences found was calculated by dividing the sum of squares between groups by the total sum of squares. This provided an indication of the magnitude of the differences between responses to the pain conditions, and represented the proportion of variance in the pain rating scores, as explained by the pain conditions. Planned comparisons/post-hoc analyses were also conducted to determine where these significant differences, if any, lay amongst the four conditions.

Three-way between-groups ANOVA

The three-way between-groups ANOVA enabled the exploration of any main effects vignette characters' age and gender, and pain levels had on undergraduates' pain ratings. This statistical analysis also facilitated the identification of any interaction between these variables and impact on resulting pain ratings.

(iii) Analysis based on a Signal Detection Theory Framework

The correct, and incorrect, hit rates for the four pain conditions were computed. That is whether, or not, the undergraduates had correctly detected a pain signal within the vignettes they had read. These data were subsequently used to calculate the incorrect and correct rejection rates (i.e. whether undergraduates had correctly, or incorrectly, detected a pain signal when it was present and whether they correctly, or incorrectly, detected a pain signal when it was absent). Pain judgement mean response scores for each pain condition were used as the criterion for these computations. Scores equal to, and above, the mean illustrated decisions that pain was being experienced by the vignette character (i.e. a signal was detected); scores below these criteria levels indicated decisions that pain was not being experienced (i.e. a signal was not detected).

Correct Hit Rate

The rate of correct hits was calculated by dividing the number of times each an undergraduate said 'yes, Pat/Chris is experiencing pain' at each pain condition (correct hit frequencies) and was correct in this response, by this number plus the incorrect rejection frequencies (i.e. the number of undergraduates who incorrectly detected a pain signal in the no pain condition vignettes).

Incorrect Hit Rate

The incorrect hit rate was calculated by dividing the number of times each undergraduate said 'yes, Pat/Chris is experiencing pain' at each pain condition and was wrong in this response (i.e. incorrect hit frequencies) and dividing it by this number plus the correct rejection frequencies (i.e. the number of undergraduates who correctly detected no signal was present in the no pain vignettes).

Correct and Incorrect Rejection Rate

Correct and incorrect rejection rates were calculated by subtracting the correct hit rate, and incorrect hit rate, respectively from 1.

7.3 Study 1 / Results

Resulting data are presented by way of descriptive analysis, inferential analysis and analysis within a signal detection theoretical framework. Descriptive analysis comprises of response frequencies and mean scores to the four pain levels, to each vignette scenario, and to each vignette character age and gender. Inferential statistical analysis employed is a one-way, and three-way, between-groups ANOVA; post-hoc tests are also outlined. The criteria for SDT analytical framework are presented along with detection rates for the four pain levels.

7.3.1 Overview

Descriptive analysis of resulting data illustrated that undergraduates proportionately responded to the four pain conditions and to each vignette within the series. Responses to the statement 'Pat/Chris is experiencing pain' indicated undergraduates felt vignette characters experienced more pain as vignette pain-level descriptors graduated from mild pain to moderate pain, and to severe pain.

These data suggested that older males were perceived to experience more pain than older females, and the younger males and females. Older males attracted higher mean pain rating scores when compared to older females.

Mean responses to the statement ‘Pat/Chris is not experiencing pain’ did not follow this trend. Perception of a pain experience in the severe pain condition was greater than in the mild pain condition but less than in the moderate pain condition. Older males in the mild pain condition, younger males in the moderate condition and younger females in the severe condition were perceived as having a greater pain experience.

Inferential statistical analysis revealed significant statistical differences between responses to both pain statements in the four pain levels (with the exception of differences between the moderate and severe pain condition in responses to the statement ‘Pat/Chris is not experiencing pain). A larger effect size was found in responses to ‘Pat/Chris is experiencing pain’ when compared to the responses to the statement ‘Pat/Chris is not experiencing pain’. Impact of pain levels and age on pain ratings and interactions between vignette characters’ gender and pain levels were also found in responses to both pain statements.

SDT analysis reflected a parallel increase of detection with the mild, moderate and severe pain conditions. Eight percent of undergraduates detected a pain signal when in fact there was none – that is they felt that the vignette character was experiencing pain despite the fact that there were no pain indicators present in the descriptive scenario they read.

7.3.2 (i) Descriptive Analysis

Undergraduates' Response Frequencies to the Four Pain Levels

In general, an equitable number of undergraduates responded to each pain condition as outlined in Table 7.1. There is a response differential of 0.5% in favour of the moderate pain condition).

Table 7.1: Undergraduates' Response Frequencies to the Four Pain Levels *(n =579)*

Response Frequencies to each Vignette Scenario; age and gender

Pain level	*Response Frequencies*	*Percentage %*
No Pain	143	24.7
Mild Pain	145	25.0
Moderate Pain	146	25.3
Severe Pain	145	25.0
Total	579	100.00

There were a relative equitable number of responses to vignettes that reflected each combination of scenario, gender and age. These data are presented in Table 7.2. There was a response frequency differential of 2.3% in Scenario 1 (in favour of vignette 1 and 4) and 0.7% in Scenario 2 (in favour of vignette 5, 7 and 8).

Table 7.2: Undergraduates' Response Frequencies

Scenarios 1 and 2, vignette character male/female, and age 20/60 yrs; (n =579)

	Gender, Age, and Scenario	Frequency	Percent %
1	Male; 20yrs; vig 1	75	13.0
2	Male; 60yrs; vig 1	71	12.3
3	Female; 20yrs; vig 1	62	10.4
4	Female; 60yrs; vig 1	75	13.0
5	Male; 20yrs; vig 2	75	13.0
6	Male; 60yrs; vig 2	71	12.3
7	Female; 20yrs; vig 2	75	13.0
8	Female; 60yrs; vig 2	75	13.0
	Total	579	100.0

Undergraduates' Mean Response Pain Rating Scores

Mean response pain rating scores to both pain judgement statements within each gender, and age, are outlined in Tables 7.3 and 7.4, and Figures 7.2 and 7.3.

Table 7.3: Undergraduates' Mean Response Pain Rating Scores

Each pain condition identified by age and gender (n =579) in response to statement 'Pat/Chris is experiencing pain'

Vignette Details	*No Pain*	*Mild*	*Moderate*	*Severe*
Male 20 yrs	1.54	3.19	6.05	6.78
Male 60 yrs	1.47	4.20	6.25	6.84
Female 20 yrs	1.25	3.68	4.96	7.15
Female 60 yrs	1.53	3.32	5.60	7.11

Scores indicate that undergraduates felt 60 year old males increasingly experienced more pain than 60 and 20 year old females, and also 20 year old males, in the ascending pain conditions when asked to rate the statement 'Pat/Chris is experiencing pain'.

Figure 7.2: Undergraduates' Mean Response Pain Rating Scores Pain judgement statement 1 - 'Pat/Chris is experiencing pain'. Each pain condition identified by age and gender; (n =579)

No specific pattern is discerned from mean scores from the pain judgement statement 'Pat/Chris is not experiencing pain' with regard to age or gender as outlined in Table 7.4 and figure 7.3. A number of undergraduates did not respond to this statement (n =31; 5%).

Table 7.4: Undergraduates' Mean Response Pain Rating Scores

'Pat/Chris is not experiencing pain'

Each pain condition identified by age and gender (n =548)

Vignette Details	*None*	*Mild*	*Moderate*	*Severe*
Male 20 yrs	5.57	3.03	6.15	5.03
Male 60 yrs	7.18	3.71	5.60	4.81
Female 20 yrs	7.83	4.12	4.33	4.93
Female 60 yrs	6.68	3.11	5.68	5.19

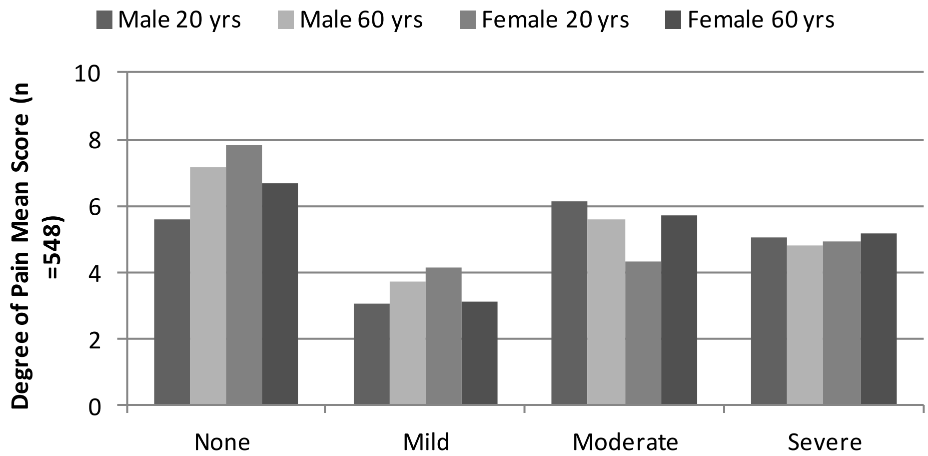

Figure 7.3: Undergraduates' Mean Response Pain Rating Scores Pain judgement statement 2- 'Pat/Chris is not experiencing pain' Each pain condition identified by age and gender; (n =548)

Mean response scores to the two pain judgement data statements for the four pain levels are outlined in Table 7.5 and Figure 7.4. Scores for the pain judgement statement 'Pat/Chris is experiencing pain' reflect perceived increasing pain levels parallel to the ascending pain levels as reflected in the vignette series.

There is no definitive pattern to scores from the pain judgement statement 'Pat/Chris is not experiencing pain' (Table 7.5). The largest mean of 6.80 refers to the no pain condition. The mean score for the moderate pain condition is 5.53 and for the severe condition 4.99. The lowest mean score of 3.46 represents the mild pain condition.

Table 7.5: Mean response pain rating scores to the four pain conditions

Pain judgement data from statement 'Pat/Chris is experiencing pain' (n =579)
Pain judgement data from statement 'Pat/Chris is not experiencing pain' (n =548)

Pain Condition	***Undergraduates***
Pain judgement data from statement 'Pat/Chris is experiencing pain' (n =579)	
No Pain (n =143)	1.45
Mild Pain (n =145)	3.57
Moderate Pain (n =146)	5.78
Severe Pain (n =145)	6.97
Pain judgement data from statement 'Pat/Chris is not experiencing pain' (n =548)	
No Pain (n =141)	6.80
Mild Pain (n =136)	3.46
Moderate Pain (n =146)	5.53
Severe Pain (n =125)	4.99

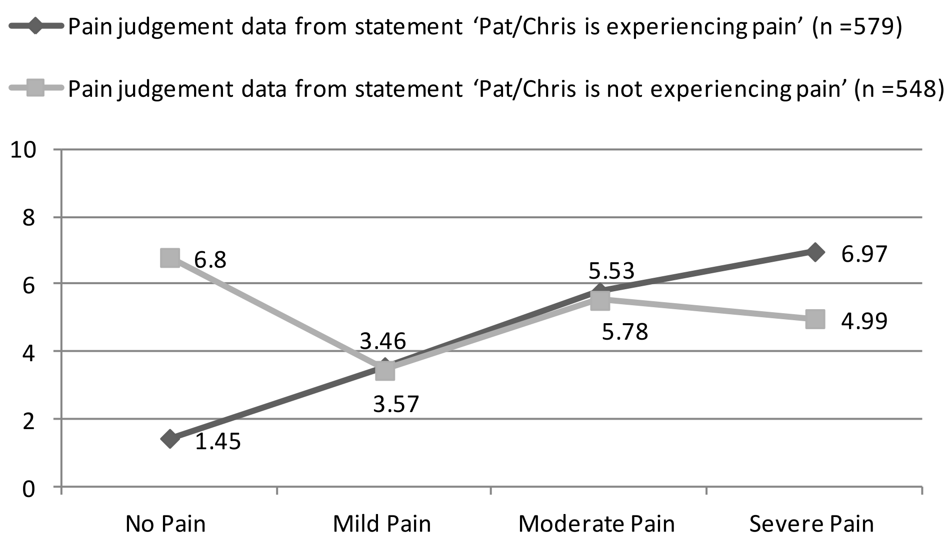

Figure 7.4: Undergraduates' Mean Response Scores to 4 Pain Conditions

Pain judgement data from statement 1 'Pat/Chris is experiencing pain' (n =579)

Pain judgement data from statement 2 'Pat/Chris is not experiencing pain' (n =548)

7.3.3 (ii) Inferential Statistical Analysis

One-way Analysis of Variance (ANOVA)

Pain judgement response data was examined using the one-way between-groups analysis technique (ANOVA). This enabled the impact of the four pain conditions on undergraduates' pain ratings to be explored. This was despite a significant Kolmogorov-Smirnov statistic at the .05 level (p =0.00) suggesting violation of the assumption of normality. This issue is further explored in Chapter 9 (The Discussion).

There was a statistically significant difference at the $p < .05$ level in pain ratings to the four pain conditions in response to the statements 'Pat/Chris is experiencing pain' F (3, 575) = 362.13, p =.001 and 'Pat/Chris is not experiencing pain' F (3, 544) = 41.77, p = .001.

The difference between the mean scores (calculated using eta squared) was very large in responses to 'Pat/Chris is experiencing pain', with an effect size of .65. Sixty five percent of the variance of the pain rating scores is explained by the different pain level conditions. Differences between mean scores in responses to 'Pat/Chris is not experiencing pain' were also large but not to same extent; there was an effect size of .19. This reflects a 19 percent variance explained by the different pain conditions.

Table 7.6:

*Interpretation and guidelines for eta value**

Eta squared (%) of variance explained		
0.01 (1%)	=	a small effect
0.06 (6%)	=	moderate effect
0.14 (14%)	=	large effect

Proposed by Cohen, 1988, pp. 284-7

Post-hoc comparisons using the Tukey HSD test indicated significant differences between the four pain conditions with the exception of differences between the moderate and severe conditions in responses to ‘Pat/Chris is not experiencing pain’. These data are presented in Table 7.7.

Table 7.7: Significant differences between mean pain rating responses to pain conditions

‘Pat/Chris is experiencing pain’ for the four pain conditions (n =579)[1]

‘Pat/Chris is not experiencing pain’ for the four pain conditions (n =548)[2]

(A) Pain level	*(B) Pain level*	*Mean Difference (A-B)*		*Std. Error*		*Sig.*	
No Pain	Mild Pain	2.118[*1]	3.338[2*]	.182[1]	.302[2]	.000[1]	.000[2]
(n =143)[1],	Moderate Pain	4.333[*1]	1.267[2*]	.181[1]	.297[2]	.000[1]	.000[2]
(n -141)[2]	Severe Pain	5.518[*1]	1.809[2*]	.182[1]	.309[2]	.000[1]	.000[2]
Mild Pain	No Pain	2.118[*1]	3.338[2*]	.182[1]	.302[2]	.000[1]	.000[2]
(n =145)[1],	Moderate Pain	2.215[*1]	2.071[2*]	.181[1]	.300[2]	.000[1]	.000[2]
(n =136)[2]	Severe Pain	3.400[*1]	1.529[2*]	.181[1]	.312[2]	.000[1]	.000[2]
Moderate Pain	No Pain	4.333[1*]	1.267[2*]	.181[1]	.297[2]	.000[1]	.000[2]
(n =146)[1],	Mild Pain	2.215[1*]	2.071[2*]	.181[1]	.300[2]	.000[1]	.000[2]
(n =146)[2]	Severe Pain	1.185[1*]	.542[2]	.181[1]	.307[2]	.000[1]	.290[2]
Severe Pain	No Pain	5.518[1*]	1.809[2*]	.182[1]	.309[2]	.000[1]	.000[2]
(n =145)[1],	Mild Pain	3.400[1*]	1.529[2*]	.181[1]	.312[2]	.000[1]	.000[2]
(n =125)[2]	Moderate Pain	1.185[1*]	-.542[2]	.181[1]	.307[2]	.000[1]	.290[2]

*The mean difference is significant at the 0.05 level.

Three-way Analysis of Variance (ANOVA)

The three-way between-groups ANOVA was conducted to explore any impact that vignette characters' age (i.e. young/old) and gender (i.e. male/female) and pain level (no pain, mild, moderate and severe pain) had on undergraduates' pain ratings of the pain statements 'Pat/Chris is experiencing pain' and 'Pat/Chris is not experiencing pain'. This analysis also identified any interaction between these three variables.

With regard to 'Pat/Chris is experiencing pain' there was a significant main effect found of pain level severity on undergraduates pain ratings, F (3, 563) = 364.58, p =.001. Post hoc multiple comparisons (Tukey HSD) reflected statistically significant differences between pain ratings that increased parallel to ascending pain levels (See Table 7.7). There was a non-significant effect of gender and age on pain ratings, F (1, 563) = 2.93, p= .09 and F (1,563) = 2.77, p= .1. This indicates that gender and age, separately, did not significantly affect undergraduates' pain judgements but the levels of pain within the vignettes did.

A significant interaction effect between vignette character's gender and pain levels, F (3, 563) =3.69, p= .012 was revealed but not between gender and age F (1, 563) =.47, p= .49 nor between pain level and age F (3, 563) =.56, p= .64. This indicates that vignette character's gender affected how undergraduates rated pain within the different pain levels. Further analysis, by way of a one-way ANOVA (i.e. examination of the effect of male/female within each pain level on undergraduates pain ratings), revealed that vignette character's gender within the moderate pain condition significantly influenced pain ratings, F (7, 571) = 159.15, p =.001. Pain ratings were similar for male and female characters in the no pain, mild and severe pain conditions (see Table 7.8 for Mean pain ratings and Std Deviation) but in the moderate pain condition pain ratings for male characters (M= 6.12; SD= 1.18) were significantly higher than pain ratings for female characters (M= 5.34; SD= 1.31).

Table 7.8: Gender/Pain Level Mean Responses

'Pat/Chris is experiencing pain' for the four pain conditions

B.A. & B.Ed. Students	N	Mean	Std. Deviation
Females/No Pain	72	1.39	.928
Females/Mild Pain	78	3.50	1.114
Females/Moderate Pain	67	**5.34**	1.309
Females/Severe Pain	70	7.13	2.315
Males/No Pain	71	1.51	1.026
Males/Mild Pain	67	3.64	1.534
Males/Moderate Pain	79	**6.15**	1.178
Males/Severe Pain	75	6.81	2.204
Total	579	4.45	2.612

There were similar findings with regard to responses to the pain statement 'Pat/Chris is not experiencing pain'. A significant main effect was found of pain level severity on pain ratings, F (3, 532) = 42.45, p =.001. Post hoc multiple comparisons (Tukey HSD) reflected statistically significant differences between pain ratings that increased parallel to ascending pain levels (See Table 7.7). No main effect of gender F (1, 532) = .235, p= .63 or age F (1,532) = .12, p= .73 on pain ratings was found.

A significant interaction was found between vignette character's gender and pain levels, F (3, 532) = 7.15, p= .001 suggesting vignette character's gender affected how undergraduates rated pain within the different pain levels. No interaction was found between pain level and vignette characters' age F (3, 532) = .308, p= .82, nor between vignette characters' gender and age F (1, 563) = 2.07, p= .15.

A one-way ANOVA enabled a deeper analysis of the significant gender/pain level interaction (i.e. examination of the effect of male/female within each pain level on undergraduates' pain ratings) and indicated that vignette character's gender, within particular pain levels, significantly influenced pain ratings, F (7, 540) = 19.27, p =.001. Examination of the mean scores (see Table 7.9) showed that ratings were similar for male and female characters in the mild and severe pain conditions. Pain ratings were significantly higher for females (*M*= 7.27; *SD*= 3.43) than for males (*M*= 6.34; *SD*= 3.83) in the no pain condition but significantly higher for males (*M*= 5.87; *SD*= 1.22) than for females in the moderate condition (*M*= 5.13; *SD*= 1.39).

