# THE EFFECTS OF DISTRACTION, RELAXATION, AND GUIDED IMAGERY ON PROCEDURAL FEAR AND PAIN IN CHILDREN.

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**SUMMARY**

The fear and pain of medical procedures are a source of great distress to children. Techniques such as distraction, relaxation and guided imagery help children to cope, and in some cases, have a marked influence on the experience of fear and pain during painful medical procedures. However, the effects, embedded in the relationships between consciousness, imagery, fear and pain, are unclear, particularly with regard to the clinical (as opposed to the laboratory) reality of procedural pain. The aim of this thesis was to empirically account for the therapeutic effects of distraction, relaxation, and imagery on procedural fear and pain in children and to offer a model based on a constructive view of experience allied to recent advances in neurophysiology that could account for the effects. Two studies were undertaken to address this aim. The first study investigated the effects of cartoon distraction on fear and pain in children undergoing venepuncture. The second study investigated the independent and combined effects of relaxation and imagery on fear and pain in children also undergoing venepuncture. The studies indicated that relaxation, distraction and imagery reduced procedural fear. Procedural pain was not affected by relaxation but distraction showed positive effects as did imagery, particularly if procedural pain was defined in terms of its sensory and emotional components. These effects are explained using a model based on a top-down constructivist view of the psychology and neurophysiology of fear, pain, imagery and consciousness. The neurophysiological components of the model comprised the amygdala, anterior cingulate cortex and association areas within a working memory view of consciousness. The constructivist perspective held that during relaxation the child's cognitive, emotional and sensorial quality were largely based on the 'reality' of the procedure room, but that during imagery and perhaps distraction, the qualia were located elsewhere. The thesis concludes with the relevance of the model for clinical practice and implications for further psychological and neurophysiological research.

## STATEMENT OF AUTHORSHIP

Except where explicit reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma. No other person's work has been relied upon or used without due acknowledgement in the main text and reference list of the thesis.

Candidate's signature: ........................................ Date: 11 Sept 2002

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# CHAPTER 1

## PURPOSE AND ORGANIZATION

This thesis is about the psychology of fear and pain in children who are subjected to painful medical procedures. It is also an investigation of the therapeutic effects of distraction, relaxation and mental imagery in the form of guided imagery on procedural fear and pain in children. This, the first of 12 chapters, introduces the topic, the theoretical framework, the research approach and outlines the structure of the thesis.

### *Significance and Background to the Present Study*

The spectrum of medical treatment of children from a perceived 'simple immunization' injection to the complexities of chemotherapy frequently involves pain and fear. Best intentions and an improved outcome are no longer sufficient justification for ignoring the fear and pain of medical treatment in children. The term *ignore* implies denial or an intentional lack of concern and describes the attitude of a minority of health professionals towards the pain and fear that they inflict on children. A more apt term, stemming from the inadequate education and entrenched practice that reflects the majority, is perhaps ignorance. Many health professionals simply do not know, beyond pharmacological interventions, how to manage fear and pain in children. The problem of procedural pain and fear, therefore, traverses education and practice and has an added complexity because the recipient of treatment has very little say or choice in the matter. An adult may exercise his or her choice and refuse treatment but children have no choice. The onus is on the health professional to develop ways of delivering treatment that reduces harm to the child. Within the context of this argument, *harm* includes psychological and physical damage. Best practice demands treatment that carries the least risk, is effective and ethically sound. The challenge and, indeed, responsibility for researchers and clinicians treating children is to meet a duty of care that includes minimal impact on the child. In many respects, this represents a change in practice. Any change in practice should be justified and grounded in research. The following scenario illustrates the fear and pain of a medical procedure from the viewpoint of a child; it is commonplace and reflects the need for change. The purpose of this thesis is to investigate the psychology of procedural fear and pain and related strategies as vehicles for change.

> Imagine for a moment that you are six years old. You are sitting in a waiting room with Mum somewhere in a hospital. The reason you are there is that your doctor has said that you have to have an operation. You are waiting to have a blood test. Suddenly the nurse calls your name and Mum says, “Come on we are next." You stand up and walk to the window and say, “Mummy I don’t want to have a needle, I’m scared.” The nurse seems friendly she says, “Come on, you’re brave aren’t you?” As you walk through the door, you feel a shiver across your shoulders, you try to swallow but your mouth is dry. You can hear a baby screaming behind a closed door and your hand feels sweaty in Mum’s. The nurse says, “OK, you sit here on Mum’s knee and let’s pull up that sleeve.” The nurse puts a tight stretchy thing high up on your arm and then tells Mum to hold your arm out straight. She says to you, “Now you have to hold very still; you will just feel a little pinch.” Mum is holding you tight; you cannot move; tears well in your eyes as a huge wave of fear comes up from deep inside. The nurse wipes your arm with something that smells like the hospital. It is right there in front of you now: the needle. “Oh No! Mum I don’t want the needle, Please don’t,” you plead. However, Mum does not say anything; she is holding you tight. The nurse says, “Just a little prick... One, Two, Three." You scream out OWWW as you feel the needle pierce your skin. You look down and say to yourself, “Oh No, she stuck it in me, I’m bleeding.” The nurse is putting the blood in a plastic thing; she then pulls the needle out and there is more hurt. Then she puts a Bandaid® on your arm and says, “There you are; all finished, that wasn’t so bad was it." You turn around to cuddle Mum, and see the tears in her eyes. As you walk out the door the nurse says, “2 pm tomorrow OK then?” You ask, “What does she mean tomorrow?” Mum replies “We have to come back for another test tomorrow."