Table 7.9: Gender/Pain Level Mean Responses

'Pat/Chris is not experiencing pain' for the four pain conditions

B.A. & B.Ed. Students	N	Mean	Std. Deviation
Females/No Pain	70	**7.27**	3.43
Females/Mild Pain	72	3.58	1.48
Females/Moderate Pain	67	**5.13**	1.39
Females/Severe Pain	60	5.07	3.01
Males/No Pain	71	**6.34**	3.83
Males/Mild Pain	64	3.33	1.48
Males/Moderate Pain	79	**5.87**	1.22
Males/Severe Pain	65	4.92	2.75
Total	548	5.22	2.78

7.3.4 (iii) Analysis Based On Signal Detection Theory Framework

Vignettes that did not contain pain descriptors reflected, in respect of SDT analysis, noise only. Pain descriptors, appropriate to each pain level, were embedded in the vignette series in the other three pain conditions and reflected noise and a signal. SDT analysis was not conducted on data garnered from '*Pat/Chris is not experiencing pain'* due to the apparent confusion of undergraduates when responding. This issue is examined and discussed in section 7.4.

Criteria for Signal Detection Theory Analysis

The decision-making criterion for the basis for analysis with the use of a Signal Detection Theory (SDT) framework was taken as the undergraduates mean response scores to each pain level (see Table 7.5) from the pain statement '*Pat/Chris is experiencing pain'*. This meant that scores equal to and above these mean response scores to the mild, moderate, and severe pain levels (where a signal was present) were considered the necessary criteria as to whether, or not, undergraduates felt vignette characters were experiencing pain (i.e. a signal was detected). Scores lower than these means determined that undergraduates felt vignette characters were not experiencing pain (i.e. no signal was detected). Undergraduates' response frequencies equal to and above these determined scores were then used to compute the signal detection rates in conjunction with the mean response scores from the no pain level.

The range of response frequencies (in percentages) over the four pain conditions is illustrated in Table 7.10. These data show the increased pain ratings that correspond to the four pain levels.

Table 7.10:

Frequencies, percentages spread over four pain conditions (n =579)*

Pain Level	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
None (n=143)	**106** **74%**	**25** **18%**	3 2%	5 4%	2 1%	2 1%				
Mild (n=145)	1 1%	21 14%	66 45%	**31** **21%**	**13** **9%**	**8** **5%**	**2** **2%**	**2** **2%**	**1** **1%**	
Moderate (n=146)		2 2%	4 3%	13 9%	43 29%	**42** **28%**	**28** **19%**	**13** **9%**	**1** **1%**	
Severe (n=145)	1 1%	7 5.5%	7 5.5%	11 8%	10 7%	11 8%	26 17%	26 17%	**36** **24%**	**10** **7%**

* Note cut off point (% figures in bold) for Signal Detection Theory analysis

No Pain Condition *(n =143)*

There are no pain descriptors in the vignettes in the 'no pain' condition (i.e. signal absent). Undergraduates required pain rating scores of 1 or 2 to indicate no signal detection – *a correct rejection*; scores of 3 or above indicated signal detection, where in fact, there was no signal present – *an incorrect hit.* There was a response spread of between 1 and 6 within the 10 point scale. Ninety two percent of undergraduates (n = 131) detected there was no signal present (i.e. *a correct rejection);* 8 percent (n

=12) detected a signal *(i.e. an incorrect hit)* when in fact there was no signal present. These data are outlined in Table 7.8.

Mild Pain Condition *(n =145)*

Undergraduates required a pain rating of 4 and above to indicate correct signal detection (i.e. *a correct hit*) in this condition. Scores of 3 and below indicated no signal detection where there was in fact a signal present (i.e. *an incorrect rejection)*. Forty percent (n =57) of undergraduates detected there was a signal present in the mild pain condition (i.e. *a correct hit*) and 60 percent (n =128) did not detect a present signal (*an incorrect rejection*). There was a spread of 9 points between 1 and 9 in responses. See Table 7.8.

Moderate Pain Condition *(n =145)*

In the moderate pain condition undergraduates required a pain rating of 6 and above to indicate correct signal detection (i.e. *a correct hit*) and scores of five and below indicated no signal detection where there was in fact a signal present (i.e. *an incorrect rejection)*. Fifty seven percent (n =84) of undergraduates required a pain rating of 6 and above to indicate *a correct hit*, and 43 percent (n =61) indicated no signal detection when, in fact, there was one present *(i.e. an incorrect rejection).* Undergraduate's response spread was between 2 and 9 on the moderate pain scale (see Table 7.8).

Severe Pain Condition *(n =145)*

Undergraduates required a pain rating of 7 and above to indicate *a correct hit*, detecting a present signal. Scores of 6 and below indicated no signal detection when, in fact, there was a signal present (i.e. *an incorrect rejection*). Sixty five percent of undergraduates detected a signal (*i.e. a correct hit*) while 35 percent did not detect a present signal (*i.e. an incorrect rejection*). In this condition the Undergraduates' responses were spread over the full pain scale (see Table 7.8).

Formulae for Signal Detection Rates

Resulting data from noise, and signal and noise trials were used to calculate participants' signal detection rates. A trial is defined as a single 'unit' in which a stimulus is presented and some response made. For the purposes of this study each trial was represented by one vignette, a component of an extended series which made up the complete study.

Correct hit plus incorrect rejection data, and incorrect hit plus correct rejection data, both equal 100 percent. Consequently, analysis of incorrect rejection and incorrect hit data is not reported here, but is included in Table 7.10 for reference. Lachman, Lachman & Butterfield (1979) state that correct, and incorrect hit, data are sufficient for SDT analysis.

Frequencies from resulting data from the vignettes were aggregated and calculated within a single matrix using the formulae in Figure 7.5 as previously outlined in Chapter 6 (section 6.5.3).

- *Correct Hit Rate* = $\frac{\text{Correct hit frequencies}}{\text{Correct hit frequencies + incorrect rejection frequencies}}$
- *Incorrect Rejection Rate* = 1 – correct hit rate
- *Incorrect Hit Rate* = $\frac{\text{Incorrect hit frequencies}}{\text{Incorrect hit frequencies + correct rejection frequencies}}$
- *Correct Rejection Rate* = 1 – incorrect hit rate

Figure 7.5: Formulae for calculation of signal detection rates

Signal Detection Hit and Rejection Rates

Correct Hit Rate

Resulting data illustrate that undergraduate signal detection rates (when a signal is present) is greatest in the severe pain condition (65%). Detection rates do not proportionately increase with the ascending pain conditions. A detection rate of 57 percent was found in the moderate condition, 8 percent less than the severe detection rate of 65 percent and 17 percent more than the mild condition of 40 percent.

Incorrect Hit Rate

The incorrect hit signal detection rate reflects the extent of undergraduates' recognition of a signal when in fact, none is present (i.e. undergraduate state the vignette character is experiencing pain when in fact s/he is not). Participants incorrect hit signal detection was found to be 8 percent. These data are presented in Table 7.11.

Table 7.11: Undergraduates' signal pain detection rates

Signal Present (n =436); Signal Absent (n =143)

		SIGNAL PRESENT (Vignette characters are experiencing pain)	*SIGNAL ABSENT (Vignette characters are not experiencing pain)*
		CORRECT HIT	**INCORRECT HIT**
	Pain Level	Undergraduates	Undergraduates
PARTICIPANTS DECISION: Yes - there is pain being experienced	Mild	40%	8%
	Moderate	57%	
	Severe	65%	
		INCORRECT REJECTION	**CORRECT REJECTION**
PARTICIPANTS DECISION: No - there is no pain being experienced	Mild	60%	92%
	Moderate	43%	
	Severe	35%	

7.4 Study 1 / Procedural Discussion

Key findings of this study are summarised and procedural concerns are briefly addressed here. Remaining issues will be comprehensively discussed in Chapter 9 (General Discussion).

The main findings of this study show that data analysis, based on a SDT framework and utilising vignette methodology, reflects increased pain perception, paralleled with ascending pain levels (i.e. mild, moderate and severe pain - dependant on the pain indicators) though not proportionately. The incorporation of a SDT framework facilitated a base rate of pain perception to be recognised (i.e. the mean pain ratings within each pain level) for this study's particular target population of University undergraduates. This meant that a criterion for pain perception within each pain level could be identified. The criterion for signal detection increased parallel to the ascending pain levels but not always proportionately. The use of an SDT framework for the vignette design enabled identification of those who perceived a pain signal where in fact, there was none.

Undergraduates' judgement processes appeared laborious in their responses to the second pain judgement question *Pat is not experiencing pain*. This statement, illustrated in Figure 7.6, was presented in addition to the statement *Pat is experiencing pain*.

2) Pat is not experiencing pain

1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐
No pain									*pain as bad as you can imagine*

Figure 7.6: Pain judgement statement 2 Presented to participants subsequent to reading vignettes

The aim of the second negative pain statement was to account for and balance potential biases that may occur in response to the first positive statement. However, Undergraduates seemed confused when responding to the negative statement. This may be due to the fact that double negatives cancel one another and produce an affirmative sense (Matlin, 2005). The combination of the negative statement with the start point of the Likert scale (1 =no pain) is a double negative and a complex task to process. If the start point of 'no pain' had been represented by '0', as opposed to '1', participants may have been less confused and more willing to respond – 32 undergraduates did not respond to this question. Resulting data did not follow any discernible trend unlike resulting data from the first pain judgement statement (see Figure 7.4 and Table 7.5). This may have been because of the linguistic double negative involved rather than any non-ecological feature of the vignettes as cognitive processes handle positive information more efficiently than negative information (Matlin, 2005). This pain statement will therefore be omitted from the next study.

The central aim of this thesis is to develop a tool that incorporates the social interaction between two parties (i.e. the person experiencing pain and the person assessing the sufferer's assessment of pain). Research evidence indicates that different populations have different baseline pain perception levels. Consequently, Study 2 was conducted with a different population (i.e. healthcare providers/student nurses). It is anticipated that the methodological and analytical framework in this pain assessment tool will better explain these pain perception discrepancies between populations.

Pertinent findings from this study will be then be integrated with those of Study 2 (as described in the next section) and reported in Chapter 8.

7.5 Study 2 / Overview

Six months after Study 1 was conducted a second experiment was undertaken with a different undergraduate cohort, student nurses. This was to determine if the developed pain assessment tool, which incorporated vignette methodology and SDT analysis, could explain potential discrepancies between the groups, as research has shown that healthcare providers frequently underestimate pain when compared to other populations (Prkachin et al. 1994; Chambers et al. 1999; Kappesser & Williams 2002; and Marquié et al, 2003).

As a consequence of procedural difficulties in Study 1, the vignette questionnaire was modified and the pain statement *Pat/Chris is not experiencing pain* was omitted. This issue was discussed in section 7.4.2.

The following sections (7.5.1 – 7.5.4) examine participant details, materials, procedure and experimental controls. The first experimental control as listed in section 7.2.4 (i) was amended as I.T. facilities were unavailable during Study 2. Section 7.5.5 describes data input and analysis methodologies. Results of Study 2 are presented in section 7.6

7.5.1 Participants

A convenience sample of 3rd and 4th year student Nurses participated in Study 2 (n =81) and comprised of nurses in pre-registration General, Mental Health, and Intellectual Disability degree programmes.

There were 73 (90%) females and 8 (10%) males. Sixty five (80%) were aged between 18 and 22 years and 16 (20%) were aged between 23 and 40. Seventy nine (98%) nurses indicated they were in good health while two (2%) did not respond to the statement. Nurses were recruited during five college recreational periods[4].

7.5.2 Materials

The vignette series (hardcopy only) (Appendix F) and accompanying questionnaire (Appendix G) were used in this study.

7.5.3 Procedure

The vignette scenario getting up in the morning with accompanying questionnaire (Appendix F & G) were presented to five groups of between 13 and 15 Nurses in their college canteen. One vignette scenario only was employed as the sample of nurses was smaller (n= 81) than the sample of undergraduates in Study 1 (n =579).

The nurses were informed this was a linguistic study relating to the investigation of adjective pattern use and asked for verbal consent to participate. They were also told they could leave before, or during, the survey being distributed (see Appendix H). They were asked to complete the demographic questionnaire before reading the vignette. After reading the vignette, the nurses were asked to respond to a verification question to ensure their understanding of, and attention to, the

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[4] Similar to the Arts/Education students the assumption was made that the student Nurses were also able to (i) read the vignettes as required by the survey (ii) carry out instructions in the completion of the pain judgement questionnaire and (iii) have a clear cognitive understanding of the vocabulary used in both vignettes and questionnaires.

vignette's detail. Finally, they were asked to respond to the statement presented in Figure.7.7.

Pat is experiencing pain										
	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
No pain									*pain as bad as you can imagine*	

Figure 7.7: Pain Judgement Data Statement No. 1. Experiment 2

7.5.4 Experimental Controls

Experimental controls (ii) independence of observations and influence, (iii) stated purpose of the questionnaire, and (iv) vignette gender/age manipulation as described in section 7.2.4 were also in place for this experiment. With regard to experimental control (i) during Study 2, there were no I.T. facilities available to the researcher in the particular location used on campus for the student survey. As no significant differences between resulting data from vignettes viewed as a PowerPoint presentation and those viewed as hardcopy in Study 1 were found, it was felt that data collected from nurses who only viewed the hardcopy vignettes would be reliable.

On completion nurses were thanked for their time (Appendix E). The purpose of the experiment with regard to language centred on pain was fully explained, as was how the data would be treated and analysed. Any questions raised were fully addressed. The researcher's contact e-mail address was provided for any future queries. Nurses were also informed that this study's results and report, once completed, would be available to them.

7.5.5 Data Input and Analysis

Data Input & Data Analysis

Data input and analysis was conducted in the same manner to Study 1 (Section 7.2.5).

7.6 Study 2 / Results

Resulting data are presented by way of (i) descriptive, (ii) inferential and (iii) analysis within a signal detection theoretical framework. Descriptive analysis comprises of response frequencies and mean scores to the four pain levels and to each vignette character age and gender. Resulting data from inferential statistical analysis (i.e. one-way and a three-way between-groups ANOVA with post-hoc tests) are also outlined. The criteria for SDT analytical framework are presented along with detection rates for the four pain levels.

7.6.1 Overview

Descriptive analysis of resulting data illustrated that there was a differential of 9% of nurses who responded to the four pain conditions and 2.4% to each vignette within the series. Responses to the statement 'Pat/Chris is experiencing pain' indicated nurses felt vignette characters experienced more pain as vignette painlevel descriptors graduated from mild pain to moderate pain, and to severe pain. These data suggested that in general older characters were perceived to experience more pain than younger characters with a negligible difference between genders.

Inferential statistical analysis revealed significant statistical differences between responses to the four pain levels and a significant impact of vignette characters' age and pain levels on pain judgement ratings.

SDT analysis reflected a parallel increase of detection with the mild, moderate and severe pain conditions. Thirty two percent of nurses detected a pain signal when in fact there was none – that is they felt that the vignette character was experiencing pain despite the fact that there were no pain indicators present in the descriptive scenario they read.

7.6.2 (i) Descriptive Analysis

Nurses' Response Frequencies to the Four Pain Levels

Between 21 and 30 percent of participants (a differential of 9% in favour of the severe pain condition) responded to each pain condition as presented in Table 7.12.

Table 7.12: Nurses' Response Frequencies to the Four Pain Levels *(n =81)*

Response Frequencies to the Vignette Scenario (getting up in the morning); age and gender

Pain level	*Response Frequencies*	*Percentage*
No Pain	19	23.5
Mild Pain	21	25.9
Moderate Pain	17	21.0
Severe Pain	24	29.6
Total	81	100.00

Nurses' Response Frequencies to Vignettes/Age/Gender

On average, an equitable number (differential of 2.4%) of nurses responded to vignettes that reflected each combination of gender and age. These data are illustrated in Table 7.13

Table 7.13: Nurses' Response Frequencies

Scenario 1, vignette character male/female, and age 20/60 yrs; (n =81)

	Gender	*Age*	*Scenario*	*Frequency*	*Percentage*
1	Male;	20yrs;	vig 1	20	24.7
2	Male;	60yrs;	vig 1	21	25.9
3	Female;	20yrs;	vig 1	21	25.9
4	Female;	60yrs;	vig 1	19	23.5
	Total			81	100.00

Nurses Mean Response Pain Rating Scores/Vignette/Age/Gender

Mean response pain rating scores to the pain judgement statement 'Pat/Chris is experiencing pain' within each gender and age are outlined in Tables 7.14 and Figure 7.8. Experienced pain was perceived to increase parallel with the ascending pain levels.

Table 7.14: Nurses' Mean Response Pain Rating Scores

Each pain condition identified by age and gender (n =81) in response to statement 'Pat/Chris is experiencing pain'

Vignette Details	*None*	*Mild*	*Moderate*	*Severe*
Male 20 yrs	1.0	3.83	6.75	8.83
Male 60 yrs	1.8	4.80	7.20	9.83
Female 20 yrs	1.0	3.50	7.25	8.67
Female 60 yrs	1.4	4.75	7.75	9.83

Scores across the pain conditions indicate that, with the exception of the moderate pain level, nurses felt older vignette characters experience increasingly more pain than younger characters. Responses to the no pain condition illustrate nurses' perceived older characters experiencing pain with males experiencing more pain than females.

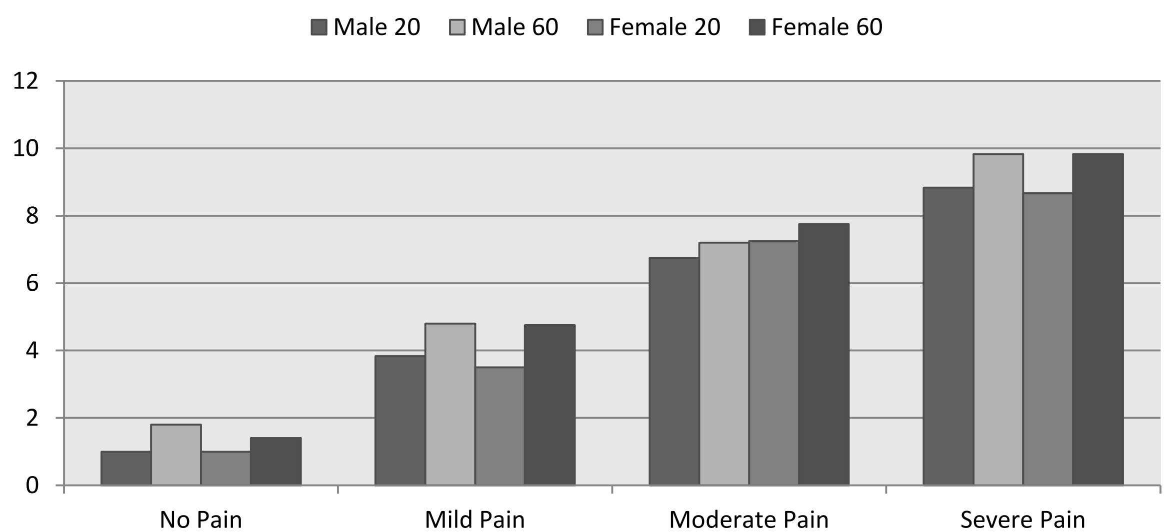

Figure 7.8: Nurses' Mean Response Pain Rating Scores for Pain judgement statement 'Pat/Chris is experiencing pain' Each pain condition identified by age and gender (n =81)

Mean response pain rating scores for the four pain levels are outlined in Table 7.15 and Figure 7.9 and reflect perceived increasing pain levels parallel to the ascending pain levels.