The foregoing story is intended to illustrate the complexity of thoughts and emotions that a young child (and parent) may experience even when undergoing what many health professionals would see as a routine or minor procedure. Anticipation, concern, pain, helplessness, fear and anxiety are represented, while for another child, the predominant emotion could be anger.

There is more to understanding and managing procedural pain than simply focussing on the physical sensation. Pain is, in fact, defined in lay and specialist settings in terms that extend beyond the physical sensation. The *Shorter Oxford English Dictionary* (Little, Fowler, Coulson, Onions, & Friedrichsen, 1991) for example defines pain as "The opposite of *pleasure*; the sensation which one feels when hurt (in body or mind); suffering, distress" (p. 1494, italics original). The International Association for the Study of Pain (IASP, 1979, pp. 249-252) defines pain as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage".

The pain felt by children undergoing medical procedures is consistent with both of these definitions. Children certainly suffer and become distressed and their pain has sensory and emotional components. However, the pain of a medical procedure is not the same as post-operative pain or the pain of a sporting injury because, generally, the child is subjected to procedural pain, in the here and now, at the hands of another, indeed, an adult who is socially and legally sanctioned to inflict pain on a child. In many settings, the focus of the health professionals who inflict the pain is only on the sensory component because the child's pain is considered the same as any other pain. Even if the sensory component is managed well, then, at best the health professionals have managed only part of the problem. Accompanying the physical sensations are the social, cognitive and attendant emotional complexities that make up the experience of procedural pain. These not only serve to amplify the sensation, in some cases they may represent the bulk of the child's pain experience. The following exemplar, an actual case (Whitaker, 1994), illustrates this point.

> A ten-year-old boy had presented to the emergency department with a large laceration to the inner aspect of his thigh. He had sustained this injury by sliding down a pole that had a nail or something sharp protruding from it. The laceration was surgical; it was clean and deep enough to expose the underlying fatty tissue. The wound was covered with gauze soaked in adrenaline and cocaine to anaesthetize the area. He was fairly settled as he waited to go to the procedure room to have his leg sutured. At the time, I was in the emergency department using relaxation therapy with guided imagery with children undergoing medical procedures for my masters research. I accompanied the child to the procedure room after an explanation of my intentions and consent from

the parents. I started the process with progressive relaxation, and then we talked about his chosen imagery. He was very apprehensive but started to describe his imagery. At this point, the attending doctor started to inject the lignocaine (local anaesthetic) into the wound. The boy lost his focus on the imagery, opened his eyes and started to scream. He continued screaming as a total of 20ml of lignocaine was infiltrated into the tissues in and around the wound. After a couple of minutes, the doctor began suturing. The boy became very distressed, screamed, and literally cried until the last suture was tied. It is extremely unlikely that he felt much in the way of sensory pain with the adrenaline and cocaine and lignocaine. What he was experiencing though was an enormous amount of fear. The local anaesthetic did nothing for his fear and because he lost his focus on his imagery, neither did the imagery.

Such an extremely negative reaction to pain is not inevitable. The following examples (Whitaker, 1994) suggest that imagery may radically alter a child's experience of pain in a range of procedures.

A boy with a large pre-tibial laceration that required six deep and 13 superficial sutures entered into his imagery and happily chatted away describing playing at school and at home for 45 minutes while the wound was injected with local anaesthetic and sutured. He showed no signs of pain, distress or even concern and actually laughed and smiled at times. Another child imagined that she was in a swimming pool during a local anaesthetic, manipulation and plaster (LAMP) to repair a fractured right radius and ulnar. Throughout the procedure, she described swimming, floating and playing in the water. At no stage did she report any subjective experience or show any objective sign of pain or distress. After the procedure, she was asked, "What did you feel during the procedure?" She replied, "I could feel the water lifting me and drifting me". Obviously there was no water present. The child had an intravenous cannula inserted in the back of each hand and the fractures reduced using a *Bier's* block. Another child presented to the Emergency Department with part of a sewing machine needle broken off and embedded through the nail and flesh of the end of her index finger. The inflamed and painful tip of her finger was injected with local anaesthetic while she was in imagery. No suggestions, direct or indirect, for analgesia, anaesthesia, or even altered sensation were given. She lay on the operating table with her arm stretched out on an arm board and quietly described a ride on a chair-lift at a snow field. She did not flinch or move in any way and no change was heard in her voice as the hypodermic needle was inserted into the tip of her inflamed finger and the local anaesthetic injected.

The fear and pain of medical procedures from capillary pricks to lumbar punctures are a source of great distress to children. The illustrations clearly indicate that children, nonetheless, can cope with such painful procedures in a remarkably controlled manner. Such altered experiences of pain are not confined to the clinical setting. In many cultures, religious initiation ceremonies involve extensive tissue damage but the subjects seem oblivious to pain sensations (Anderson & Anderson, 1994). Some individuals earn their living by subjecting themselves to levels of tissue injury that most would find excruciating but they too, neither report, nor appear to feel pain (Greenfield, 2000). Clearly, there exists a range of situations in which observers gain the strong impression that the individual does not "feel" pain. The focus of this thesis is to examine in detail the precise effects that the processes of distraction, relaxation and imagery can have on children undergoing painful medical procedures**.** In this examination an attempt will be made to determine the relationship between the mechanisms of distraction and imagery on the various sensory, cognitive and emotional components that make up a child's reaction to a painful procedure.