Table 7.15: Mean response pain rating scores to the four pain conditions

Pain judgement data from statement 'Pat/Chris is experiencing pain' (n =81)

Pain Condition	*Nurses*
No Pain (n =19)	1.32
Mild Pain (n =21)	4.14
Moderate Pain (n =17)	7.24
Severe Pain (n =24)	9.29

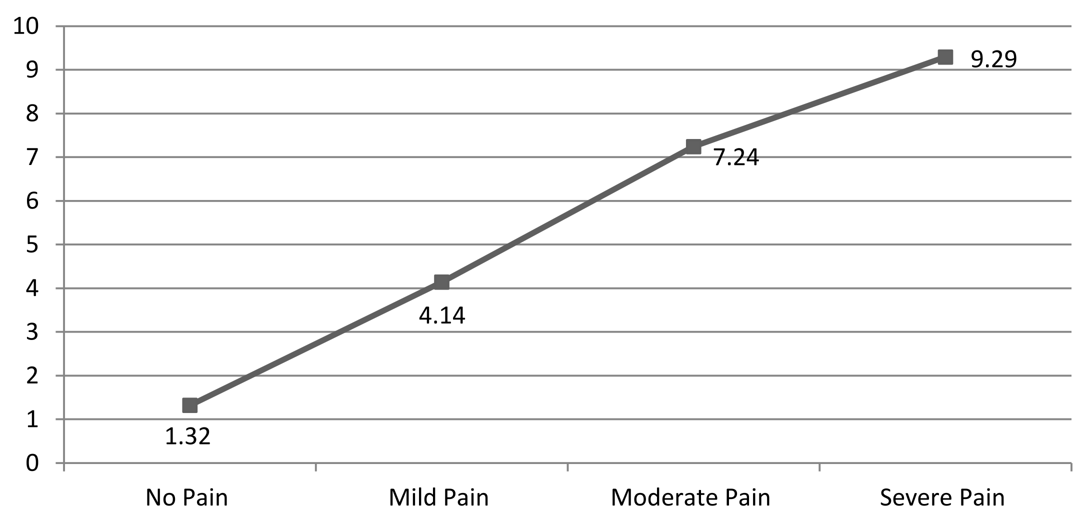

Figure 7.9: Nurses' Mean Pain Rating Scores to Four Pain Conditions

Pain judgement data from statement 'Pat/Chris is experiencing pain' (n =81)

7.6.3 (ii) Inferential Statistical Analysis

One-way between-groups Analysis of Variance (ANOVA)

One way between-groups AVOVA was conducted on pain response data to explore the impact the four pain conditions had on nurses' responses. Violation of the assumption of normality was suggested by the fact that the Kilmogorov-Smirnov statistic was significant at the .05 level (p =0.00). This issue is further examined in Chapter 9 (The Discussion).

A statistically significant difference at the $p < .05$ level in pain ratings was revealed F (3, 77) = 535.54, p =.001. The difference between mean scores (calculated using eta squared) was extremely large .95 (see Table 7.15) with 95% of the variance of the pain rating scores explained by the 4 pain conditions.

Post-hoc comparisons using the Tukey HSD test indicated significant differences between the four pain conditions. These data are presented in Table 7.16.

Table 7.16: Significant differences between mean pain rating responses to pain conditions

'Pat/Chris is experiencing pain' for the four pain conditions (n =81)

(A) Level of Pain:	*(B) Level of Pain:*	*Mean Difference (A-B)*	*Std. Error*	*Sig.*
No Pain (n =19)	Mild Pain	-2.827*	.219	.000
	Moderate Pain	-5.920*	.230	.000
	Severe Pain	-7.976*	.212	.000
Mild Pain (n =21)	No Pain	2.827*	.219	.000
	Moderate Pain	-3.092*	.225	.000
	Severe Pain	-5.149*	.206	.000
Moderate Pain (n =17)	No Pain	5.920*	.230	.000
	Mild Pain	3.092*	.225	.000
	Severe Pain	-2.056*	.219	.000
Severe Pain (n =24)	No Pain	7.976*	.212	.000
	Mild Pain	5.149*	.206	.000
	Moderate Pain	2.056*	.219	.000

*The mean difference is significant at the 0.05 level.

Three-way Analysis of Variance (ANOVA)

A three-way between-groups ANOVA facilitated the identification of any main effects that vignette characters age (i.e. young/old), gender (i.e. male/female), and pain levels (no pain, mild, moderate and severe pain) had on pain ratings. This statistical analysis also enabled the identification of any interaction between these variables. A significant main effect was found in pain level severity, F (3, 65) = 875.73, p =.001, and vignette characters age, F (1, 65) = 45.49, p =.001, on pain ratings but not in gender F (1, 65) = .011, p= .918. Post hoc multiple comparisons (Tukey HSD) reflected statistical significant differences between pain ratings that increased parallel to ascending pain levels (see Table 7.16).

With regard to the main effect of age (i.e. young or old), independent samples *t*-tests showed that vignette characters significantly impacted pain ratings in all pain conditions - no pain: t (9) = -3.67, p=.01, mild pain: t (19) = -4.40, p=.001, severe pain: t (17) = -4.42, p=.001, except the moderate pain condition t (15) = -1.72, p=.12. Overall, pain ratings were significantly higher for older vignette characters (*M*= 6.10, *SE* =.512) than younger vignette characters (*M*= 5.22, *SE* =.479), and separately in the no pain (60 yrs: *M* = 1.16, *SE* = .16; 20 yrs: *M* = 1.0, *SE* = .01), mild (60 yrs: *M* = 4.78, *SE* = .19; 20 yrs: *M* = 3.67, *SE* = .15), and severe condition (60 yrs: *M* = 9.83, *SE* = .11; 20 yrs: *M* = 8.75, *SE* = .22) and also higher but not significantly so in the moderate condition (60 yrs: *M* = 7.44, *SE* = .18; 20 yrs: *M* = 7.00, *SE* = .19).

No significant interaction effects were found between gender and age F (1, 65) =.01, p= .92, gender and pain levels F (3, 65) =1.82, p= .15, or age and pain levels F (3, 65) =1.79, p= .16

7.6.4 (iii) Analysis Based On a Signal Detection Theory Framework

Vignettes that did not contain pain descriptors reflected, in respect of SDT analysis, noise only. Pain descriptors, appropriate to each pain level, were embedded in the vignette series in the other three pain conditions and reflected noise and a signal.

Criteria for Signal Detection Theory Analysis

The decision-making criterion for the basis for analysis with the use of a Signal Detection Theory (SDT) framework was taken as the nurses mean response scores to each pain level (see Table 7.13 and Figure 7.10) from the pain statement '*Pat/Chris is experiencing pain'*. This meant that scores equal to and above these mean response scores to the mild, moderate, and severe pain levels (where a signal was present) were considered the necessary criteria as to whether, or not, nurses felt vignette characters were experiencing pain (i.e. a signal was detected). Scores lower than these means determined that nurses felt vignette characters were not experiencing pain (i.e. no signal was detected). Nurses' response frequencies equal to and above these determined scores were then used to compute the signal detection rates in conjunction with the mean response scores from the no pain level.

The spread of response frequencies (in percentages) over the four pain conditions is illustrated in Table 7.17.

Table 7.17:

Frequencies, percentages spread over four pain conditions (n =81)*

Pain Level	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
None (n=19)	**13** **68%**	6 32%								
Mild (n=21)			5 24%	**8** **38%**	**8** **38%**					
Moderate n=17)						1 6%	**11** **65%**	**5** **29%**		
Severe (n=24)								5 21%	**7** **29%**	**12** **50%**

* Note cut off point **(% figures in bold)** for Signal Detection Theory analysis

No pain condition *(n =19)*

There are no pain descriptors in the vignettes in the 'no pain' condition (i.e. signal absent). Nurses required pain rating scores of 1 to indicate no signal detection – *a* *correct rejection*; scores of 2 or above indicated signal detection, where in fact, there was no signal present – *an incorrect hit.* There was a response spread of between 1 and 2 within the 10 point scale.

Sixty eight percent of nurses (n = 13) detected there was no signal present (i.e. *a correct rejection);* 32 percent (n =6) detected a signal *(i.e. an incorrect hit)* when in fact there was no signal present. These data are outlined in Table 7.18.

Mild Pain Condition *(n =21)*

Nurses required a pain rating of 4 and above to indicate correct signal detection (i.e. *a correct hit*) in this condition. Scores of 3 and below indicated no signal detection where there was in fact a signal present (i.e. *an incorrect rejection)*. Seventy six (n =16) of nurses detected there was a signal present in the mild pain condition (i.e. *a correct hit*) and 24 percent (n =5) did not detect a present signal (*an incorrect rejection*). There was a spread of 3 points between 3 and 5 in responses to mild pain.

Moderate Pain Condition *(n =17)*

In the moderate pain condition nurses required a pain rating of 7 and above to indicate correct signal detection (i.e. *a correct hit*) and scores of six and below indicated no signal detection where there was in fact a signal present (i.e. *an incorrect rejection)*. Ninety four percent (n =16) of nurses required a pain rating of 7 and above to indicate *a correct hit*, and 6 percent (n =1) indicated no signal detection when, in fact, there was one present *(i.e. an incorrect rejection).* Nurses' response spread was between 6 and 8 on the moderate pain scale.

Severe Pain Condition *(n =24)*

Nurses required a pain rating of 9 and above to indicate *a correct hit*, detecting a present signal. Scores of 8 and below indicated no signal detection when, in fact, there was a signal present (i.e. *an incorrect rejection*). Seventy nine percent of nurses detected a signal (*i.e. a correct hit*) while 21 percent did not detect a present signal (*i.e. an incorrect rejection*). In this condition nurses' responses were spread between 8 and 10.

Formulae for Signal Detection Rates

Frequencies from resulting data from the vignettes were aggregated and calculated within a single matrix using the formulae in Figure 7.10 previously described in Chapter 6 (section 6.5.3).

- *Correct Hit Rate* = $\frac{\text{Correct hit frequencies}}{\text{Correct hit frequencies + incorrect rejection frequencies}}$
- *Incorrect Rejection Rate* = 1 – correct hit rate
- *Incorrect Hit Rate* = $\frac{\text{Incorrect hit frequencies}}{\text{Incorrect hit frequencies + correct rejection frequencies}}$
- *Correct Rejection Rate* = 1 – incorrect hit rate

Figure 7.10: Formulae for calculation of signal detection rates

Signal Detection Rates

Correct hit rate

Resulting data illustrate that nurses signal detection rates (when a signal is present) is greatest in the moderate pain condition (94%). Detection rates do not proportionately increase with the ascending pain conditions. A detection rate of 76 percent was found in the mild condition, 18 percent less than the detection rate of the moderate condition (94%) and three percent less than the detection rate of 79 percent in the severe condition.

Incorrect Hit Rate

The incorrect hit signal detection rate reflects the extent of nurses' recognition of a signal when in fact, none is present (i.e. the vignette character is experiencing pain when in fact s/he is not). Nurses incorrect hit signal detection was found to be 32 percent. These data are presented in Table 7.18.

Table 7.18: Nurses' signal detection rates

Signal Present (n =62); Signal Absent (n =19)

		SIGNAL PRESENT (Vignette characters are experiencing pain)	*SIGNAL ABSENT (Vignette characters are not experiencing pain)*
		CORRECT HIT	**INCORRECT HIT**
	Pain Level	Nurses	Nurses
NURSES DECISION: Yes - there is pain being experienced	Mild	76%	32%
	Moderate	94%	
	Severe	79%	
		INCORRECT REJECTION	**CORRECT REJECTION**
NURSES DECISION: No - there is no pain being experienced	Mild	24%	68%
	Moderate	6%	
	Severe	21%	

7.7 Study 2 / Procedural Discussion

This discussion will present key findings and discuss procedural concerns of Study 2. Remaining issues will be comprehensively discussed in Chapter 9 (General Discussion).

The key findings of this study indicates that data analysis , based on a SDT framework and utilizing vignette methodology, reflected different responses to pain levels. Increased mean response scores for pain conditions also reflected the ascending pain levels as did the significant interaction between pain levels and pain judgement ratings.

SDT enabled a base rate of pain perception to be determined for each pain level for nurses who participated; this meant a criterion for pain perception for nurses within each pain level could be identified. The criterion required for pain perception increased parallel, though not proportionately, to ascending pain levels. SDT analysis also enabled identification of nurses who perceived a pain signal when in fact, there was none embedded within the vignettes.

This study was conducted in a busy college canteen which may have contributed extra 'noise' both external and internal to nurses' judgement decision making process. This issue will be re-examined in Chapter 9 (General Discussion).

The next chapter will collate and analyse the data from Study 1 and Study 2. Differences found between the two populations will be presented and highlighted.

8. GENERAL RESULTS

8.1 Overview & Introduction

8.1.1 Overview

Resulting data are presented in a similar manner to Study's 1 and 2. Inferential statistical analysis, by way of a one-way and three-way ANOVA, was used to explore differences in pain ratings in the pain levels and identify any impact and interaction within the variables of vignette character's age and gender, and pain severity levels on pain ratings. *t*-tests were also conducted to investigate response differences between the undergraduates and student nurses. Effect sizes of differences were calculated by squaring the t-value, and dividing it by the total number of undergraduates and nurses minus 2 (i.e. the number of groups) plus the *t*-value squared. This provided an indication of the magnitude of the differences between the two groups and represented the proportion of variance in the pain rating scores, as explained by the two student groups. The criteria for SDT analysis are presented along with detection rates for the four pain levels.

8.1.2 Introduction

Descriptive analysis of resulting data indicated participants felt vignette characters experienced more pain as vignette pain-level descriptors graduated from mild pain to moderate pain, and to severe pain. Frequencies suggested that participants felt older male and female characters, within both vignette scenarios, experienced more pain than younger male and female characters. Older males attracted higher mean pain rating scores when compared to older females.

Inferential statistical analysis revealed significant differences between responses to the four pain levels in both studies. In Study 1 such analysis showed that vignette characters' gender and pain levels notably interacted to influence undergraduates' pain judgements; similar analysis in Study 2 indicated that nurses felt vignette characters experienced greater pain in the moderate and severe conditions when compared with undergraduates. Age of vignette characters was found to impact, but not extensively, on nurses' pain ratings.

Signal detection rates generally increased in parallel with mild, moderate, and severe pain conditions. Further analysis revealed different detection criteria and detection rates for the two samples. Undergraduate's criteria for detecting pain signals were lower than those of nurses in the moderate and severe pain conditions. Criteria for detection in the mild pain condition were the same for both groups. Nurses' detection rates were higher than undergraduates when they incorrectly determined vignette characters were experiencing pain, in the no pain condition (i.e. where in fact there were no pain descriptors). Their detection rates were also higher than undergraduates when they correctly determined vignette characters were experiencing pain in the mild, moderate and severe pain conditions.

8.2 Response Frequencies to the Four Pain Levels

In general, an equitable number of participants responded to each pain condition as outlined in Table 8.1. There is a response differential of 0.5% within the undergraduate cohort (in favour of the moderate pain condition) and 8.6% within the nurses group (in favour of the severe pain condition).

Table 8.1 Response frequencies to the four pain levels

Undergraduates (n =579; Nurses (n =81)

Pain level	*Participant Response Frequencies*		*Percentage %*	
	Undergraduates	Nurses	Undergraduates	Nurses
No Pain	143	19	24.7	23.5
Mild Pain	145	21	25.0	25.9
Moderate Pain	146	17	25.3	21.0
Severe Pain	145	24	25.0	29.6
Total	579	81	100.00	100.00

8.2.1 Response Frequencies to Each Vignette Scenario; Age and Gender

On average, an equitable number of participants responded to vignettes that reflected each combination of scenario, gender and age. These data are presented in Table 8.2. There was a response frequency differential of 2.3% in Scenario 1 (in favour of vignette 1 and 4) and 0.7% in Scenario 2 (in favour of vignette 5, 7 and 8) with regard to the undergraduates (n= 579) and a 2.4%

differential in Scenario 1 (in favour of vignette 2 and 3) with regard to the nurses (n =81). Nurses were not presented with vignettes illustrating Scenario 2.

Table 8.2: Response frequency

Scenarios 1 and 2, vignette character male/female, and age 20/60 yrs; Undergraduates (n =579); Nurses (n =81).

Gender, Age, and Scenario	Frequency		Percent %	
	Undergrads	Nurses	Undergrads	Nurses
1 Male; 20yrs; vig 1	75	20	13.0	24.7
2 Male; 60yrs; vig 1	71	21	12.3	25.9
3 Female; 20yrs; vig 1	62	21	10.7	25.9
4 Female; 60yrs; vig 1	75	19	13.0	23.5
5 Male; 20yrs; vig 2	75	0.00	13.0	0.00
6 Male; 60yrs; vig 2	71	0.00	12.0	0.00
7 Female; 20yrs; vig 2	75	0.00	13.0	0.00
8 Female; 60yrs; vig 2	75	0.00	13.0	0.00
Total	579	81	100.0	100.00

8.2.2 Mean Response Pain Rating Scores towards Vignette Character's Age and Gender

Mean response pain rating scores within each gender, and age, are outlined in Table 8.3 and Figure 8.1. Mean response pain rating scores from the total sample indicate participants felt 60 year old males increasingly experienced more pain than 60 and 20 year old females, and also 20 year old males, in the ascending pain conditions.

Nurses felt that 60 year old females experienced more pain than others in the moderate condition, and the same as 60 year old males in the severe condition. All participants felt that 60 year old females experienced more pain than 20 year old males and females, but in the mild and severe conditions only.

Table 8.3: Mean response pain rating scores

Each pain condition identified by age and gender;

Total Participants (N =660); Undergraduates (n =579); Nurses (n =81).

	Vignette Details	None	Mild	Moderate	Severe
Total Participants	Male 20 yrs	1.55	3	6.52	7.13
Undergraduates		1.67	2.75	6.47	6.56
Nurses		1	3.83	6.75	8.83
Total Participants	Male 60 yrs	1.46	4.06	7.04	7.88
Undergraduates		1.37	3.75	7	7.3
Nurses		1.8	4.8	7.2	9.83
Total Participants	Female 20 yrs	1.17	3.38	6.3	7.57
Undergraduates		1.21	3.35	5.67	7.18
Nurses		1	3.5	7.25	8.67
Total Participants	Female 60 yrs	1.13	3.91	5.71	7.79
Undergraduates s		1.05	3.72	5.3	7.11
Nurses		1.4	4.75	7.75	9.83

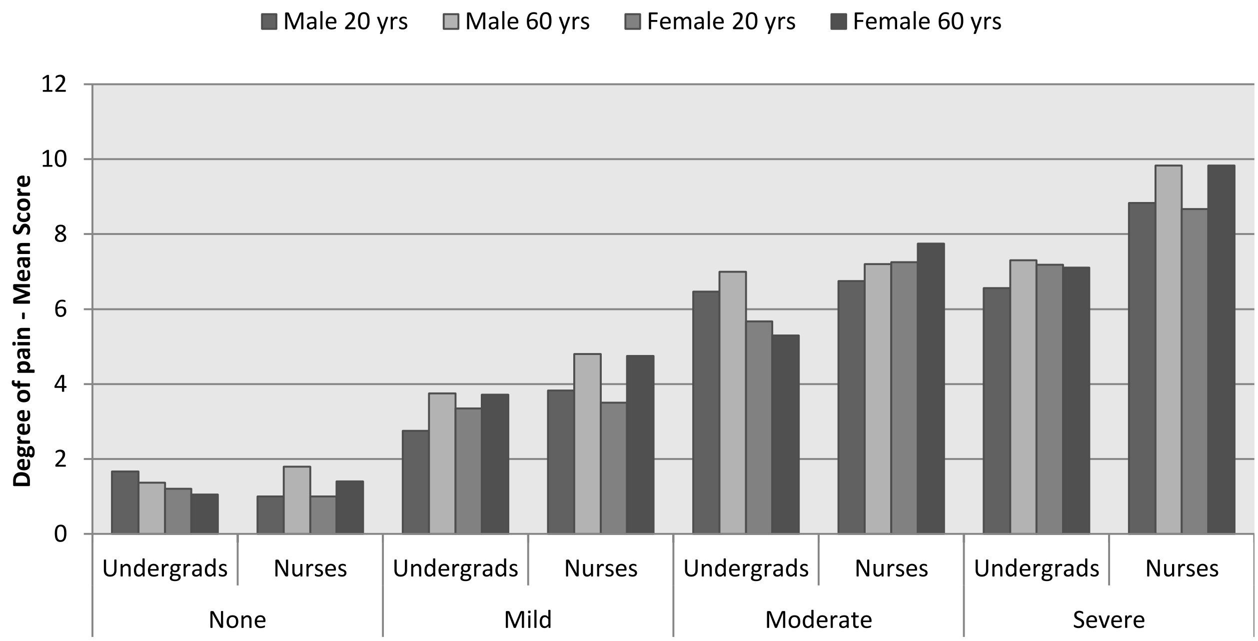

Figure 8.1: Mean response pain rating scores; each pain condition identified by age and gender; Undergraduates (n =579); Nurses (n =81).