Essentially, the research questions focus on how mental imagery alters the experience of fear and pain in children undergoing a painful medical procedure, how the effects compare to a distraction technique, such as watching a cartoon video, and, where relaxation fits in relation to imagery and distraction. The aim of this thesis is to compare, contrast, and empirically account for the therapeutic effects of distraction, relaxation, and imagery on fear and pain in children undergoing painful medical procedures. At the same time, this thesis will offer a model based on a constructive view of experience allied to recent advances in neurophysiology that can account for the empirical findings in the two studies in this thesis as well as results from other studies.

### *Theoretical Framework and Direction*

An understanding of how imagery alters the experience of pain and fear in children requires a level of theoretical analysis that encompasses the neurophysiology and psychology of pain and emotion (specifically fear), and cognition. Inevitably, it will touch on consciousness and reality. These are profoundly complex phenomena. By way of introduction, this section offers a general overview of the ideas to be developed in this thesis. A number of complex key concepts are addressed prior to describing and reporting the findings of the two studies undertaken in this thesis. The key concepts, nociception, the psychology and neurophysiology of emotion, mental imagery, consciousness and 'reality' are mapped out in the following section to provide an overview of the theoretical framework.

The thesis begins with a synopsis of current knowledge on the transmission and modulation of nociceptive input. Despite the relatively advanced knowledge of spinal mechanisms of the transmission and modulation of nociceptive impulses, and identification of active brain areas in the experience of pain (Coghill, Sang, Maisog, & Iadarola, 1999; Derbyshire & Jones, 1998; Hofbauer, Rainville, Duncan, & Bushnell, 2001; Hsieh et al., 1995; Treede, Kenshalo, Gracely & Jones, 1999; Willis & Westlund, 1997) very little is known about how pain is perceived. Indeed, what 'perceived' actually means remains an open issue. The debate is exemplified by the considerable diversity of views on the neural correlates of consciousness (Baars, 1996, 1997, 1999; Crick & Koch, 2000; Flohr, 2000; Hardcastle, 2000; Posner & Rothbart, 1998; Roth, 2000).

The psychology of emotion is beset by a plethora of theories (Strongman, 1987, 1996). The emotion of primary concern in this thesis is fear because overwhelmingly, fear is the emotion that children experience when they are subjected to painful medical procedures. The reviewed theories were selected because of their contextual relevance to procedural fear in children. More is known of the brain neurophysiological correlates of fear than any other emotion. This knowledge has developed out of animal studies (Blanchard & Blanchard, 1972; Phillips & LeDoux, 1992; Rasia-Filho, Londero, & Achaval, 2000**;** Weiskrantz, 1956) and brain lesions in humans (Adolphs, Russell, & Tranel, 1999; Adolphs, Tranel, Damasio, & Damasio, 1994, 1995;

Anderson & Phelps, 2001). With the advent of neuroimaging techniques, the neurophysiology of fear has focussed on the amygdala, a subcortical, bilateral group of nuclei in the limbic forebrain, and its connectivity with other brain regions (Davidson & Irwin, 1999; Furmark, Fischer, Wik, Larsson, & Fredrikson, 1997; Lane, Reiman, Bradley, Lang, Ahern, Davidson, & Schwartz, 1997; Lane, Reiman, Axelrod, Yun, Holmes, & Schwartz, 1998; Lane & Nadel, 2000; LeDoux, 1987; Paradiso, Johnson, Anderson, & O'Leary, 1999; Reiman, 1997; Schneider, Grodd, Weiss, Klose, Mayer, Nagele, & Gur 1997). These findings have been incorporated in the model of fear used in this thesis.

Novel neuroimaging techniques have also facilitated investigation into the brain regions that are active during mental imagery (D'Esposito, Detre, Aguirre, Stallcup, Alsop, Tippet, & Farah, 1997; Kosslyn, 1999; Kreiman, Koch, & Fried, 2000; Mellet, Petit, Mazoyer, Denis & Tzourio, 1998; Mellet, Tzourio, Crivello, Joliot, & Denis, 1996). Most of the research is on visual imagery and, despite some conflicting results, the most likely site of visual mental imagery is the visual association areas of the temporal lobe. Mental imagery is, of course, common to recognised techniques used in the psychological reduction of pain such as hypnosis and guided imagery. The use of hypnosis in managing pain and in particular procedural pain in children has been well researched over a number of years (Ellis & Spanos, 1994; Genuis, 1995; Katz, Kellerman, & Ellenberg, 1987; Kohen & Olness, 1993; Kuttner, 1988, 1989, 1997, Kuttner, Bowman, & Teasdale, 1988, LeBaron & Zeltzer, 2001; LeBaron, Zeltzer, & Fanurik, 1988; Milling, & Costantino, 2000; Montgomery, DuHamel, & Reid, 2000; Smith, Barabasz, & Barabasz, 1996; Wall & Womack, 1989; Zeltzer & LeBaron, 1982, 1983). Further detailed research has taken place into the subtleties of direct versus indirect suggestion in hypnosis (Fricton & Roth, 1985; Hawkins, Liossi, Ewart, Hatira, & Kosmidis, 1998; Lynn, Neufield, & Matyi, 1987; Lynn, Weeks, Matyi, & Neufeld, 1988; Matthews, 2000; Matthews, Bennett, Bean, & Gallagher, 1985; Matthews, Conti, & Starr, 1999;). Given this large body of research, and the focus on the baseline effects of imaging, without suggestions for altered sensation, the decision was made to concentrate on imagery in the form of guided imagery rather than hypnosis or a combination of the two interventions, which would increase the risk of inadvertent crossover in technique. The subtle but significant differences between guided imagery and hypnosis are discussed in Chapter 6. Although the empirical findings are of primary relevance to imagery, it is anticipated, that they will contribute to the existing body of work on hypnosis, particularly the imaging component.

The notion of 'imaging' is inextricably linked with consciousness. The search for the neural correlates of consciousness is an area of brain research that has only been seriously considered since the 1990s and is very much the subject of ongoing debate (Metzinger, 2000). The task of defining consciousness is, to a large degree, subject to practical realities and needs which are discipline based. Pain and consciousness are obviously related and are commonly considered in the field of surgical anaesthesia. Indeed, neuroscientist Christof Koch developed an interest in consciousness while suffering the pain of a throbbing toothache. Koch then teamed up with Francis Crick to become major contributors in the field of consciousness research (Wakefield, 2001). While it seems implausible that in some situations extensive nociceptive input is not perceived as pain, clinically, as in the vignettes described above, it happens. The neural activity of nociception and the consciousness of pain are related but the relationship is not necessarily direct, concrete or inductive. The view adopted from the neuroscience literature reviewed in this thesis is that consciousness is a phenomenon that emerges from activity in working memory (Baars, 1996; Baddeley, 1993; LeDoux, 1998; Phaf & Wolters, 1997; Schachter, 1991) and that the brain is not a slave to the senses (Greenfield, 2000). This is not to say that the working memory structures are the neural correlates of consciousness. Exactly how the brain constructs our sensory experiences and how it produces consciousness has been dubbed *the hard problem* by Chalmers (cited in Crick & Koch, 2000). Pain, as a sensory and emotional experience represented in consciousness, is part of the hard problem. In exploring the relationships between pain, fear, distraction, imagery, consciousness and reality in children undergoing medical procedures, this thesis is inextricably located within a focussed area in the hard problem.

The final component in the theoretical framework deals with reality. Discourse on reality is fundamentally philosophical. In psychology, one theory that fits within the constructivist approach and accommodates the notion of a reality shift as seen and described in imagery is George Kelly's *Psychology of Personal Constructs* (1955). Kelly's Personal Construct Theory is a theory of personality. For Kelly, reality is not concrete and static, rather each of us actively construct our own version of reality.

Kelly’s use of the term ‘reality’ is intrinsically personal, encompassing beliefs, attitudes, relationships and so on but it is also universal. Kelly holds that the universe is real and happening all the time but it is open to individual interpretation. In developing a theory of personality, Kelly paid little attention to the notion of self in an individually constructed sensory reality but this notion fits with contemporary neurophysiology and Kelly’s fundamental postulate “A person’s processes are psychologically channelized by the ways in which he (sic) anticipates events” (Kelly, 1955, p. 46). Kelly clearly stated that ‘psychologically’ did not exclude ‘physiologically’, his emphasis was simply on the psychological. The application of Kelly’s constructivist view in this thesis holds to the psychological but also embraces, and applies, the underemphasized physiological attributes of his theory. This move is corroborated in the neuroscience literature by the prevalent view that the brain constructs our sensory impression of the world in which we live (Greenfield, 2000; Kosslyn, 2001; Stuss, Picton, & Alexander, 2001). This constitutes a fundamental shift from the traditional ‘predictable’ bottom-up, sensory – appraisal – response view, to an often, ‘surprising’ top-down dynamically construed and reconstrued sense of self in the world. It will be argued that without such a shift, attempts to understand what is referred to as ‘cognitive modulation’ of pain (Petrovic & Ingvar, 2002; Petrovic, Peterson, Ghatan, Stone-Elander, & Ingvar, 2000; Villemure & Bushnell, 2002), be they ‘descending pathways to the dorsal horn’ or ‘shifts in attention’ will continue to be constrained by the limitations of the traditional bottom-up view of pain.

A notable exclusion from the theoretical framework in this thesis is Piagetian developmental theory. The reason for the exclusion is twofold. Firstly, Piaget’s emphasis on development from the individual, to the social, fits poorly with the observation that children as young a five or six can construct and communicate their imagined world, and, as they develop, it seems that it is the ‘personality’ of their imagery that develops, rather than necessarily the degree of abstraction or social interaction. In contrast to Piaget, it was Vygotsky (1962) who stressed that children develop from, and within a social setting, to the individual. Secondly, in this thesis, the Psychology of Personal Constructs (Kelly, 1955) is adopted in favour of the developmental approach. The Personal Construct view of children is fundamentally at odds with developmental approaches (Rychlak, 1990; Vaughn & Pfenninger, 1994). The dissonance between the two approaches is outlined in Chapter 4, which focuses on the philosophical and psychological aspects of Personal Construct Theory. The two approaches are further contrasted with regard to procedural pain and fear in children in Chapter 5.