8.2.3 Mean Responses Scores to the Four Pain Levels

Mean response scores (Table 8.4) reflect increasing pain levels parallel to the ascending pain levels as reflected in the vignette series.

Table 8.4: Mean response pain rating scores to the four pain conditions

Undergraduates (n =579); Nurses (n =81)

Pain Condition	Total Sample	Undergraduates	Nurses
No Pain	1.39	1.45	1.32
Mild Pain	3.86	3.57	4.14
Moderate Pain	6.51	5.78	7.24
Severe Pain	8.13	6.97	9.29

When this data was analysed more closely, nurses scored similarly to the undergraduates in the no pain condition but increasingly higher in the other three conditions as illustrated in Figure 8.2.

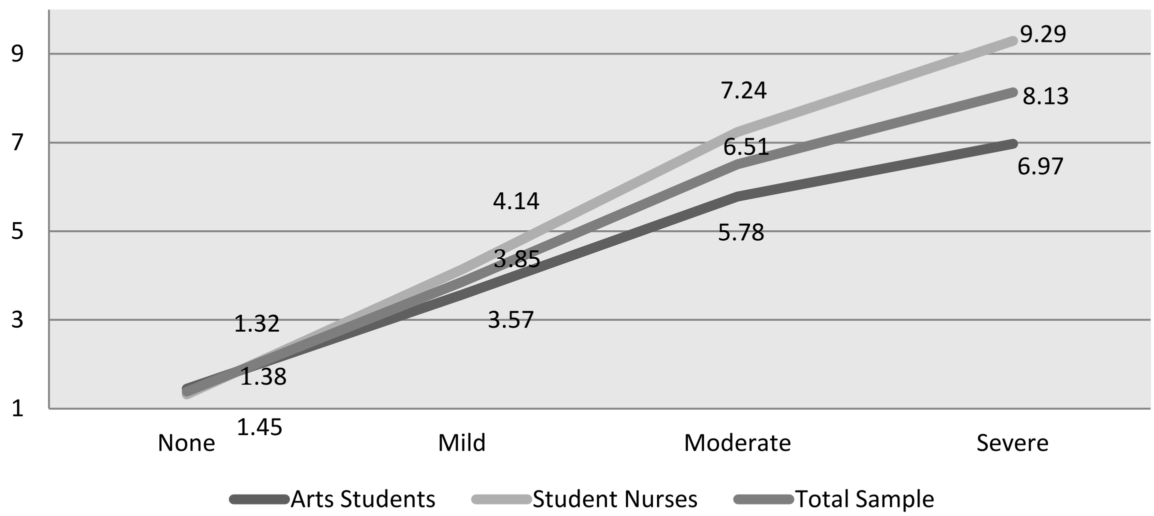

Figure 8.2: Mean response pain rating scores to four pain conditions (N =660) Undergraduates (n =579); Nurses (n =81)

8.3 Inferential Statistical Analysis

8.3.1 ANOVA

One-Way Between-Groups Analysis of Variance

The first null hypothesis, that is responses to all pain levels being compared are equal, was examined using the one way between-groups analysis technique (ANOVA). This enabled the impact of the four pain conditions on participants' pain ratings in the vignette series to be explored. This was despite the fact that the Kolmogorov-Smirnov statistic was significant at the .05 level and suggested violation of the assumption of normality. This issue is further explored in the Chapter 9 (The Discussion).

There was a statistically significant difference at the $p < .05$ level in pain ratings to the four pain conditions F (3, 656) = 464.65, p =.001. The difference between the mean scores (calculated using eta squared) was very large, with an effect size of .68 (i.e. 68% of the variance of the pain rating scores is explained by the different pain level conditions). Consequently, the first null hypothesis was rejected.

Table 8.5 illustrates the guidelines for interpreting the eta value.

Table 8.5:

*Interpretation and guidelines for eta value**

0.01 (1%)	=	a small effect
0.06 (6%)	=	moderate effect
0.14 (14%)	=	large effect

Proposed by Cohen, 1988, pp. 284-7

Post-hoc comparisons using the Tukey HSD test indicated significant differences between the four pain conditions. These differences are presented in Table 8.6.

Table 8.6: Differences between mean pain rating responses to pain conditions

(N =660) 'Pat/Chris is experiencing pain' for the four pain conditions

(A) Pain level	*(B) Pain level*	*Mean Difference (A-B)*	*Std. Error*	*Sig.*
	Mild Pain	-2.206*	.170	.000
No Pain	Moderate Pain	-4.500*	.171	.000
(n =162)	Severe Pain	-5.864*	.169	.000
	No Pain	2.206*	.170	.000
Mild Pain	Moderate Pain	-2.294*	.170	.000
(n =166)	Severe Pain	-3.657*	.168	.000
	No Pain	4.500*	.171	.000
Moderate Pain	Mild Pain	2.294*	.170	.000
(n =163)	Severe Pain	-1.363*	.169	.000
	No Pain	5.864*	.169	.000
Severe Pain	Mild Pain	3.657*	.168	.000
(n =169)	Moderate Pain	1.363*	.169	.000

**The mean difference is significant at the .05 level.*

Three-Way Between-Groups Analysis of Variance

A three-way between-groups ANOVA highlighted any influence that vignette characters age (i.e. young/old) and gender (i.e. male/female), and pain levels (no pain, mild, moderate and severe pain) had on pain rating scores. This statistical analysis also enabled the identification of any interaction between these three variables.

Each pain level was found to directly impact on the degree of pain rating scores in both student groups, that is undergraduates: F (3, 563) = 364.58, p =.001 and nurses F (3, 65)= 875.73, p =.001. See Table 8.7

Table 8.7: Differences between groups in mean pain rating responses

(N =660) 'Pat/Chris is experiencing pain' for the four pain conditions

	Level of Pain: (A)	Level of Pain: (B)	Mean Diff. (A-B)	Std. Error	Sig.
Undergrads. (n =579)	No Pain	Mild Pain	-2.12*	.180	.000
		Moderate Pain	-4.33*	.179	.000
		Severe Pain	-5.52*	.180	.000
	Mild Pain	No Pain	2.12*	.180	.000
		Moderate Pain	-2.22*	.179	.000
		Severe Pain	-3.40*	.179	.000
	Moderate Pain	No Pain	4.33*	.179	.000
		Mild Pain	2.22*	.179	.000
		Severe Pain	-1.18*	.179	.000
	Severe Pain	No Pain	5.52*	.180	.000
		Mild Pain	3.40*	.179	.000
		Moderate Pain	1.18*	.179	.000
Nurses (n =81)	No Pain	Mild Pain	-2.83*	.170	.000
		Moderate Pain	-5.92*	.179	.000
		Severe Pain	-7.98*	.165	.000
	Mild Pain	No Pain	2.83*	.170	.000
		Moderate Pain	-3.09*	.175	.000
		Severe Pain	-5.15*	.161	.000
	Moderate Pain	No Pain	5.92*	.179	.000
		Mild Pain	3.09*	.175	.000
		Severe Pain	-2.06*	.170	.000
	Severe Pain	No Pain	7.98*	.165	.000
		Mild Pain	5.15*	.161	.000
		Moderate Pain	2.06*	.170	.000

No significant main effect was found for gender in either group, undergraduates: F (1, 563) = 2.93, p= .09; nurses: F (1, 65) = .011, p= .918. Age did not significantly impact on undergraduates pain responses F (1,563) = 2.77, p= .1 but it did on nurses pain responses F (1, 65) = 45.49, p= .001. Further analysis by way of independent sample t-tests showed that vignette characters, either young or old, significantly impacted pain ratings in all pain except the moderate pain condition. See Table 8.8. Overall, pain ratings were significantly higher for older vignette characters (M= 6.10, SE =.512) than younger vignette characters (M= 5.22, SE =.479), and separately in the no pain (60 yrs: M = 1.16, SE = .16; 20 yrs: M = 1.0, SE = .01), mild (60 yrs: M = 4.78, SE = .19; 20 yrs: M = 3.67, SE = .15), and severe condition (60 yrs: M = 9.83, SE = .11; 20 yrs: M = 8.75, SE = .22)but not significantly so in the moderate condition (60 yrs: M = 7.44, SE = .18; 20 yrs: M = 7.00, SE = .19).

Table 8.8: Interpretation of main effect of gender on pain ratings (Nurses n =81)

Level of Pain	*t-test for Equality of Means*	*df*	*Sig. (2-tailed)*	*Mean Difference*	*Std. Error Difference*
No Pain	-3.67	9	.01	-.600	.163
Mild Pain	-4.40	19	.001	-1.11	.252
Moderate pain	-1.72	15	.11	-.44	.258
Severe Pain	-4.42	17	.001	-1.08	.245

The three-way ANOVA highlighted only one interaction effect between gender and pain levels found in undergraduates' responses (see Table 8.9 for this and the other non-significant effects).

Table 8.9: Interaction Effects between 3 Variables

(N =660) 'Pat/Chris is experiencing pain' for the four pain conditions

	*Gender * Age*	*Gender * Pain Level*	*Age * Pain Level*
Undergrad.	F (1, 563)=.47, p= .49	**F (3, 563)=3.69, p= .012**	F (3, 563)=.56, p= .64
Nurses	F (1, 65)=.01, p= .92	F (3, 65)=1.82, p= 15	F (3, 65)=1.79, p= .16

This suggests that vignette character's gender affect undergraduates' pain judgements within the different pain levels. Further examination using a one-way ANOVA illustrated significant differences F (7, 571) = 159.15, p =.001. Multiple comparisons of each male and female vignette character within each pain level revealed the effect was seen in the moderate pain condition only where pain ratings for male characters (M= 6.12; SD= 1.18) were significantly higher than pain ratings for female characters (M= 5.34; SD= 1.31).

8.3.2 Independent-Samples t-test

The second null hypothesis, that is, pain rating response scores by undergraduates and nurses when compared are equal, was examined using an independent-samples t-test. This enabled the impact of the student groups on pain rating scores in the vignette series to be explored. Significant differences were found t (95.8) =-3.26, p =.002. Nurses (M =5.65, SE =.352) felt vignette characters experienced greater pain when compared to undergraduates (M =4.45, SE =.109). The second null hypothesis was therefore rejected.

The extent of the differences in the means (mean difference = 1.20, 95% Cl:-1.93 to -.47) was small (eta squared .016); 1.6 percent of the variance in the pain rating scores was attributed to whether participants were undergraduates or nurses. When resulting data from each pain condition was subjected to *t*-test analyses, significant differences between undergraduates and nurses were found in the moderate t (40.38) =-8.37, p =.001 and severe t (95.56) =-9.327, p =.001 pain condition but not in the mild pain condition t (164) =-1.95, p =.053. When compared to undergraduates (moderate M =5.78, SE =.108; severe M =6.97, SE =.187), nurses (moderate M =7.24, SE =.136; severe M =9.29, SE =.165) felt vignette characters experienced more pain in these pain conditions.

There was a large difference effect between the means of the two groups of students in the moderate pain condition (mean difference =1.46, 95% Cl:-1.81 to -1.10). There was a 30 percent variance in the pain rating scores attributed to the category of student – undergraduate or nurse (i.e. eta squared =.303).

The severe pain condition reflected a large difference effect between the undergraduates and nurses (mean difference = -2.33, 95% Cl:-2.81 to -1.83) (eta squared .342). The eta squared value of 0.342 reflects a 34 percent of the variance in the pain rating scores in this pain condition attributed to the category of student. Differences, though not statistically significant, were also found between the undergraduates and nurses in the mild condition (mean difference = 0.57, 95% Cl:--1.16 to .01.

8.4 Signal Detection Theory Analysis

Vignettes that did not contain pain descriptors reflected, in respect of SDT analysis, noise only. Pain descriptors, appropriate to each pain level, were embedded in the vignette series in the other three pain conditions and reflected noise and a signal.

8.4.1 Criteria for Signal Detection Theory Analysis

The decision-making criterion for the basis of SDT analysis was taken as participants' mean response scores to each pain level (see Table 8.4). Scores equal to and above participants' mean response scores to the mild, moderate, and severe pain levels (where a signal was present) were considered the necessary criteria as to whether, or not, participants felt vignette characters were experiencing pain (i.e. a signal was detected). Scores lower than these means determined that participants felt vignette characters were not experiencing pain (i.e. no signal was detected). Participants' response frequencies equal to and above these determined scores were then used to compute signal detection rates in conjunction with the mean response scores from the no pain level.

It was possible to calculate separate detection rates for each group as there were different mean response scores for each pain condition obtained from the two student groups.

The range of response frequencies (in percentages) over the four pain conditions is illustrated in Table 8.10. These data show the increased pain ratings that correspond to the four pain levels.

Table 8.10: Frequencies & % pain rating four pain conditions*

Undergraduates (n =579); Nurses (n =81)

NO PAIN *Note cut off point (% figures in bold) for Signal Detection Theory analysis*										
Pain Level Rating	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Undergrads	106	25	3	5	2	2				
(n =143)	74%	**18%**	2%	4%	1%	1%				
Nurses	13	6								
(n =19)	**68%**	32%								
Total mean	119	31	3	5	2	2				
(n =162)	**74%**	19%	2%	3%	1%	1%				
MILD PAIN Note cut off point (% figures in bold)										
Pain Level Rating	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Undergrads	1	21	66	31	13	8	2	2	1	
(n =145)	1%	14%	45%	**21%**	9%	5%	2%	2%	1%	
Nurses			5	8	8					
(n =21)			24%	**38%**	38%					
Total mean	1	21	71	39	21	8	2	2	1	
(n =166)	.5%	13%	43%	**23%**	13%	5%	1%	1%	.5%	
MODERATE PAIN Note cut off point (% figures in bold)										
Pain Level Rating	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Undergrads		2	4	13	43	42	28	13	1	
(n =146)		2%	3%	9%	29%	**28%**	19%	9%	1%	
Nurses						1	11	5		
(n =17)						6%	**65%**	29%		
Total mean		2	4	13	43	43	39	18	1	
(n =163)		1%	3%	8%	26%	26%	**24%**	11%	1%	
SEVERE PAIN Note cut off point (% figures in bold)										
Pain Level Rating	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Undergrads	1	7	7	11	10	11	26	26	36	10
(n =145)	1%	5.5%	5.5%	8%	7%	8%	**17%**	17%	24%	7%
Nurses								5	7	12
(n =24)								21%	**29%**	50%
Total mean	1	7	7	11	10	11	26	31	43	22
(n =169)	1%	4%	4%	7%	6%	7%	15%	**18%**	25%	13%

8.4.2 No Pain Condition (Undergraduates n =143; Nurses n =19)

There are no pain descriptors in the vignettes in the 'no pain' condition (i.e. signal absent). Undergraduates required pain rating scores of 1 or 2 to indicate no signal detection – a correct rejection; scores of 3 or above indicated signal detection, where in fact, there was no signal present – an incorrect hit. These data are outlined in Table 8.10. Nurses required a lower score of 1 indicating no signal detection, and a score of two or above to indicate signal detection.

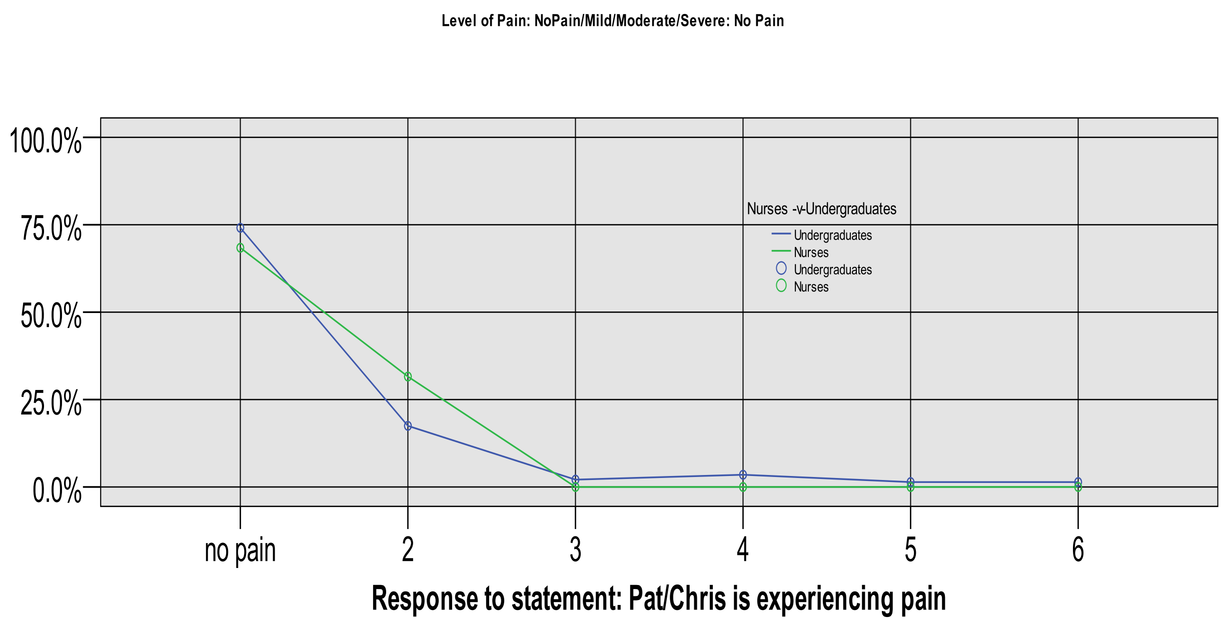

Figure 8.3: Pain Ratings (%) in the no pain condition Undergraduates (n =143); Nurses (n =19)

There was a correct rejection differential of 23.2 percent between the two groups in favour of the undergraduates (see Figure 8.3).

In the no pain condition 73.5 percent (n =119) participants correctly indicated there was no signal present (i.e. a correct rejection); 26.5 percent (n =43) of participants incorrectly, detected a signal, that was not present (i.e. an incorrect hit). A larger proportion of undergraduates (91.6%; n =131) indicated there was no signal present (i.e. a correct rejection) when compared to nurses (68.4%; n =13). A greater percentage of nurses (32.6%; n =6) incorrectly detected a signal, when in fact, there was no signal present (i.e. an incorrect hit) when compared to undergraduates (8.4%; n =12).