## *Research Approach*

Two studies were designed to investigate procedural fear and pain in children. The first study tested the effect of viewing a cartoon as a form of distraction on fear and pain in children undergoing venepuncture without topical anaesthesia as the painful medical procedure. The second study investigated the effects of relaxation and imagery, independently, and as a combined intervention, on fear and pain in children undergoing the same medical procedure. Chapters 2 to 7 review and criticize the literature relating to the key concepts in the theoretical framework. In so doing, these chapters draw upon the neurophysiology and psychology of pain and emotion, constructivism with a specific focus on Personal Construct Psychology (PCP), together with an overview of imagery and procedural pain in children. To begin, Chapter 2, Neurophysiology of Pain: Sensation and Emotion, describes the neurophysiological basis of pain and emotion and identifies the limitations of current knowledge of pain pathways and processing. Chapter 3, The Psychology of Emotion, describes early and contemporary theories of emotion and relates these to the fear experienced by children undergoing painful procedures. Chapter 4, Constructivism, describes the theoretical basis of constructivism through a review and critique of one of its main exponents, George Kelly, and his Personal Construct Psychology (PCP) Theory. Chapter 5 explores the problem of Procedural Pain in Children in a manner that shifts the focus of the problem from the child, to the health professional. This is an atypical approach to the problem of procedural pain with allied implications for research and clinical practice. The concepts of consciousness, imagery and hypnosis are reviewed in Chapter 6. Frequently, Guided Imagery is poorly defined or spuriously labelled as hypnosis. An attempt is made in this chapter is to define and differentiate between guided imagery and hypnosis. The chapter concludes with a definition of guided imagery that is embedded in Personal Construct Psychology. The focus of Chapter 7 is on imagery and distraction in the management of procedural pain in children. The term imagery is applied to a number of interventions including pre-recorded audiotapes, emotive imagery and healing imagery. These approaches are described and differentiated from the guided imagery technique that was employed in this study. Previous studies investigating the effects of distraction on procedural pain, fear and distress in children are also reviewed in this chapter. The chapter concludes with a constructivist view of distraction, imagery and consciousness. Chapter 8 describes the first of two studies undertaken in this thesis. The first study was designed to investigate the effects of distraction, in the form of watching a cartoon video, on fear and pain in children undergoing venepuncture as a painful medical procedure. The results are also presented in this chapter. Chapter 9 outlines the method undertaken in the second, the larger of the two studies in the thesis. The second study investigated the effects of relaxation and guided imagery as combined and independent interventions on fear, pain and a number of related variables in children undergoing venepuncture as the painful medical procedure. The results of the imagery and relaxation study are presented in Chapter 10. Chapter 11, Discussion, is a synthesis of the key concepts laid down in Chapters 2-7 with the empirical findings of the two studies and culminates in a model of the proposed effects of imagery, distraction and relaxation on procedural fear and pain in children. Finally, Chapter 12 concludes the thesis by addressing the aim, which was to propose how imagery alters the experience of fear and pain in children undergoing medical procedures and to differentiate between the effects of imagery, relaxation and distraction. A number of suggestions for further research aimed at a further investigation of the model, the validity of a new measure of involvement in imagery developed in this research, and importantly, the relationship between the child and the health professional in the procedural context are also provided. Statements of ethical approval from the relevant Institutional Ethics Committees are attached as Appendix A. The remaining appendices contain material related to the analyses and are appropriately identified throughout the thesis.

CHAPTER 2

# NEUROPHYSIOLOGY OF PAIN AND FEAR

The previous chapter outlined the structure of the thesis; this chapter will focus on the neurophysiology of pain and emotion, specifically, fear. The purpose of this chapter is to describe the neurophysiological aspects of pain transmission and modulation drawing upon the neurophysiology of sensation and emotion. To achieve this aim the chapter has three sections. The first section will briefly outline the philosophy of pain within the Aristotelian and Cartesian paradigms. Current pain mechanisms will follow, first with a description of the afferent pathways from nociceptor activation to the spinal cord and up to the brain, then the modulation of pain signals by way of the descending inhibitory pathways from brain to dorsal horn of the spinal cord. The second section will focus on the emotion pathways in the limbic forebrain. The final section will describe the body-mind relationship through the effects that the neuropeptides released in emotion have on the body as a whole. This chapter on neurophysiology, the next on the psychology of emotion, and the following on constructivism will together provide a broad base for understanding the nature of pain as construed within the context of this study.

## *Philosophical Perspectives on Pain*

Life and pain go hand in hand: to be alive is to feel pain at some time. The word pain comes from the Latin *poena*, which means penalty or punishment. Stimmel (1997) states, "The most ancient interpretation ascribes pain as a punishment for offending the gods" (p. 3). Nowadays many would scoff at the notion of being punished by the gods but the notion that pain is a punishment may not be far fetched, particularly in those with extreme religious convictions or, indeed, in young children.

Aristotle (384-322 B.C) believed that pain was a feeling in the heart and that it got there by way of the bloodstream. He described pain as a "passion of the soul" which essentially means a feeling of life, part of being alive. An interpretation of the Aristotelian concept of 'soul' is given by Calhoun and Solomon (1984):

> In *de Anima*, Aristotle characterizes the human "soul" or "psyche", which is best translated as "life principle." (Thus, plants have souls too insofar as they grow and reproduce, and animals have souls insofar as they can feel, move, and desire). (p. 42, italics and parentheses are original)

The Aristotelian view of pain prevailed until Descartes (1596-1650) postulated a shift from the Aristotelian notion of the heart, to the brain, as the centre for pain. Descartes postulated that pain travelled in small threads connecting the skin to the brain with branches to the pineal gland (Stimmel, 1997). The Cartesian paradigm of mind and body as separate entities is essentially as pervasive in modern medicine as Aristotle's philosophy was leading up to the 17th century. Pain theory certainly developed as knowledge of anatomy and physiology developed through the 19th and 20th centuries but the limited dualistic notion of mind and body as separate entities is one of the main factors that some suggest have retarded the development of medical science (Capra, 1983) including pain theory and management strategies (Main & Spanswick, 2000).

An overview of the current scientific view of pain will now be given under Peripheral Mechanisms – from the tissues to the spinal cord, and Central Mechanisms – the spinal cord and brain. This is the classic bottom-up sensory view of pain. It is outlined here because, later, the bottom-up, sensory – appraisal view will be contrasted with the top-down constructivist view associated with contemporary neurophysiology.

### *Current Pain Mechanisms*

## *Algesic Chemicals: Pain and Inflammation*

When tissue is damaged, a number of chemicals are released into the extracellular fluid that bathes the bare nerve endings of pain fibres. These terminal nerve endings are the nociceptors, the pain receptors; they constitute the beginning of the bottom-up view of pain. The chemicals in the tissues include hydrogen ions ($H^+$) (acidity), potassium ions ($K^+$), serotonin and prostaglandins. Substance P (SP) is a pain neurotransmitter in the nerve terminals while the remaining chemicals are in the various components of blood (Prithvi Raj, 1996). Histamine is in platelets, basophils and mast cells. Bradykinin a powerful algesic, is in plasma; serotonin (the painful component in stinging nettles) is also in mast cells and platelets. Many of these chemicals are involved in the inflammatory response and contribute to the cardinal signs of inflammation: pain, redness and swelling.

## *Peripheral Mechanisms: Nociceptors and Afferent Nerves*

The term nociceptor describes a number of specialised receptors for pain, chemonociceptors respond to chemicals, mechanical nociceptors respond to strong mechanical stimulation and thermal nociceptors respond to extremes in temperature (hot and cold). Nociceptors form the endings of the afferent nerves that transmit pain signals to the spinal cord. The afferent nerve fibres for pain are the A-delta and C-fibres. Their cell bodies are located in the dorsal root ganglion close to the vertebral column. These fibres differ in structure and function. The A-delta fibres are thinly myelinated and therefore transmit impulses at a relatively fast rate (15m/sec). The C-fibres are unmyelinated so conduction velocity is slow (1m/sec). The skin is supplied by A-delta mechanoreceptors, A-delta mechanothermal nociceptors, C polymodal nociceptors activated by mechanical, thermal and chemical stimuli, and by a miscellaneous group of C mechanical nociceptors and cold nociceptors (Prithvi Raj, 1996, Stimmel, 1997).

With repeated stimulation, most sensory receptors become fatigued and less responsive. The nociceptors are a paradox; the opposite occurs, their threshold potential is lowered making them easier to activate, a phenomenon called *sensitisation* (Prithvi Raj, 1996). Given that pain is a warning of actual or potential tissue damage, it makes biological sense that repeated stimulation results in an enhancement rather than inhibition of signals to the spinal cord. Once stimulated by chemicals, extreme temperature change or mechanically, the nociceptors transform the stimuli in a yet unknown way into nociceptive impulses that travel along the afferent A-delta or C-fibres to the spinal cord.

### *Central Excitatory Mechanisms: Spinal Cord to Brain*

The incoming A-delta and C-fibres terminate in the dorsal horn of the spinal cord, the substantia gelatinosa. This area is highly specialized in terms of its structure and function. It is divided into ten layers or laminae, referred to as the Rexed laminae. Of the ten laminae, six are believed to receive nociceptive signals. The dorsal root contains large and small fibres, which arrange just before entering the spinal cord (Stimmel, 1997). The medial aspect contains the large myelinated fibres (proprioceptive, touch, pressure) and reflex activity fibres. The lateral aspect contains the thinly myelinated A-delta and the unmyelinated C-fibres. The A-delta fibres terminate in lamina I, the outer aspect of lamina II, and laminae V and X. The C-fibres terminate in laminae I, II (outer) and V. The highest concentration of nociceptive fibres is in lamina I.

The substantia gelatinosa contains various cell types. The two that are considered important for nociception are the stalked cells and the islet cells (Prithvi Raj, 1996). It is thought that the majority of stalked cells are excitatory and the islet cells are inhibitory. The fact that nociceptive impulses can be enhanced or inhibited adds the dimension of pain modulation to this area. The proposed mechanism underlying the modulation of nociceptive input will be outlined after describing the ascending system.

#### *Ascending Nociceptive Pathways*

In humans the transmission of nociceptive impulses from their point of entry into the spinal cord to the brain is facilitated by a number of ascending nerve tracts (Martini, 1998). This makes biological sense because if one tract is damaged, the brain is not deprived of nociceptive input signalling the presence of tissue damage. Furthermore, the tracts end in different parts of the brain allowing for more complex processing. The primary pathways are the spinothalamic tract, the spinoreticular tract and the spinomesencephalic tract. The lateral part of the spinothalamic tract is referred to as the neospinothalamic tract (Prithvi Raj, 1996). The cell bodies of these axons are in laminae I and V. These axons project to the ventroposterolateral thalamic nucleus where they synapse with third order neurons that project to the somatosensory cortex. The medial part of the spinothalamic tract is referred to as the paleospinothalamic tract (Prithvi Raj, 1996). These axons, together with the ones in the spinoreticular tract and the spinomesencephalic tract, project to the following sub-cortical structures: the reticular formation, periaqueductal gray area, hypothalamus and medial and intralaminar thalamic nuclei. They then synapse with other neurons and project to the limbic forebrain and outer parts of the brain.