Mild/Moderate/Severe Pain Conditions

Vignettes in these conditions contained specific pain descriptors relevant to each pain level (i.e. there was a mild pain, moderate pain, or a severe pain signal present). Scores equal to and above 4 (mild pain), equal to and above 7 (moderate pain), and equal to and above 8 (severe pain) respectively, indicated signal detection (i.e. a correct hit). Scores below these means indicated no signal detection (i.e. an incorrect rejection).

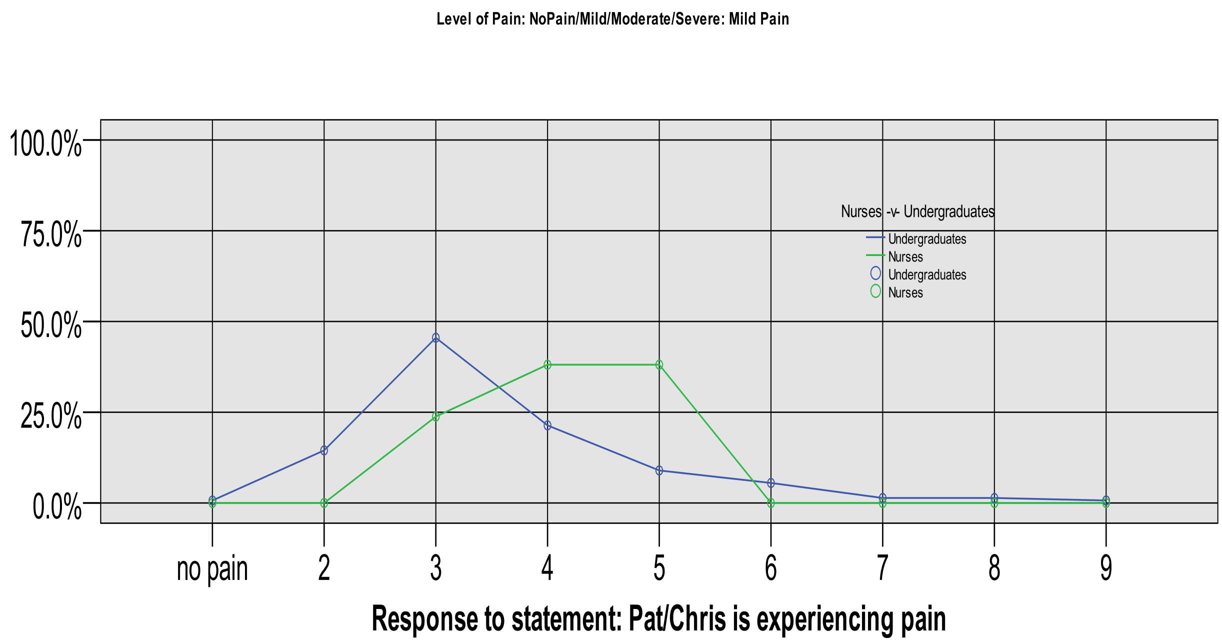

Figure 8.4: Pain Ratings (%) in the mild pain condition. Undergraduate (n =145); Nurses (n =21)

8.4.3 Mild Pain Condition (Undergraduates n =145; Nurses n =21)

Undergraduates and nurses both required a pain rating of 4 and above to indicate correct signal detection (a signal present) that is a correct hit. Scores of three and below indicated no signal detection where there was, in fact, a signal present (i.e. an incorrect rejection). There was correct hit differential of 36.9 percent between the two groups in favour of the nurses (see Figure 8.4). Forty four percent (n =73) of participants correctly detected there was a signal present in the mild pain condition (i.e. a correct hit), 56 percent (n =93) incorrectly, did not detect a present signal (an incorrect rejection). A larger percentage of nurses (76.2%; n =16) correctly detected a present signal (i.e. correct hit) when compared to undergraduates (39.3%; n =57). Conversely

60.7 percent (n =88) of undergraduates incorrectly, did not detect a present signal (an incorrect rejection) compared to 23.8 percent (n =5) of Nurses.

8.4.4 Moderate Pain Condition (Undergraduates =146; nurses n =17)

In the moderate condition, undergraduates required a pain rating of 6 and above to indicate a correct hit, correctly detecting a present signal. Scores of 5 and below indicated no signal detection when, in fact, there was a signal present (i.e. an incorrect rejection). Student Nurses required a pain rating of 7 and above to correctly detect a present signal (i.e. a correct hit) while scores of 6 and below indicated no signal detection when, in fact, there was a signal present (i.e. an incorrect rejection). The correct hit differential was 37.2 percent in favour of the student Nurses (see Figure 8.5).

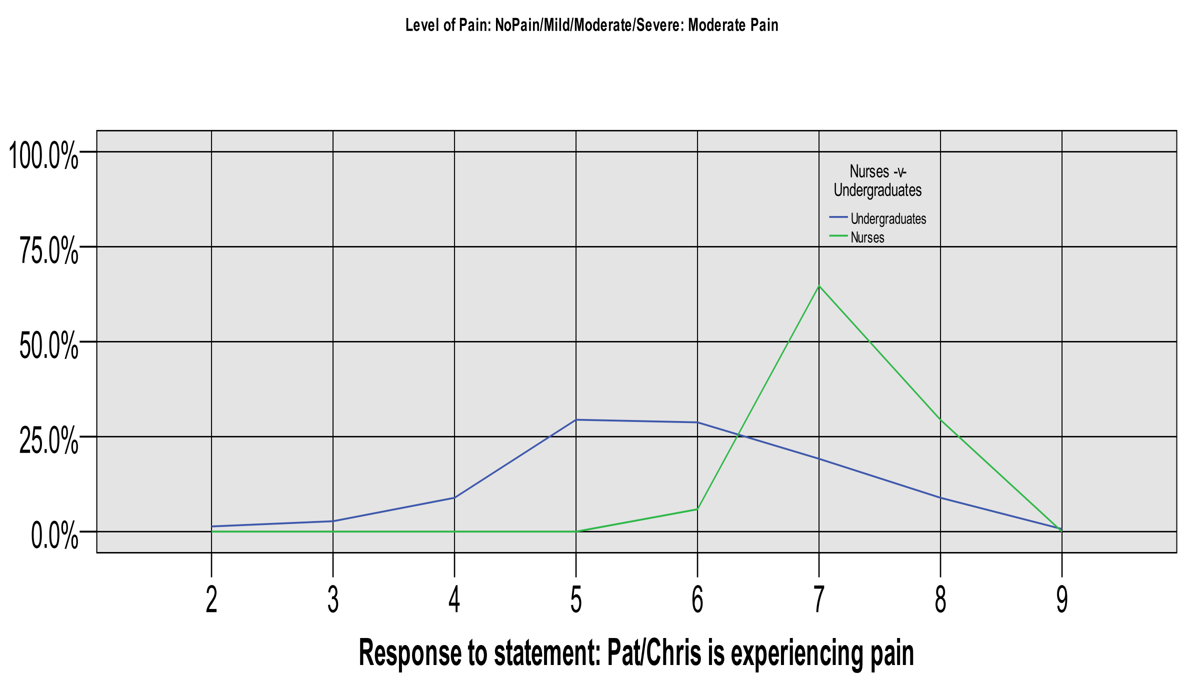

Figure 8.5: Pain Ratings (%) in the moderate pain condition. Arts/Education Students (n =146); Student Nurses (n =17)

In this condition 35.5 percent (n =58) of participants correctly detected there was a signal present (i.e. a correct hit) and 64.4 percent (n =105) incorrectly, did not detect a present signal (i.e. an incorrect rejection). A greater percentage of nurses 94.1 percent (n =16) correctly detected a present signal (i.e. a correct hit) when compared to 57.8 percent (n =84) of undergraduates. A larger proportion of undergraduates 57.6 percent (n =62) incorrectly, did not detect a present signal (i.e. an incorrect rejection) compared to nurses 5.9 percent (n =1) when in fact, there was a signal present.

8.4.5 Severe Pain Condition (Undergraduates n =145; Nurses n =24)

Arts/Education students required a pain rating of 7 and above to indicate a correct hit, correctly detecting a present signal. Scores of 6 and below indicated no signal detection when, in fact, there was a signal present (i.e. an incorrect rejection). Student Nurses required a pain rating of 9 and above to correctly detect a present signal (i.e. a correct hit), scores of 8 and below indicated no signal detection when, in fact, there was a signal present (i.e. an incorrect rejection). There was a severe pain differential of 11.7 percent in favour of the student Nurses (see Figure 8.6).

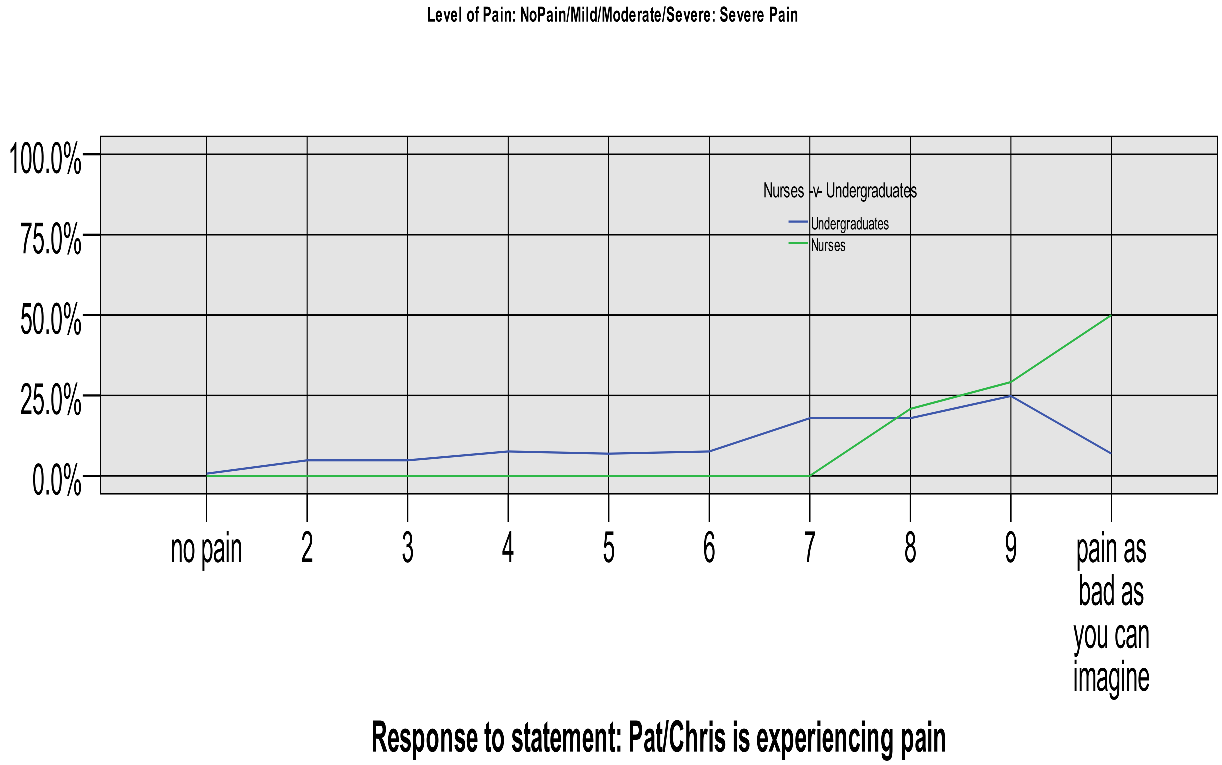

Figure 8.6: Pain Ratings (%) in the severe pain condition Arts/Education Students (n =145); Student Nurses (n =24)

In excess of half of the participants (56.7%; n =96) correctly detected there was a signal present in the severe pain condition (i.e. a correct hit). Less than half (43.3%; n =73), incorrectly, did not detect a present signal (i.e. an incorrect rejection). A larger proportion of nurses (79.2%; n =19) compared to undergraduates (67.5%; n =98) correctly detected a present signal (i.e. a correct hit). A larger proportion of undergraduates (32.5%, n =47), incorrectly, did not detect a present signal (i.e. an incorrect rejection) compared to nurses (20.8%; n =5).

Undergraduates correct hit ratings reflected a greater response spread than nurses in all three conditions. In the mild condition, undergraduates' Likert scale pain ratings were between 4 and 9; nurses' pain ratings were either 4 or 5. The moderate pain condition attracted undergraduates' Likert scale pain ratings of between 6 and 9; student Nurses' ratings were either 7 or 8. Likert scale pain ratings for the severe pain condition for undergraduates were between 6 and 10 and were either 9 or 10 for nurses. These data suggests that, on average, undergraduates were not as confident or certain in their decision-making with regard to their pain perception of the vignette characters as were the student nurses.

8.4.6 Signal Detection Rates

Formulae for Signal Detection Rates

Resulting data from noise, and signal and noise trials were used to calculate participants' signal detection rates. A trial is defined as a single 'unit' in which a stimulus is presented and some response made. For the purposes of this study each trial was represented by one vignette, a component of an extended series and taken together made up the two experiments.

Correct hit plus incorrect rejection data, and incorrect hit plus correct rejection data, both equal 100 percent. Consequently, analysis of incorrect rejection and incorrect hit data is not reported here. Lachman, Lachman & Butterfield (1979) state that correct, and incorrect hit, data are sufficient for SDT analysis.

Frequencies from resulting data from the vignettes were aggregated and calculated within a single matrix using the formulae in Figure 8.7 as previously outlined in Chapter 6 (section 6.5.3).

$$\text{Correct Hit Rate} = \frac{\text{Correct hit frequencies}}{\text{Correct hit frequencies + incorrect rejection frequencies}}$$

$$\text{Incorrect Rejection Rate} = 1 - \text{correct hit rate}$$

$$\text{Incorrect Hit Rate} = \frac{\text{Incorrect hit frequencies}}{\text{Incorrect hit frequencies + correct rejection frequencies}}$$

$$\text{Correct Rejection Rate} = 1 - \text{incorrect hit rate}$$

Figure 8.7: Formulae for calculating signal detection rates

8.4.7 Correct Hit Rate

Resulting data illustrate that participant signal detection rates (when a signal is present) is greatest in the severe pain condition (56.8%). Detection rates do not increase parallel with the ascending pain conditions. A detection rate of 35.6 percent was found in the moderate condition, 8.4 percent less than the detection rate of 44 percent in the mild condition. Undergraduates have lower correct hit detection rates when compared to nurses at all pain levels. Their signal detection rates increase parallel to ascending pain levels (mild 39.3%; moderate 57.5%; and severe 67.6%). Nurses correct signal detection rates are greatest in the moderate pain condition (94.1%) and least in the mild pain condition (76.2%). The detection rate in the severe pain condition was found to be 79.2 percent.

8.4.8 Incorrect Hit Rate

The incorrect hit signal detection rate reflects the extent of participants' recognition of a signal when in fact, none is present (i.e. participants state the vignette character is experiencing pain when in fact s/he is not). Participants incorrect hit signal detection was found to be 26.5 percent. A smaller incorrect hit rate of 8.4 percent was revealed for undergraduates compared to 32.6 percent for nurses.

These data, and correct and incorrect rejection data are presented in Table 8.11.

Table 8.11: Participants' signal pain detection rates

Signal Present (Total n =498; Arts n =436; Nurses n =62); Signal Absent (Total n =162; Arts n =143; Nurses n =19)

	SIGNAL PRESENT (Vignette characters are experiencing pain)				*SIGNAL ABSENT (Vignette characters are not experiencing pain)*		
	CORRECT HIT				INCORRECT HIT		
	Pain Level	All Participants	Undergraduates	Nurses	All Participants	Undergraduates	Nurses
PARTICIPANTS DECISION: Yes - there is pain being experienced	Mild	44%	39.3%	76.2%			
	Moderate	35.6%	57.5%	94.1%	26.5%	8.4%	32.6%
	Severe	56.8%	67.6%	79.2%			
	INCORRECT REJECTION				CORRECT REJECTION		
PARTICIPANTS DECISION: No - there is no pain being experienced	Mild	56%	60.7%	23.8%			
	Moderate	64.4%	42.5%	5.9%	73.5%	91.6%	67.4%
	Severe	43.2%	32.4%	20.8%			

8.5 Summary

Resulting data, when analysed by descriptive analysis, inferential statistical techniques and signal detection theory reflect a general trend of increased pain perception which correspond to ascending pain levels.

Inferential statistical analysis revealed significant differences between the pain levels and between the two participating groups, undergraduates and nurses.

Inferential statistical analysis suggested that pain severity levels, vignette characters' age impact on pain ratings in addition to interaction between vignette characters' gender and pain levels.

Signal Detection Theory analysis indicated, different detection criteria for the two groups, and diverse detection rates between the four pain levels and between the two groups.

Nurses' correct hit rates were higher than those of undergraduates in all three levels.

9. GENERAL DISCUSSION

9.1 Overview

The current findings of this study, when analysed by way of descriptive, inferential and SDT methods, have met the specific objectives of this thesis. Analysis revealed significant differences in pain ratings between undergraduates (representative of the ordinary public/healthcare receivers) and student nurses (representative of healthcare personnel/providers). Resultant findings also illustrated a general trend of increased pain perception that paralleled graduated pain conditions (i.e. no pain, mild, moderate and severe pain). Further analysis in this regard shows that pain severity conditions directly influence pain ratings. In addition, analysis based on a SDT framework highlighted the criteria employed by undergraduates and nurses that resulted in different detection rates when reporting pain as perceived in others.

These findings are discussed and presented in five sections. Section 9.2 presents a précis of Chapter's 7 and 8 findings and examines these results in light of the literature review (Chapters 1 – 5). The strengths, limitations, and statistical analysis methodology of this study are discussed in section 9.3. Section 9.4 explores the direction and form future research might take in the area and Section 9.5 concludes the thesis.

9.2 Findings Discussed

This section discusses the findings with regard to response spread across the Likert Scale, pain perception criterion adopted by the two groups, detection rates across the four pain levels, the influence of vignette characters' gender and age on pain ratings and the impact of vignette methodology itself.

9.2.1 Response Spread

The response spread across the Likert Pain Rating Scale was examined in order to identify the criteria/response bias adopted by undergraduates and nurses. The mean response scores within each pain level (Table 8.4, Chapter 8, Section 8.2.3) was taken to be the pain perception criteria required of each group. The Pain Rating Scale start point 1 represented *no pain* and the end point 10 represented *pain as bad as you can imagine*.

Differences in pain ratings across the Likert Scale between nurses and undergraduates were considerable in each pain condition with nurses being more definitive in their pain judgement (i.e. no pain= response spread 1-2; mild pain 3-5; moderate pain = 6-8; and severe pain= 8-10) compared to undergraduates (i.e. no pain= response spread 1-6; mild pain= 1-9; moderate pain= 2-9; and severe pain= 1-10). Nurses' average response spread was 2.75 points compared to the undergraduates' average of 8 points. Undergraduates may have been insecure in pain judgement compared to the nurses who may have had more confidence and surety due to their healthcare and professional training and clinical placement experience. Differences in personal history, biological endowment and/or constraints, knowledge, professional training and personal judgement have been shown to influence pain ratings (Craig, 2009).

9.2.2 Criteria for Pain Perception

A major advantage of the use of SDT analysis is that it highlights differences in the criterion, or biases, adopted by individuals when they estimate pain. Other pain assessment tools may reflect differences in pain ratings between groups, but SDT can help attribute some, or all, of those differences to a pre-existing range of biases within the parties involved in the pain dialogue. Although differences between groups may be identified with the use of contemporary pain measurement tools, they are not considered, and it is the healthcare providers' pain perception of the situation that most often determines treatment and pain management strategies (Wilson, 2007). Findings from the two studies conducted suggest the two populations appear to employ different criteria in their pain perception across the four pain levels (see Table 8.10, Chapter 8, and Section 8.4.1).