### *Central Inhibitory Effects within the Brain and Spinal Cord*

Afferent nociceptive signals can be modulated in the dorsal horn. Take for example a girl who accidentally jams her finger in the car door. A number of automatic behavioural responses occur. Initially, she will reflexively pull her hand away removing it from the noxious stimulus. Then she will probably stimulate the area in one of a number of ways: shaking the hand; rubbing fingers with the other hand; putting it in her mouth and so on. At the same time, she will verbalize her pain and look to quickly assess the damage. In terms of nociception and neurophysiology, it is the shaking and rubbing that is interesting. There is a definite neurophysiological basis for this behaviour in that the tactile stimulation activates the endogenous pain control system. This is essentially, what Melzack and Wall postulated in 1965 as the *Gate Control Theory of Pain* (Melzack & Wall, 1965).

Since the 1960s much has been discovered regarding pain and pain modulation not the least of which are the opioid receptors and associated neuropeptides. An opioid is any substance that acts like morphine and the endogenous opioids are neuropeptides, so named because they were first discovered in neural tissue and ‘peptides’ because they are comprised of amino acids strung together. The endogenous opioids belong to three families: the *enkephalins*, *dynorphins* and beta-*endorphins*. Each of these families has members that are structurally and functionally related. They are found in varying concentrations in many parts of the central nervous system including the dorsal horn laminae I and V, the periaqueductal gray, the reticular system, the hypothalamus and the limbic system (Prithvi Raj, 1996). The opioids exert a number of physiological effects by interacting with opioid receptors. Of the various effects of opioids, the most important regarding the transmission of pain signals is analgesia.

The first opiate receptor was discovered in 1972 (Pert & Snyder, 1973). The discovery led to a deeper understanding of pain transmission and modulation as well as receptor physiology and sparked research into opioid receptors. The three main receptors in terms of analgesic effects are classified as mu, delta and kappa (Dickenson, 1994). Although Pert (1990) holds that opioid receptors have both wave-like and particulate character, she holds that the molecular substance of all opioid receptors is the same, not only within an individual but also across species.

> The actual molecule of the rat brain opiate receptor is identical to the human brain opiate receptor and is also identical to the opiate receptor components in that simplest of animals, the tetrahymena" (p. 156).

The analgesic effects of opioids are largely due to the effects of the opioid on the transmission of pain signals through the dorsal horn of the spinal cord, and activation of the descending inhibitory system described below. The transmission of nociceptive signals is dependent upon the release of the neurotransmitter, substance P (SP). Opiate receptors are located on the incoming A-delta and C-fibres (Alvares & Fitzgerald, 1999; Dickenson, 1994). In addition, in the dorsal horn are enkephalin releasing interneurons. Some synapses are excitatory some are inhibitory. The simplest and predominant action of the opioids is a presynaptic inhibition of the release of substance P (SP); this action is mediated mainly by the mu and delta receptors (Dickenson, 1994). A simple analogy here is that SP is rather like water flowing from a tap (nerve ending). While the water (SP) flows, nociceptive signals are transmitted up to the brain. Located on the presynaptic side (on the pipe) are opioid receptors (mu and delta). When the opioid receptors are stimulated, they turn the tap down to a trickle thus reducing the flow of water (release of SP) and analgesia results.

Essentially, there are two ways to activate the enkephalin releasing interneuron in the dorsal horn (Cailliet, 1993). One way is by stimulating the A-beta fast touch afferents. This is achieved by cutaneous stimulation and is the neurophysiological basis for rubbing an injured area described above. This mechanism also underpins the effect of Transcutaneous Electrical Nerve Stimulation (TENS). When the A-beta afferents are stimulated, they excite the enkephalin releasing interneuron with subsequent release of opioids onto the opioid receptors on the incoming pain afferents; the effect is analgesia. The other way of activating the enkephalin releasing interneuron is via the central descending inhibitory system from the brain down to the spinal cord. An important brain area in this mechanism is the periaqueductal gray area. It contains large numbers of opioid receptors and when these are activated, impulses are sent down to the dorsal horn and the enkephalin releasing interneuron is activated.

The last aspect of the sensory component of pain worth mentioning involves a centrally mediated heightened sensitivity to pain. This is a separate phenomenon from the sensitisation of nociceptors, which also causes an increased sensitivity to pain. This second state of hypersensitivity occurs because of changes in the spinal cord. In acute and chronic pain states, the person may experience an increased sensitivity to pain (hyperalgesia). The heightened sensitivity means that normally non-noxious stimulation causes pain (allodynia). The mechanism underlying hyperalgesia and its clinical manifestation, allodynia, is referred to as “wind-up”. In wind-up, an impulse in the second order neuron in the dorsal horn is generated more easily because the threshold potential of the postsynaptic neuron is lowered.

The neurophysiological description of pain described so far has accounted for peripheral and central transmission, modulation and exacerbation of pain, which according to most pain researchers paints the picture pretty much as it is currently seen. However, the foregoing does not explain some chronic pain states, for example, phantom limb pain, a pain problem that has puzzled researchers and clinicians for many years (Jensen, Krebs, Nielsen, & Ramussen, 1985; Melzack, 1990, 1999; Willoch, Rosen, Tolle, Oye, Wester, Berner, Schwaiger, & Bartenstein, 2000).

### *Melzack: The Neuromatrix and Neurosignature.*

Much is written about the transmission of pain signals from the periphery to the dorsal horn and up to the brain, less is written about what happens in the brain and how nociceptive input is perceived as pain. Most descriptions of pain in the brain focus on neuroimaging studies that highlight areas of increased activity during experimentally induced pain. These areas include the thalamus, anterior cingulate, insular, prefrontal and somatosensory cortices (Derbyshire & Jones, 1998; Hofbauer, Rainville, Duncan, & Bushnell, 2001; Peyron, Laurent, & Garcia-Larrea, 2000; Ploghaus, Tracey, Gati, Clare, Menon, Matthews, & Rawlins, 1999; Price, 1999). The studies are, however, generally based on the pervasive bottom-up view of pain. The fact that paraplegics and quadriplegics can sense body parts, or that a person who has had a limb amputated can sense the limb and even feel pain, led Melzack to consider the role of the brain in not only perceiving, but also actually constituting pain.