Mild/Moderate/Severe Pain Condition

Nurses adopted higher criteria by 1 and 2 points on the Likert Pain Rating scale in their pain perception in the *moderate* and *severe* pain conditions respectively when compared to undergraduates (i.e. *moderate* – nurses 7, undergraduates 6;

severe – nurses 9, undergraduates 7); a similar criteria was adopted by both groups in the *mild* pain condition (i.e. mild – nurses/undergraduates 4).

No Pain Condition

Nurses adopted a lower criterion of 1 point in the *no pain* condition on the Likert Pain Rating scale compared to the undergraduates' criterion of 2 (see Table 8.10, Chapter8, Section 8.4.1). Although these findings are in contrast with the tendency of healthcare providers to *underestimate* pain when asked to provide proxy pain reports of others, Marquié et al. (2003)observed that healthcare practitioners with more expertise underestimated patient's pain to a greater extent compared to practitioners with less expertise. The nurses involved in this study had limited health care expertise as they were 3rd or 4th year students in a pre-registration degree programme as opposed to registered nurses with many years experience and subsequent greater level of expertise.

Marquié et al (2003) also found that the degree of underestimation varied dependent on whether the healthcare practitioner was male or female and whether the patients cause of pain was obvious or not (e.g. broken arm or large laceration vs. condition/disease not immediately detectable or obvious). Male healthcare practitioners were found to judge female patient's pain lower than male patients. In contrast, female healthcare practitioners judged female patient's pain the same as males. The fact that a large majority of the nurses in this study were female (90%) may have impacted on resulting data. In addition a large majority of undergraduates were also female (84%).

Irrespective as to whether resulting data are supported by other studies the data illustrate how SDT based analysis can identify and highlight pre existing biases in individuals' estimates of pain levels. The biases underpin differences or variation in the 'meaning' that observers (e.g. healthcare practitioners such as doctors, nurses, family members) report when assessing the pain of others. There are currently no pain measurement tools *that attempt* to incorporate or account for this variability of meaning.

9.2.3 Pain Detection Rates

Mild/Moderate/Severe Pain Condition

SDT detection rates indicated that nurses were more likely to determine that vignette characters were experiencing pain when compared to undergraduates in the mild, moderate, and severe pain conditions. Nurses' *correct hit* signal detection rates were consistently higher than undergraduates (i.e. *correct hit* - pain was indicated in vignettes – signal present). Differences of 37 percent and 36 percent between the groups' *correct hit* detection rates (i.e. correctly detecting a signal when a signal is present; e.g. pain) were found in the mild and moderate pain condition respectively. Differences were found to be considerably less in the severe pain condition; a difference of 11 percent between groups (Table 8.11, Chapter 8, and Section 8.4.8).

Research has shown that nurses' perception of their patient's pain is influenced by their level of (healthcare/nursing) education and clinical experience (Wilson, 2007). Nurses who participated in this study were 3rd and 4th year student nurses which may explain the differences found between them and the undergraduates in their pain detection rates in the mild and moderate pain levels. In contrast to undergraduates, nurses in their third level studies were engaged with academic healthcare instruction and had also experienced clinical placement. This and other reasons may explain the smaller difference observed in the severe pain condition. Nurses' confidence with regard to their determination of high pain levels may have been curtailed as their pre-registration studies were not yet complete and their clinical experience limited. Pain underestimation at this particular pain level is frequently observed by healthcare professionals (Hartmannsgruber, Swamidoss, Budde, Qadir, Sorin, & Silverman, 1999).

No Pain Condition

Nurses were more likely to detect pain in the 'no pain' condition than undergraduates by 25%. Nurses may feel the consequences of an *incorrect hit* (i.e. pain perceived but not indicated) impact less on a vignette character than the consequences of an *incorrect rejection* (i.e. pain not perceived when in fact it was indicated). In other words they may feel that patients may suffer more without analgesia than if erroneously prescribed. *Incorrect rejections* most often occur when the negative consequences of an *incorrect rejection* are greater than negative consequences of an *incorrect hit* (Swets, 1996). For instance, when a patient's actual pain is not perceived (*incorrect rejection*) compared to a patient not in pain but perceived as being so (*incorrect hit*). Incorrect hits are common in medical decision making by both healthcare practitioners and their patients; in fact they are frequently encouraged (Allen & Siegal, 2002). An *incorrect hit* concludes that an ambiguous signal (e.g. pain experience) did, or did not, occur. These findings illustrate the nurses in this condition adopted a more 'liberal' decision criterion (bias) than their undergraduate counterparts. That is they had a bias toward pain detection irrespective as to whether it was present or not.

9.2.4 Impact of Vignette Characters' Age/Gender on Pain Ratings

Examination of pain ratings with regard to vignette characters' age and gender, while not an objective of this research, highlight the benefits of vignette methodology when based on a SDT framework. Such examination also identifies differences, influences and interactions between these variables and the various pain conditions. Descriptive and inferential data analysis revealed differences between undergraduates and nurses responses to vignette characters' gender and age.

Vignette Characters' Gender

Whilst findings indicate that gender did not influence pain ratings per se, the interaction of gender within the moderate pain condition resulted in an undergraduate prejudice towards males being more likely to experience more pain when compared to females, and in the no pain condition where females were more likely to experience pain when compared to males. Considering these findings came from the undergraduate cohort as opposed to the nurses they are not supported by current research that suggests a prejudice towards women as being more likely to experience more pain than men by their healthcare providers (Hadjistavropoulos et al. 1990; Hadjistavropoulos et al. 1996). In addition, and also not supported by this study's findings, Marquie et al. (2003) found that male health practitioners rate pain in females lower than males while females judge females the same as males.

Vignette Characters' Age (i.e. Young or Old)

The age of vignette characters was found to have a significant impact on nurses' pain ratings, but not on undergraduates, in all conditions except the moderate pain condition where older vignette characters attracted higher pain ratings when compared to younger characters. These findings are in contrast with evidence based research reflecting the under assessment of pain amongst the older population by healthcare practitioners (Hadjistavropoulos et al, 2009). According to Wilson (2007), educational healthcare programmes expand the knowledge of and the ability to assess pain but it is the working environment, and the extent of the experience within, that influences and develops the use of this knowledge. If the cohort of nurses in this study complete their studies and continue with a nursing career and if they were similarly surveyed in five years time their pain rating of the vignette characters, all things being equal, should be quite different as a result of the practical experience acquired in the working environment.

9.3 Strengths and Limitations of Studies 1 & 2

9.3.1 Overview

The main strength of these studies is the vignette methodology supported and underpinned by an SDT analytical process; experimental controls also strengthen the studies' design. The main limitation is the population from which the samples were drawn combined with the fact that each participant responded to one SDT trial only. These and other strengths and limitations are discussed in detail in the following sections.

9.3.2 Strengths

Vignette Methodology

Vignette methodology allows resultant data to be analysed within an SDT perspective. The combination of this methodology and analytical process allows a 'space' for responses from those who perceive stimuli when in fact there are none, and from those who do not perceive stimuli when in fact there are stimuli present. This is an alternative to conventional methodologies where respondents indicate their perceived degree of pain within an experimental design that comprises of a present stimulus. Vignette methodology also allows different populations to respond to the same stimuli and avoids distortion of self-reported pain. This is especially valuable when examining the disparate views of pain perception between different healthcare populations as found by Marquié et al. (2007 and 2003). Healthcare providers, more commonly, gave lower ratings of their patients' pain than did their patients. Issues such as professional status, gender (in both healthcare providers and receivers), and the obviousness of pain as referred to by Sweeney (2010) were indicated as contributing factors to these discrepancies in pain perception (Marquié et al. 2003).

Vignette methodology enabled exploration and examination of different groups' interpretations of common scenarios that reflected different pain conditions and also enabled SDT analysis of resulting data. Igier et al (2007) observed that typical cues and plausible situations enabled their participants (i.e. nurses, student nurses and nurses aides) to respond objectively and to make pain perception judgements without difficulty. The typical cues and plausible situations within the vignette series in these studies also enabled objective and easy responses. The format, design, and validity of the vignette series served as strengths in this methodology.

Format

The use of textual vignettes as presented in Chapter 5 (see section 5.4), as opposed to visual or oral forms, was of particular value as no visual or oral images could bias participants' responses toward the depicted vignette characters. Current research conducted by Xu, Zuo, Wang & Han (2009) indicates the existence of an empathic bias toward racial in-group members as a result of visual stimuli as opposed to other forms. They observed their participants' racial empathic biases (by way of neural mechanisms via fMRI techniques) when painful stimulations were viewed of Caucasian and Chinese patients.

Design

Vignette methodology within an SDT analytical framework facilitated the omission of pain indicators and descriptors in some trials[5], and inclusion (various levels), in others. This provided the opportunity to collect data from participants who perceived vignette characters experiencing pain when in fact none was indicated. Key to SDT analysis is the fact that participants have four response options. These are correct or incorrect; yes or no when there is a signal present *and* yes or no when a signal is absent. This is in contrast to the yes/no response when stimuli are traditionally embedded within a vignette series.

The use of generic first names as proposed by King et al (2004) encouraged non gender bias responses. The gender nonspecific names of Pat and Chris were culturally matched to that of the general student population. The mundane and realistic scenarios within the vignette series reflected the reality of life with no emphasis on eccentric vignette characters or disastrous events. Finch (1987)

[5] A trial is a single 'unit' in which a stimulus is either presented or not, and a response required.

and Hughes and Huby (1997) maintain that good quality data is achieved when vignettes comprise of these characteristics.

The four pain levels included were considered particularly appropriate. Individuals with osteoarthritis, the most common health problem amongst older people – but also seen in the younger population (Murray, 2012), have a wide range of pain experiences that range from 'a baseline of no pain to severe and persistent and episodes of acute pain (or acute exacerbations of chronic pain) that may be mild or severe' (Igier et al, 2007, p. 543).

The two scenarios illustrated within the vignettes account for the pain influence on depicted characters and their affective and sensory evaluation of that influence. The graduation of movement difficulty of vignette characters reflects general activity and kinetic ability. Both scenarios provide prompts to the degree of pain experienced. This is important as unconscious behaviours seen in a pain experience act as influential cues to the observer (Hadjistavropoulos & Craig, 2002). For example, getting out of bed in the morning is reflected by *'Pat swings her legs onto the floor'*- no pain*; 'with her hand Pat lifts her legs out onto the floor'* – mild pain; *with her hands Pat gently lifts her legs out onto the floor'*- moderate pain*; and 'with her hands Pat cautiously lifts her legs out onto the floor'* – severe pain. Similarly, speed of movement, within the pertinent context, contributes to pain perception – for example Pat walks *'quickly'/'slowly'/'very slowly'/'awfully slowly' to the kitchen to have her breakfast* and '*sits up without delay*'/*'gradually sits up*'/*'gingerly sits up'*/ and *'very carefully sits up'*. These graduations of kinetic ability and speed, in addition to the affective graduated sentences included in the vignettes, account for the broad pain profile as proposed by Kehoe et al. (2007) (see Figure 6.3, Chapter 6, Section 6.3.3).

Validity

- Face Validity

The vignette series indicated high face validity as participants appeared to make pain judgments with ease when responding to the pain statement '*Pat is experiencing pain*'. In addition, the vignettes were viewed by two individuals with a professional interest in healthcare and a chronic illness and who commented positively on the 'realism' and 'plausibility' of each vignette scenario.

- Construct Validity

The pain descriptors employed in the vignettes contribute to the construct validity of the vignette series. The descriptors are extracted from the McGill Pain Questionnaire (SF-MPQ) (Melzack & Torgenson, 1971; Melzack, 1975) and are part of general language used in current western culture during the experience of pain and when in distress (Morris, 1991). Direct translation of questionnaires into other languages does not guarantee maintenance of validity but the SF-MPQ has retained high validity after translations into numerous languages (e.g. Norwegian - Strand & Ljunggren, 1997; Greek – Mystakidou, Tsilika, Parpa, Smyrniotis, Galanos, Vlahos et al, 1987; Dutch - Vanderiet

Adriaensen, Carton & Vertommen, 2002; and Turkish –Yakut, Yakut, Bayer & Uygur, 2007). Validity of the SF-MPQ across different populations (e.g. terminally ill patients, terminal cancer patients), and in those suffering from acute and chronic pain has also been observed (Melzack & Ketz, 2001).

9.3.3 Limitations

The limitations and challenges of this study are examined in this section in detail. Issues such as participant population, generalization of results, pain representation within vignettes, and cognitive processing of double negatives are discussed.

Participant Population

A serious limitation of this study is the fact that the samples employed, (i.e. student nurses vs. arts undergraduates) were drawn from a University student population. While this form of convenience sampling is frequently employed in psychological studies as participants are readily available (Howitt & Cramer, 2005) they do not exactly represent the healthcare receiver/provider population (i.e. undergraduates vs. those who have chosen to become professional healthcare practitioners). Nonetheless, the samples facilitate identification of pain perception differences between groups while employing vignette methodology based on a framework of SDT.

There is little doubt that potential differences in pain perception within the healthcare population would be best observed by healthcare professionals *and* their patients in response to a similar pain experience. This is especially true where vignettes are utilised. Hughes (1998) maintains that direct experience of a situation under scrutiny in a vignette facilitates a valid interpretation of the situation being presented. Hughes, in his exploration of drug abuse and behaviour associated with HIV, observed drug addicts easily responded to vignettes when a character wanted an injection. It may be argued that healthcare professionals and healthcare receivers (e.g. from a clinical population with chronic illnesses) may interpret the vignettes employed in this study more easily than undergraduates, in line with Hughes' findings. However, it is important, both ethically and economically to demonstrate *a priori* that the vignette/SDT tool can provide important supplementary information about pain *before* being tested in a clinical setting. Data from the present studies justify further exploration of pain perception in a clinical setting with professional healthcare practitioners and their patients.

Generalisation of Results

As a convenience sample drawn from a university undergraduate population was studied findings may not be generalised to the general healthcare population. While participants were generally considered in good health, a similar survey conducted on a clinical population of healthcare receivers with chronic illnesses and their healthcare providers may elicit different data. The issue here is not only the overt pain ratings but rather whether the tool can add value in the form of an assessment and attribution of individual and population bias in pain perception. If the tool does this on healthy individuals, then it is reasonable to suppose it might also work on less healthy populations.

Pain Representation

The wide ranging cues of a complete pain profile were addressed in the vignette series. These comprised of the assessment of the distress of pain, its influence on sufferers by the assessment of physical pain, and the assessment of its levels of social impairment by mild, moderate, and severe pain descriptors (Kehoe et al. 2007), but not all the specific cues as listed by Igier et al. (2007) were included. Igier et al (2007, p. 543) argue that recent literature with regard to pain assessment indicates five principle cues (with particular relevance to osteoarthritis pain) facial grimacing, maintenance of abnormal body position (in which the patient feels less uncomfortable), restriction of movement (to avoid movements that cause pain), complaints about pain, and signs of possible depression ’. Restrictions of movement (to avoid movements that cause pain) and to a lesser extent complaints of pain were incorporated into the vignette series but the remaining cues were not. It was necessary, for practicalities, to limit the number and length of each vignette in this study. Further research is warranted to evaluate each cue within relevant pain levels and resultant pain ratings. Examination of such resultant data in order to explore whether all levels receive similar ratings or if certain cues attract higher or lower pain judgment ratings may also be informative.

It is not known if pain judgement ratings of vignettes were right, in the sense of providing an accurate and precise measure of the vignette character's pain experience. This is the challenge of assessing and measuring the subjective percept of pain. Relative judgements' ratings can be compared and analysed for differences between groups and pain levels as opposed to examining any accuracy of assessment.

Cognitive Processes

Participants' judgement processes appeared laborious and confused in responses to the second pain judgement question *Pat is not experiencing pain*. Resulting data did not follow any discernible trend unlike resulting data from the first pain judgement statement. This may have been because of the linguistic double negative involved rather than any non-ecological feature of the vignettes. Cognitive processes handle positive information more efficiently than negative information (Matlin, 2005). Sentences are understood more easily if they are worded in the affirmative compared to those presented negatively. For example 'Pat is honest' rather than the negatively presented 'Pat is not dishonest' is understood easily (Matlin, 2005). The combination of the negative statement with the start point of the Likert scale (1 =no pain) is a double negative; a complex task to process.

9.3.4 Strengths & Limitations of Statistical Analysis

Descriptive analysis enabled mean scores for each group within the pain levels to be identified and was taken to be the criterion for calculation of the various detection rates. Resulting data was examined using the one way between-groups analysis technique (ANOVA) prior to SDT analysis. This enabled differences between pain levels, but specifically between the no pain level (facilitated by a SDT framework) and other pain levels, to be underlined.

Descriptive Statistical Analysis

The Likert Pain Rating scale start point of 1 that represented *No Pain*, which was employed, may have impacted on the criterion adopted by participants and subsequent SDT analysis. Volkmann's (1951) 'rubber model' suggests perception of Likert Scale points reflects the scope expected (as cited in Heine, Lehman, Peng & Greenholtz, 2002). The use of a start point of 0 may have been more appropriate.

Inferential Statistical Analysis - Kilmogorov-Smirnov Statistic

ANOVA statistical tests were conducted despite the fact the Kolmogorov-Smirnov statistic was significant at the .05 level which suggested violation of the assumption of normality when responses to all pain levels were being compared. In assessment of distribution of scores normality the Kilmogorov-

Smirnov statistic significance is quite common in larger samples (N =660 in the current study) (Pallent, 2007). Field (2011, p. 144) argues that

> ...it is very easy to get significant results from small deviations from normality, and so a significant test doesn't necessary tell whether the deviation from normality is enough to bias any statistical procedures applied to the data.

Several scales and measures used in the social sciences produce positively or negatively skewed scores. This may be due to the nature of what is being measured, pain perception in this instance, as opposed to the scale being used. Resulting data was considered to be normally distributed as parametric techniques are 'fairly robust and will tolerate minor violations of assumptions' particularly if there is a good size sample' (Pallent, 2007, p. 204). In addition, the size of the four participants' groups was reasonably similar (i.e. the mean response percentage to each pain level was 25% with a 1.40% differential).

Signal Detection Analysis

SDT analysis, in conjunction with vignette methodology, added pertinent information to the body of resulting data that would not otherwise have been emphasised. The SDT framework, upon which the vignette series was designed, enabled data to be analysed with regard to pain perception when no pain was indicated. The relative frequency of responses is not independent and all SDT analyses are outlined by the proportion of *correct* and *incorrect hits* (i.e. correctly perceived pain when pain is present and an incorrectly perceived pain when it is not). The use of such a framework enables a wider scope of pain perception assessment by both healthcare professionals and healthcare receivers as both parties can respond to the 'situation' irrespective as to whether pain is present or not.

A conventional SDT study presents all participants with a number of trials. Each trial randomly presented represents the intensity of each condition (i.e. signal present - mild, moderate and severe pain conditions; signal absent – no pain). In other words the SDT convention operates on a 'within subjects' or 'repeated measures' design basis. In this study it was not practical to present participants with each vignette permutation due to the extended vignette series which included 32 permutations (i.e. four pain conditions presented within two scenarios, getting up in the morning and grocery shopping, and vignette characters - male and female, aged 20 and 60). Contrary to the usual SDT standard, the experimental design in this study was based on a 'between subjects' or 'independent measures' design. The number of participants allocated to each group was not equal although the differential between groups' response frequencies to the four pain levels (undergraduates: 0.5%; nurses: 8.6%) and response frequencies to the two vignette scenarios and characters' different age and gender (undergraduates: 2.3%; nurses: 2.4%) was relatively small. The experimental design may therefore have impacted on the SDT analysis; a within subjects experimental design may have proven more reliable results.

9.5 Conclusion

This Chapter has discussed the two studies conducted and resultant pain judgement data from a vignette series based on a framework of SDT in conjunction with the relevant literature. It has shown how the methodology of specially designed vignettes, underpinned by SDT analysis, can account for pain perception biases between groups. Resultant data promotes the development of a pain assessment tool informed by the Social Communication Model of Pain and the methodology used in these studies within a wider context. Refinement of the methodology and analysis, and further research with the involvement of healthcare professionals and their patients, may result in a valuable pain perception tool that can supplement existing pain assessment techniques and be of equal benefit to healthcare providers *and* receivers.

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APPENDICES

A	Gate Control Theory Factors that influence the 'hypothetical gate'. Components of pain explored (e.g. rest and sleep, anxiety and worry, depression, and tension and anger)
B	McGill Pain Questionnaire (MPQ)
C	McGill Pain Questionnaire – Short Form (SF-MPQ)
D	Results of keyword/abstract/title search for 'Vignette' & 'Design', Medline CINIHAL, PsychArticles & Social Science: Full Text between years 1996 and 2011 related to vignette development and utilisation
E	Information Sheet
F	Debriefing form
G	Vignette Series 1 – 32
H	Questionnaire that accompanied vignette
I	SPSS Coding Sheet

APPENDIX A

Factors that influence the 'hypothetical nerve gate'
Melzack & Wall Gate Control Pain Theory (1965)

Sensory/Discriminative Location and type of pain and intensity of the sensation		Motivational/Affective Focuses on the emotional properties of pain and ability to escape pain or tackle it		Cognitive/Evaluative Evaluation of pain information leading to a decision on how to tackle it	
Conditions that open the 'gate'	***Conditions that close the 'date'***	***Conditions that open the 'gate'***	***Conditions that close the 'date'***	***Conditions that open the 'gate'***	***Conditions that close the 'date'***
Extensive injury/trauma	Application of heat or ice; massage	***Anxiety & Worry**	Avoidance of excessive emotions	Focusing on pain	Distraction
Readiness of the nervous system to send pain signals	Medication	***Depression**	Making time to focus on positive emotions	Boredom due to minimal involvement in life activities	Increased positive activities
Inappropriate activity levels	Appropriate activity levels	***Tension and anger**	Good stress management	Maladaptive attitudes	Healthy eating
	***Rest & Sleep**				Having a communicative outlet to share thoughts and feelings

*** These factors, relative to pain experienced, are outlined and examined in this appendix.**

Sensory/Discriminative Factors within the Gate Control Theory

From a physical perspective, the application of heat or ice, massage, medication, appropriate activity levels, and rest and sleep help to lessen the pain experience while the extent of the injury/trauma, the readiness of the nervous system to send pain signals and inappropriate activity levels can exacerbate pain levels.

Rest and sleep

Rest and sleep restores energy and reduces body demands. This allows the body to repair itself and reduces pain from both a biological and psychological perspective. Lack of rest and sleep may be detrimental to cognitive and social functioning. These needs increase during time of illness and injury, as pain can seem worse when tired or restless. Pain is focused on, and attended to, more often during these times. For example, in order to avoid pain surgical patients may be kept sedated; such sedation can allow the body to regenerate energy and heal and (Carlson, 2004).

Motivational/Affective Factors within the Gate Control Theory

An individual's emotional state can influence pain experienced. For example, the avoiding of excessive emotions, making time to focus on positive emotions, and good stress management can improve life quality where pain is present. Anxiety and worry, depression, and tension and anger are proven to aggravate pain levels (Gatchel, 2005; Robinson & Riley, 1999). These areas are more closely examined here.

Anxiety and Worry

Individuals with symptomatic pain are often anxious and worried, especially when their symptoms are unexplained (Gatchel et al. 2007). This is frequently the case for those with chronic pain. In a large scale American study of individuals with fibromyalgia syndrome, Wolfe, Smythe, Yunus, Bennett, Bombardier,

Goldenberg et al (1990) found that between 44 and 51 percent of patients stated they were anxious. Fibromyalgia is a difficult to diagnose illness and often regarded as a medical enigma; it is an arthritis-related syndrome characterized by widespread or generalized muscular pain, tenderness, and fatigue.

The anxiety of those in persistent pain can also lead to fear that others will not believe they are suffering. These individuals are fearful of being told that they are beyond help (Gatchel et al. 2007). Anxiety is also related to physical activities that may exacerbate chronic pain. Anxiety of this type can lead to avoidance behaviours, motivating inactivity, and consequently leading to even greater impairment and disability (Boersma & Linton, 2006). Certain avoidance behaviours may be reinforced through the reduction of chronic pain (McCracken, Gross, Sorg, & Edmands, 1993).

Anxiousness can also contribute to increased muscle tension and physiological arousal. This in turn may maintain and even increase pain (Gatchel, 2005; Robinson & Riley, 1999). The threat and fear of intense pain takes the attention of the individual in such a way that they have great difficulty disengaging from it. This can occur to the extent whereby 'the whole mechanism of pain becomes maladaptive and … starts to threaten and endanger' (Grahek, 2007, p.14). According to McCracken and Gross (1998), the reduction in pain-related anxiety can predict an improvement in general functioning and can also lead to reduced distress, less pain, and also less pain-related interference (avoidance behaviours) with normal activities.

Depression

Research indicates that nearly half of those who suffer with chronic pain also suffer with depressive disorders (Banks & Kerns, 1996; Dersh, Gatchel, Mayer, Polatin, & Temple, 2006; Romano & Turner, 1985). Such studies provide empirical evidence for a strong association between chronic pain and depression but conflict as to whether chronic pain causes depression or depression causes chronic pain. For example, studies of patients with chronic musculoskeletal pain suggest chronic pain may cause depression (Atkinson, Slater, Patterson, Gant, & Garfin, 1991); but, research conducted by Magni, Moreschi, Rigatti Luchini, and Merskey (1994) suggest that depression can cause chronic pain. However, Rudy, Kerns and Turk (1988) found that chronic pain and depression exist in a mutually reinforcing relationship.

According to Von Korff and Simon (1996) depression appears to be a much stronger predictor of incident back pain than other risk factors (clinical or anatomic). This has prompted some researchers to propose a common trait of susceptibility to many physical symptoms (including pain). Susceptibility to negative psychological symptoms, which include anxiety as well as depression, has also been proposed (Gatchel et al. 2007). Von Korff and Simon (1996, p.107) argue that 'pain and psychological illness should be viewed as having reciprocal psychological and behavioural effects involving both processes of illness expression and adaptation'. However, Gatchel et al (2007) states that, with the interdependence of cognition and affect, individuals who believe they can continue to function and maintain control despite their pain are less likely to become depressed. This assertion supports Kleinman's (1988) findings that some chronically ill individuals are an inspiration to their families and loved ones.

Anger & Tension

Although those with chronic pain may present an image of themselves as even tempered, anger is often found in individuals with chronic pain (Schwartz, Slater, Birchler, & Atkinson, 1991). Corbishley, Hendrickson, Beutler, and Engle (1990) found that 88 percent of participants stated feelings of anger when these were explicitly sought. However, due to anger being a socially undesirable trait, demand characteristics in questionnaires and surveys may have prevented some individuals from admitting their feelings of anger. Consequently, anger rates within the population of those with chronic pain may be underestimated. It is not surprising then to find an association between anger inhibition, pain severity, and explicit pain behaviours (Kerns, Rosenberg, & Jacob, 1994) as well as to increased emotional distress (Duckro, Chibnall & Tomazic, 1995; Tschannen, Duckro, Margolis, & Tomazic, 1992).

How anger exacerbates pain is not known. Burns (1997) and Cacioppo, Bernston, Klein, and Poehlmann, (1997) suggest that physiological arousal is increased by anger thereby aggravating any existing pain and discomfort. In support of this argument Burns (1997) conducted a study and found that anger induced stress produced increased muscle tension, which in turn predicted increased pain intensity in participants with chronic back-pain. However, he found that this effect was specific to anger. The measure of depression significantly correlated with pain, was not associated with increased muscle reactivity.

Acording to Gatchel et al (2007) anger may interact with depression relating to how individuals perceive pain intensity. Additionally, anger may block motivation for, and acceptance of, various pain management therapies rather than cure. Rehabilitation and disability management are frequently the only options for individuals with chronic pain. Consequently, the denial and or rejection of such therapies are counterproductive to such individuals.

Cognitive/Evaluative Factors within the Gate Control Theory

There are various cognitive and evaluative factors within the Gate Control Theory of Pain. Mental factors such as focusing on pain, boredom due to minimal involvement in life activities and maladaptive attitudes increase pain levels while distraction, increased positive activities, healthy eating and having a communicative outlet to share thoughts and feelings lessen them. For example ccognitive behavioral pain management programs (Gatchel & Turk, 1996; Philips & Rachman, 1996) teach alternative ways of dealing with pain. These programmes have been shown to reduce pain levels by increasing understanding and control over the problem, encouraging activation, and breaking the cycle of factors which maintain high pain levels where physical interventions have not succeeded. Such self-management programmes also reduce distress, anxiety and depression. Mindfulness or meditation has also been shown to significantly reduce pain levels (Zeidan et al. 2011) as described in chapter 2 (section 2.4.2)

APPENDIX B

Original McGill Pain Questionnaire

www.chcr.brown.edu/pcoc/MCGILLPAINQUEST.PDF

Melzack, R. (1970).

Original (Long Version) McGill Pain Questionnaire.

APPENDIX C

McGill Pain Questionnaire – Short Form

www.chcr.brown.edu/pcoc/SHORTMCGILLQUEST.PDF

Melzack, R. (1984a).

Short-Form McGill Pain Questionnaire (SF-MCQ).

APPENDIX D

PsychArticles, CINHAL, MEDLINE AND Social Sciences articles which include 'vignettes' in (i) Keyword/Subject, (ii) abstract and (iii) title relevant to development and utilisation of Vignettes 19th January 2012

1. Creating case scenarios or vignettes using factorial study design methods. Full Text Available (includes abstract); Brauer PM; Hanning RM; Arocha JF; Royall D; Goy R; Grant A; Dietrich L; Martino R; Horrocks J; Journal of Advanced Nursing, **2009** Sep; 65 (9): 1937-45 (journal article - equations & formulas, research, tables/charts) ISSN: 0309-2402 PMID: 19694857
Subjects: Problem-Based Learning; Vignettes
Database: CINAHL Plus with Full Text **NO PARTICIPANT INTERPRETATION OF REPONSES**

2. Development and utilization of vignettes in assessing medical students' support of older and younger patients' medical decisions. Detail Only Available (includes abstract); Schigelone AS; Fitzgerald JT; Evaluation & the Health Professions, **2004** Sep; 27 (3): 265-84 (journal article - research, tables/charts) ISSN: 0163-2787 PMID: 15312285
OFTEN IT IS NOT CLEAR HOW THESE VIGNETTES ARE DEVELOPED AND WHAT THEY ACTUALLY MEASURE. EFFORTS WERE MADE HERE TO CLARIFY BOTH OF THESE ISSUES.
Subjects: Decision Making, Patient; Support, Psychosocial; Vignettes; Adult: 19-44 years; Aged: 65+ years; Middle Aged: 45-64 years; Female; Male

3. How vignettes can aid social research in palliative care. Detail Only Available (includes abstract); Hughes R; European Journal of Palliative Care, **2007** Nov-Dec; 14 (6): 242-4 (journal article - pictorial, research) ISSN: 1352-2779
Subjects: Palliative Care; Research Methodology
Database: CINAHL Plus with Full Text **PALLIATIVE CARE**

4. Pediatric nurses' thinking in response to vignettes on administering analgesics. Full Text Available (includes abstract); Van Hulle Vincent C; Gaddy EJ; Research in Nursing & Health, **2009** Oct; 32 (5): 530-9 (journal article - research, tables/charts) ISSN: 0160-6891 PMID: 19504564
Subjects: Analgesics, Opioid; Morphine; Nurse Attitudes; Pain Measurement; Pediatric Nursing; Postoperative Pain; Adult: 19-44 years; Child: 6-12 years; Female; Male
Database: CINAHL Plus with Full Text **NURSES PAIN MANAGEMENT/VIGNETTES/BEHAVIOUR/SELF-REPORT OF PAIN**

5. Putting it in context: the use of vignettes in qualitative interviewing. Detail Only Available (includes abstract); Jenkins N; Bloor M; Fischer J; Berney L; Neale J; Qualitative Research, **2010** Apr; 10 (2): 175-98 (journal article - research, tables/charts) ISSN: 1468-7941
The article draws on two separate studies employing developmental vignettes (hypothetical scenarios which unfold through a series of stages) to interview research participants. One study used the...
Subjects: Interviews; Substance Abuse; Substance Abuse; Vignettes
Database: CINAHL Plus with Full Text **VIGNETTE-BASED INTERVIEWING**

6. The application of vignettes in social and nursing research. Full Text Available (includes abstract); Hughes R; Huby M; Journal of Advanced Nursing, **2002** Feb; 37 (4): 382-6 (journal article - review) ISSN: 0309-2402 PMID: 11872108
Aim. The aim of this paper is to review the potential for, and the limitations of, the use of vignettes in research that seeks an understanding of people's attitudes, perceptions and beliefs, par...
Subjects: Vignettes; Research, Nursing; Qualitative Studies
Database: CINAHL Plus with Full Text **ISSUES SURROUNDING PRACTICAL APPLICATION OF VIGNETTES**

7. Using vignettes to assist reflection within an action research study on a preoperative education programme. Detail Only Available (includes abstract); Spalding NJ; British Journal of Occupational Therapy, **2004 Sep**; 67 (9): 388-95 (journal article - research, tables/charts) ISSN: 0308-0226
Subjects: Preoperative Education; Vignettes
Database: CINAHL Plus with Full Text **REFLECTION**

8. Using vignettes to collect data for nursing research studies: how valid are the findings? Full Text Available (includes abstract); Gould D; Journal of Clinical Nursing, **1996 Jul**; 5 (4): 207-12 (journal article - review) ISSN: 0962-1067 PMID: 8718052
Vignettes are simulations of real events which can be used in research studies to elicit subjects' knowledge, attitudes or opinions according to how they state they would behave in the hypothetic...
Subjects: Vignettes; Data Collection Methods; Research, Nursing
Database: CINAHL Plus with Full Text **VALIDITY**

APPENDIX E

Oral Debriefing Sheet

Painful Decisions: An exploration of pain perception in a Signal Detection Theory framework

Aim of Studies
The purpose of the two studies was to illustrate that vignette methodology and signal detection theory can be employed as a framework for pain assessment.

Participant Tasks
Participants were asked to respond to a series of especially designed vignettes that depicted a character that was 20 or 60 years old, male or female and engaged in the activity of grocery shopping or getting up in the morning.

The vignettes either included pain descriptors that portrayed different pain levels; mild, moderate and severe or did not include any pain descriptors.

Participants were initially told the title of the study was 'Linguistics: An Investigation into the use of Adjective Patterns'.

Debriefing
Subsequent to reading the vignettes and responding to the questionnaire all participants were thanked for their time and attention and informed of the true purpose of the study. The logic of the studies, what was predicted and possible applications of the results were also explained. The reasoning for the use of the research title 'Linguistics: An Investigation into the use of adjective patterns' was explained to all participants.

This was to prevent any priming or influence that the actual title 'Painful Decisions: An Exploration of Pain Perception' may have caused. Participants were also advised that they were uncomfortable with having been deceived they were free to withdraw their data from the sample. They were reminded that their results are confidential to the researcher and that all results would be published anonymously in the thesis as a group data.

Participants were given the researchers contact details should they wish to view a copy of the research results, and an opportunity to discuss them. Contact information (phone number and email address) of the researcher's Faculty Supervisor was made available in case a participant wished to express concern about the research.

APPENDIX F

Vignette Series

Vignette Ref. Nos. **Scenario No/Gender/Age/Pain level**

(Scenarios: 1-Morning; 2-Grocery Shopping)

1	**1/1**	1; Male; 20; No pain	**17**	**2/1**	2; Male; 20; No pain
2	**1/2**	1; Male; 20; Mild pain	**18**	**2/2**	2; Male; 20; Mild pain
3	**1/3**	1; Male; 20; Moderate pain	**19**	**2/3**	2; Male; 20; Moderate pain
4	**1/4**	1; Male; 20; Severe pain	**20**	**2/4**	2; Male; 20; Severe pain
5	**1/5**	1; Male; 60; No pain	**21**	**2/5**	2; Male; 60; No pain
6	**1/6**	1; Male; 60; Mild pain	**22**	**2/6**	2; Male; 60, Mild pain
7	**1/7**	1; Male; 60; Moderate pain	**23**	**2/7**	2; Male; 60 Moderate pain
8	**1/8**	1; Male; 60; Severe pain	**24**	**2/8**	2; Male; 60 Severe pain
9	**1/9**	1; Female; 20; No pain	**25**	**2/9**	2; Female; 20; No pain
10	**1/10**	1; Female; 20; Mild pain	**26**	**2/10**	2; Female; 20; Mild pain
11	**1/11**	1; Female; 20; Moderate pain	**27**	**2/11**	2; Female; 20; Moderate pain
12	**1/12**	1; Female; 20; Severe pain	**28**	**2/12**	2; Female; 20; Severe pain
13	**1/13**	1; Female; 60; No pain	**29**	**2/13**	2; Female; 60; No pain
14	**1/14**	1; Female; 60; Mild pain	**30**	**2/14**	2; Female; 60; Mild pain
15	**1/15**	1; Female; 60; Moderate pain	**31**	**2/15**	2; Female; 60; Moderate pain
16	**1/16**	1; Female; 60; Severe pain	**32**	**2/16**	2; Female; 60; Severe pain

<u>Scenario 1 – Getting up in the morning</u>

Age and gender **20 or 60 years of age; female or male**

Sleep Patterns Kinetic Activity and Ability Physical Ability Affective/Emotional Pain Indicators

Sensory/Physical Pain Indicators

Indicators for these various aspects of the pain profile are replicated in each of the no pain, mild, moderate, and severe pain vignettes.

1. **Male; 20; No Pain.**
It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat turns over and presses the snooze button for another 10 minutes. He's feeling lazy. The bedroom is dark. Ten minutes later he pushes back the bed covers and without delay sits up on the bed. Pat swings his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks quickly to the kitchen to have his breakfast.

2. **Male; 20; Mild Pain**
It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat slowly turns over and presses the snooze button for another 10 minutes. He didn't sleep well last night. The bedroom is dark. Ten minutes later he pushes back the bed covers and gradually sits up on the bed. With his hands Pat lifts his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He doesn't feel great. Stiffly, he reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks slowly to the kitchen to have his breakfast. His legs feel a bit dull today.

3. **1; Male; 20; Moderate pain**
It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat very slowly turns over and presses the snooze button for another 10 minutes. He slept badly last night. The bedroom is dark. Ten minutes later he pushes back the bed covers and gingerly sits up on the bed. With his hands Pat gently lifts his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He feels frightful. Very stiffly, he reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks laboriously to the kitchen to have his breakfast. His legs are hurting today.

4. **1; Male; 20; Severe pain**
   It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat extremely slowly turns over and presses the snooze button for another 10 minutes. He slept really badly last night. The bedroom is dark. Ten minutes later he pushes back the bed covers and very carefully sits up on the bed. With his hands Pat cautiously lifts his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He has a suffocating feeling in his body. With immense stiffness, he reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks awfully slowly to the kitchen to have his breakfast. His legs are very heavy today.

5. **1; Male; 60; No pain**
   It's 7.30a.m. The alarm clock goes off just beside the bed. Sixty-year-old Pat turns over and presses the snooze button for another 10 minutes. He's feeling lazy. The bedroom is dark. Ten minutes later he pushes back the bed covers and without delay sits up on the bed. Pat swings his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks quickly to the kitchen to have his breakfast.

6. **1; Male; 60; Mild pain**
   It's 7.30a.m. The alarm clock goes off just beside the bed. Sixty-year-old Pat slowly turns over and presses the snooze button for another 10 minutes. He didn't sleep well last night. The bedroom is dark. Ten minutes later he pushes back the bed covers and gradually sits up on the bed. With his hands Pat lifts his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He doesn't feel great. Stiffly, he reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks slowly to the kitchen to have his breakfast. His legs feel a bit dull today.

7. **1; Male; 60; Moderate pain**
   It's 7.30a.m. The alarm clock goes off just beside the bed. Sixty-year-old Pat very slowly turns over and presses the snooze button for another 10 minutes. He slept badly last night. The bedroom is dark. Ten minutes later he pushes back the bed covers and gingerly sits up on the bed. With his hands Pat gently lifts his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He feels frightful. Very stiffly, he reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks laboriously to the kitchen to have his breakfast. His legs are hurting today.

8. **1; Male; 60; Severe pain**
It's 7.30a.m. The alarm clock goes off just beside the bed. Sixty-year-old Pat extremely slowly turns over and presses the snooze button for another 10 minutes. He slept really badly last night. The bedroom is dark. Ten minutes later he pushes back the bed covers and very carefully sits up on the bed. With his hands Pat cautiously lifts his legs out onto the floor and puts his feet into his slippers. He stands up and goes to the window and opens the curtains to look out at the winter morning. He can see his breath, as the air is cold. He has a suffocating feeling in his body. Very immense stiffness, he reaches down to turn on the radiator. After being in the bathroom Pat gets himself dressed and ready for the day. He's looking forward to seeing his brother this morning; he's not seen him for a week. He must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks awfully slowly to the kitchen to have his breakfast. His legs are very heavy today.

9. **1; Female; 20; No pain**
It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat turns over and presses the snooze button for another 10 minutes. She's feeling lazy. The bedroom is dark. Ten minutes later she pushes back the bed covers and without delay sits up on the bed. Pat swings her legs out onto the floor and puts her feet into her slippers. She stands up and goes to the window and opens the curtains to look out at the winter morning. She can see her breath, as the air is cold. She reaches down to turn on the radiator. After being in the bathroom Pat gets herself dressed and ready for the day. She's looking forward to seeing her brother this morning; she's not seen him for a week. She must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks quickly to the kitchen to have her breakfast.

10. **1; Female; 20; Mild pain**
It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat slowly turns over and presses the snooze button for another 10 minutes. She didn't sleep well last night. The bedroom is dark. Ten minutes later she pushes back the bed covers and gradually sits up on the bed. With her hands Pat lifts her legs out onto the floor and puts her feet into her slippers. She stands up and goes to the window and opens the curtains to look out at the winter morning. She can see her breath, as the air is cold. She doesn't feel great. Stiffly, she reaches down to turn on the radiator. After being in the bathroom Pat gets herself dressed and ready for the day. She's looking forward to seeing her brother this morning; she's not seen him for a week. She must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks slowly to the kitchen to have her breakfast. Her legs feel a bit dull today.

11. **1; Female; 20; Moderate pain**
It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat very slowly turns over and presses the snooze button for another 10 minutes. She slept badly last night. The bedroom is dark. Ten minutes later she pushes back the bed covers and gingerly sits up on the bed. With her hands Pat gently lifts her legs out onto the floor and puts her feet into her slippers. She stands up and goes to the window and opens the curtains to look out at the winter morning. She can see her breath, as the air is cold. She feels frightful. Very stiffly, she reaches down to turn on the radiator. After being in the bathroom Pat gets herself dressed and ready for the day. She's looking forward to seeing her brother this morning; she's not seen him for a week. She must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks laboriously to the kitchen to have her breakfast. Her legs are hurting today.

12. 1; Female; 20; Severe pain

It's 7.30a.m. The alarm clock goes off just beside the bed. Twenty-year-old Pat extremely slowly turns over and presses the snooze button for another 10 minutes. She slept really badly last night. The bedroom is dark. Ten minutes later she pushes back the bed covers and very carefully sits up on the bed. With her hands Pat cautiously lifts her legs out onto the floor and puts her feet into her slippers. She stands up and goes to the window and opens the curtains to look out at the winter morning. She can see her breath, as the air is cold. She has a suffocating feeling in her body. With immense stiffness, she reaches down to turn on the radiator. After being in the bathroom Pat gets herself dressed and ready for the day. She's looking forward to seeing her brother this morning; she's not seen him for a week. She must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks awfully slowly to the kitchen to have her breakfast. Her legs are very heavy today.

13. 1; Female; 60; No pain

It's 7.30a.m. The alarm clock goes off just beside the bed. Sixty-year-old Pat turns over and presses the snooze button for another 10 minutes. She's feeling lazy. The bedroom is dark. Ten minutes later she pushes back the bed covers and without delay sits up on the bed. Pat swings her legs out onto the floor and puts her feet into her slippers. She stands up and goes to the window and opens the curtains to look out at the winter morning. She can see her breath, as the air is cold. She reaches down to turn on the radiator. After being in the bathroom Pat gets herself dressed and ready for the day. She's looking forward to seeing her brother this morning; she's not seen him for a week. She must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks quickly to the kitchen to have her breakfast.

14. 1; Female; 60; Mild pain

It's 7.30a.m. The alarm clock goes off just beside the bed. Sixty-year-old Pat slowly turns over and presses the snooze button for another 10 minutes. She didn't sleep well last night. The bedroom is dark. Ten minutes later she pushes back the bed covers and gradually sits up on the bed. With her hands Pat lifts her legs out onto the floor and puts her feet into her slippers. She stands up and goes to the window and opens the curtains to look out at the winter morning. She can see her breath, as the air is cold. She doesn't feel great. Stiffly, she reaches down to turn on the radiator. After being in the bathroom Pat gets herself dressed and ready for the day. She's looking forward to seeing her brother this morning; she's not seen him for a week. She must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks slowly to the kitchen to have her breakfast. Her legs feel a bit dull today

15. 1; Female; 60; Moderate pain

It's 7.30a.m. The alarm clock goes off just beside the bed. Sixty-year-old Pat very slowly turns over and presses the snooze button for another 10 minutes. She slept badly last night. The bedroom is dark. Ten minutes later she pushes back the bed covers and gingerly sits up on the bed. With her hands Pat gently lifts her legs out onto the floor and puts her feet into her slippers. She stands up and goes to the window and opens the curtains to look out at the winter morning. She can see her breath, as the air is cold. She feels frightful. Very stiffly, she reaches down to turn on the radiator. After being in the bathroom Pat gets herself dressed and ready for the day. She's looking forward to seeing her brother this morning; she's not seen him for a week. She must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks laboriously to the kitchen to have her breakfast. Her legs are hurting today.

16. 1; Female; 60; Severe pain

It's 7.30a.m. The alarm clock goes off just beside the bed. Sixty-year-old Pat extremely slowly turns over and presses the snooze button for another 10 minutes. She slept really badly last night. The bedroom is dark. Ten minutes later she pushes back the bed covers and very carefully sits up on the bed. With her hands Pat cautiously lifts her legs out onto the floor and puts her feet into her slippers. She stands up and goes to the window and opens the curtains to look out at the winter morning. She can see her breath, as the air is cold. She has a suffocating feeling in her body. With immense stiffness, she reaches down to turn on the radiator. After being in the bathroom Pat gets herself dressed and ready for the day. She's looking forward to seeing her brother this morning; she's not seen him for a week. She must remember to give him his birthday card and present when he arrives. They may go for a drive to look at the winter countryside during the afternoon before the light goes. When dressed, Pat walks awfully slowly to the kitchen to have her breakfast. Her legs are very heavy today.

Scenario 2 – Grocery Shopping

Age and gender **20 or 60 years of age; female or male**

Sleep Patterns ***Kinetic Activity and Ability*** ***Physical Ability*** ***Affective/Emotional Pain Indicators***

Sensory/Physical Pain Indicators ***Evaluative Pain Indicators***

Indicators for these various aspects of the pain profile are replicated in each of the no pain, mild, moderate, and severe pain vignettes.

17. 2; Male; 20; No pain

Twenty-year-old Chris is grocery shopping as he's cooking dinner for some of his family tomorrow evening. He only needs a few items such as fresh vegetables, meat, and cat food. He did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today he's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, after getting the groceries he's sorry he didn't get the trolley. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was glad to finally get to the checkout. By the time he'd put everything through the check out, paid and packed all the groceries into the carrier bags he felt relieved.

18. 2; Male; 20; Mild pain

Twenty-year-old Chris is grocery shopping as he's cooking dinner for some of his family tomorrow evening. He only needs a few items such as fresh vegetables, meat, and cat food. He did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today he's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a long time today. After getting the groceries the basket is tugging his arms and he's sorry he didn't get the trolley. Carrying the basket is really annoying his wrists. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. His arms were punishing him. By the time he'd put everything through the check out, paid and packed all the groceries into the carrier bags he felt tired.

19. 2; Male; 20; Moderate pain

Twenty-year-old Chris is grocery shopping as he's cooking dinner for some of his family tomorrow evening. He only needs a few items such as fresh vegetables, meat, and cat food. He did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today he's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a very long time today. After getting the groceries the basket is pulling his arms and he's sorry he didn't get the trolley. Carrying the basket is really making his wrists feel miserable. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. His arms were in agony. By the time he'd put everything through the check out, paid and packed all the groceries into the carrier bags he felt worn out.

20. 2; Male; 20; Severe pain

Twenty-year-old Chris is grocery shopping as he's cooking dinner for some of his family tomorrow evening. He only needs a few items such as fresh vegetables, meat, and cat food. He did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today he's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take forever today. After getting the groceries the basket is wrenching his arms and he's sorry he didn't get the trolley. Carrying the basket is really making his wrists feel unbearable. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. His arms were killing him. By the time he'd put everything through the check out, paid and packed all the groceries into the carrier bags he felt shattered.

21. 2; Male; 60; No pain

Sixty-year-old Chris is grocery shopping as he's cooking dinner for some of his family tomorrow evening. He only needs a few items such as fresh vegetables, meat, and cat food. He did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today he's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, after getting the groceries he's sorry he didn't get the trolley. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was glad to finally get to the checkout. By the time he'd put everything through the check out, paid and packed all the groceries into the carrier bags he felt relieved.

22. 2; Male; 60, Mild pain

Sixty-year-old Chris is grocery shopping as he's cooking dinner for some of his family tomorrow evening. He only needs a few items such as fresh vegetables, meat, and cat food. He did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today he's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a long time today. After getting the groceries the basket is tugging his arms and he's sorry he didn't get the trolley. Carrying the basket is really annoying his wrists. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. His arms were punishing him. By the time he'd put everything through the check out, paid and packed all the groceries into the carrier bags he felt tired.

23. 2; Male; 60 Moderate pain

Sixty-year-old Chris is grocery shopping as he's cooking dinner for some of his family tomorrow evening. He only needs a few items such as fresh vegetables, meat, and cat food. He did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today he's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a very long time today. After getting the groceries the basket is pulling his arms and he's sorry he didn't get the trolley. Carrying the basket is really making his wrists feel miserable. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. His arms were in agony. By the time he'd put everything through the check out, paid and packed all the groceries into the carrier bags he felt worn out.

24. 2; Male; 60 Severe pain

Sixty-year-old Chris is grocery shopping as he's cooking dinner for some of his family tomorrow evening. He only needs a few items such as fresh vegetables, meat, and cat food. He did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today he's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take forever today. After getting the groceries the basket is wrenching his arms and he's sorry he didn't get the trolley. Carrying the basket is really making his wrists feel unbearable. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. His arms were killing him. By the time he'd put everything through the check out, paid and packed all the groceries into the carrier bags he felt shattered.

25. 2; Female; 20; No pain

Twenty-year-old Chris is grocery shopping as she's cooking dinner for some of her family tomorrow evening. She only needs a few items such as fresh vegetables, meat, and cat food. She did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today she's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, after getting the groceries she's sorry she didn't get the trolley. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was glad to finally get to the checkout. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt relieved.

26. 2; Female; 20; Mild pain

Twenty-year-old Chris is grocery shopping as she's cooking dinner for some of her family tomorrow evening. She only needs a few items such as fresh vegetables, meat, and cat food. She did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today she's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a long time today. After getting the groceries the basket is tugging her arms and she's sorry she didn't get the trolley. Carrying the basket is really annoying her wrists. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. Her arms were punishing her. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt tired.

27. 2; Female; 20; Moderate pain

Twenty-year-old Chris is grocery shopping as she's cooking dinner for some of her family tomorrow evening. She only needs a few items such as fresh vegetables, meat, and cat food. She did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today she's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a very long time today. After getting the groceries the basket is pulling her arms and she's sorry she didn't get the trolley. Carrying the basket is really making her wrists feel miserable. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. Her arms were in agony. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt worn out.

28. 2; Female; 20; Severe pain

Twenty-year-old Chris is grocery shopping as she's cooking dinner for some of her family tomorrow evening. She only needs a few items such as fresh vegetables, meat, and cat food. She did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today she's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take forever today. After getting the groceries the basket is wrenching her arms and she's sorry she didn't get the trolley. Carrying the basket is really making her wrists feel unbearable. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. Her arms were killing her. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt shattered.

29. 2; Female; 60; No pain

Sixty-year-old Chris is grocery shopping as she's cooking dinner for some of her family tomorrow evening. She only needs a few items such as fresh vegetables, meat, and cat food. She did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today she's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, after getting the groceries she's sorry she didn't get the trolley. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was glad to finally get to the checkout. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt relieved.

30. 2; Female; 60; Mild pain

Sixty-year-old Chris is grocery shopping as she's cooking dinner for some of her family tomorrow evening. She only needs a few items such as fresh vegetables, meat, and cat food. She did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today she's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a long time today. After getting the groceries the basket is tugging her arms and she's sorry she didn't get the trolley. Carrying the basket is really annoying her wrists. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. Her arms were punishing her. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt tired.

31. 2; Female; 60; Moderate pain

Sixty-year-old Chris is grocery shopping as she's cooking dinner for some of her family tomorrow evening. She only needs a few items such as fresh vegetables, meat, and cat food. She did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today she's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a very long time today. After getting the groceries the basket is pulling her arms and she's sorry she didn't get the trolley. Carrying the basket is really making her wrists feel miserable. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. Her arms were in agony. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt worn out.

32. 2; Female; 60; Severe pain

Sixty-year-old Chris is grocery shopping as she's cooking dinner for some of her family tomorrow evening. She only needs a few items such as fresh vegetables, meat, and cat food. She did a bigger shop earlier in the week but forgot the cat-food. Though the supermarket isn't too busy today she's in a hurry and decides it would be quicker to use a basket instead of a trolley. However, shopping seems to take a very long time today. After getting the groceries the basket is pulling her arms and she's sorry she didn't get the trolley. Carrying the basket is really making her wrists feel miserable. It seemed that all the messages had been on the lowest or highest shelves making everything so much more awkward to reach for. Chris was relieved to finally get to the checkout. Her arms were in agony. By the time she'd put everything through the check out, paid and packed all the groceries into the carrier bags she felt worn out.

APPENDIX G

Vignette Series (1-32) Questionnaire

Your details: please complete where appropriate.

Female	☐		**Male**	☐
Age 18-22	☐	**23-40** ☐	**41+**	☐

Tick if appropriate I am in good health ☐

Please respond to the two statements below ticking the most appropriate box

Chris is experiencing pain

1☐ **2**☐ **3**☐ **4**☐ **5**☐ **6**☐ **7**☐ **8**☐ **9**☐ **10**☐

No Pain — Pain as bad as you can imagine

Chris is not experiencing pain

1☐ **2**☐ **3**☐ **4**☐ **5**☐ **6**☐ **7**☐ **8**☐ **9**☐ **10**☐

No Pain — Pain as bad as you can imagine

Please write your answer to the follow question

In the vignette you have just read what did Chris forget?

OR

In the vignette you have just read what must Pat remember to do?

Thank you for your time in reading this vignette and responding to the subsequent questions.

If you have any questions or queries regarding this research please feel free to contact lorraine.whisker@mic.ul.ie

APPENDIX H

Oral Instruction Sheet

'Painful Decisions: An exploration of pain perception in a Signal Detection Theory framework'

STUDY 1

Undergraduates:

At the beginning of various third level ARTS tutorials (and with prior agreement from University Tutors) the researcher introduced herself and informed undergraduate students that research was being conducted into language use - 'Linguistics: An Investigation into the use of Adjective Patterns' and invited to participate. They were told that participation was optional and they could choose to leave the room and not participate.

Two different procedures then took place

1) A vignette was shown via PowerPoint slide; undergraduates were asked to read and attend to. A questionnaire was then handed out and undergraduates invited to complete them.

OR

2) A hard copy vignette accompanied by a questionnaire was distributed. Undergraduates were asked to read and attend to, and complete this vignette.

STUDY 2

Student Nurses:

During a recreation period in a University canteen student nurses were invited to participate in research was being conducted into language use - 'Linguistics: An Investigation into the use of Adjective Patterns'. The researcher introduced herself and informed the nurses' participation was optional and they could choose to participate or not.

A hard copy vignette accompanied by a questionnaire was distributed to the nurses which they were asked read, attend to, and complete.

STUDY 1 & 2

All participants were asked to respond to a series of especially designed vignettes that depicted a character that was 20 or 60 years old, male or female and engaged in the activity of grocery shopping or getting up in the morning. The vignettes either included pain descriptors that portrayed different pain levels; mild, moderate and severe or did not include any pain descriptors.

On completion the questionnaires and vignettes were collected and all undergraduates and student nurses were thanked for their time and debriefed.

APPENDIX I

SPSS Coding Sheet

Codebook for PainData07.Sav

Full variable name	SPSS variable name	Coding Instructions
Identification Number	***idNo***	***No. assigned to each case***
Gender	Gender	1 = Females 2 = Males
Participant's Age	Age	1 = 18-22 years 2 = 23-40 years 3 = 41+
Participant's health Status	GoodHealth	1 = Good Health 2 = No Response
Vignette Details e.g. sex/age of character	VigDetails	1 = Male; 20 years; vig.1 2 = Male; 60 years; vig 1 3 = Female; 20 years; vig.1 4 = Female; 60 years; vig.1 5 = Male; 20 years; vig.2 6 = Male; 60 years; vig.2 7 = Female; 20 years; vig.2 8 = Female; 60 years; vig.2
Vignette Gender	VigGender	1 = Females 2 = Males
Vignette Age	VigAge	1 = 20 yrs 2 = 60 yrs
Age/Gender Combined	VigComb	11=Young females 12=Young males 21= Old females 22= Old males

Level of pain	PainLevel	1 = No pain 2 = Mild pain 3 = Moderate pain 4 = Severe pain
Gender/Pain Level Combined	Gen_PainLevel	11 =Female/No pain 12 =Female/Mild pain 13 =Female/Moderate pain 14 =Female/Severe pain 21 =Male/No Pain 22 =Male/Mild Pain 23 =Male/Moderate Pain 24 =Male/Severe Pain
Statement: Pat/Chris is experiencing pain	q1_ScoreVig	Enter number circled from 1 (no pain) to 10 (pain as bad as you can imagine).
Statement: Pat/Chris is experiencing pain	q2_ScoreVig	Enter number circled from not 1 (no pain) to 10 (pain as bad as you can imagine).
Question to ensure vignette was read and understood	VigAnswer	1 = Correct answer 2 = Incorrect answer 3 = No response