Melzack (1999) holds that the brain contains a genetically determined template of the body that intrinsically generates the experience of sensation with or without sensory input. According to Melzack, this template lies in the network of neurons between the thalamus and the cortex. He refers to this network as the neuromatrix. The output from the neuromatrix, the neurosignature, percolates into awareness. This model accounts for the sensations in amputated body areas or in plegias. Melzack's study of phantom limb pain lead him to four conclusions that form the basis of his neuromatrix theory.

> First, because the phantom limb... feels so real, it is reasonable to conclude that the body we normally feel is subserved by the same neural processes in the brain. The brain processes are normally activated and modulated by inputs from the body but they can act in the absence of any inputs. Second, all the qualities we normally feel from the body, including pain, are also felt in the absence of inputs from the body. From this we may conclude that the origins of the patterns that underlie the qualities of experience lie in neural networks in the brain: stimuli may trigger the patterns but do not produce them. Third, the body is perceived as a unity and is identified as the 'self', distinct from other people and the surrounding world... Fourth, the brain processes that underlie the body-self are... 'built-in' by genetic specification, although this built-in substrate must be modified by experience. (Melzack, 1999, p. S123)

Willoch, Rosen, Tolle, Oye, Berner, Schwaiger, & Bartenstein, (2000) investigated central neural circuitries of phantom limb pain using positron emission tomography (PET) and hypnosis to alternate between phantom limb movement and phantom limb pain in eight subjects.  This study supports Melzack's neuromatrix theory in that the sensation of movement correlated with activity in the motor and sensorimotor areas and subjectively rated phantom pain sensations related to activity in the anterior and posterior cingulate – areas of the brain that are normally involved in conscious awareness of pain.

The clinical realities of phantom limb pain and sensations from deafferented regions cannot be avoided in theories of pain transmission.  The focus of inquiry in these and other puzzling phenomena is shifting from the periphery and spinal cord to the brain.  Dostrovsky (1999) also stresses the role of the brain in phantom limb pain.

> The fact that stimulation at sites in the thalamus can give rise to sensations on the patient's phantom limb even many years following amputation implies that at least part of the cortical representation of the missing limb remains functional and still represents that body part  (p. S42).

The picture is, however, far from complete.  Dostrovsky also reports on two cases where thalamic stimulation failed to produce phantom limb sensations.  On this finding, he suggests that perhaps the 'brain' can learn to disregard inappropriate cortical activity with a non-existent body part and focus on input from existing areas.

Melzack's neuromatrix theory is a step closer to understanding the perception of pain.  It also deals with the previously unexplained phenomenon of phantom limb pain; however, it falls short of explaining how pain is perceived in the thalamus and cortex.  What Melzack does offer is a deeper analysis of the relationship between the thalamus and the cortex and these structures and the ascending impulses from the spinal cord.

### *The Neurophysiology of Emotion*

The other area that frequently barely rates mention in the neurophysiology of pain, other than fleeting reference to the limbic system, is emotion.  Pain is frequently discussed as a sensory-discriminative – affective-motivational dichotomy.  This is reflected in the International Association for the Study of Pain (IASP) definition of pain... ‘An unpleasant sensory *and* emotional experience...’ with the balance of research and discussion heavily biased towards sensory neurophysiology and pharmacology. Rarely are the sensory and emotional aspects of pain discussed in a manner that allows for a profound understanding of a person’s pain experience.

The study of emotion is an extremely complex area compounded by the lack of consensus as to what emotion actually is. The contemporary view in neuroscience is that cognition includes memory, emotion, attention, language, thought and consciousness (Crick & Koch, 2000; Mesulam, 1998; Roth, 2000). Since the 1980s, brain scientist Joseph LeDoux has led the field in the neurophysiology of emotion (1979, 1987, 1989, 1991, 1992, 1993a, 1993b, 1994, 1995, 1998, 2002), particularly in regard to fear and the amygdala. For this discussion of neurological aspects, emotion is best thought of in LeDoux’s (1987) terms as “A general term referring to a group of interrelated brain functions; emotion traditionally includes emotional experience, emotional expression and evaluation” (p. 419). Much of this review relates to LeDoux’s published works together with a range of other researchers in the field.

### *Early Brain Research on Emotion*

Research into the neurological basis of emotion has developed since the end of the nineteenth century. LeDoux (1987) provides a detailed review of the key contributors in the field – Cannon and Bard, Papez, Kluver and Bucy, and MacLean.

The research conducted into brain function in these early studies involved the surgical removal or ablation of various parts of an animal’s brain followed by observation of behaviour. In humans, the brain was examined at autopsy where tumours or trauma to the brain were identified and mapped against various behavioural or neurological deficiencies. Both of these techniques continue today although neuroanatomists now have the various neuroimaging techniques at hand to investigate brain function.

Using these early techniques, LeDoux (1987, p. 422) states that Kluver and Bucy removed the temporal lobe in monkeys and observed that the monkeys no longer exhibited anger and fear reactions. “They [the monkeys] approached humans, other animals, and inanimate objects without the slightest hesitation". The monkeys also exhibited bizarre behaviour copulating with members of the same sex and other animals, and eating items that were usually avoided including raw meat and faeces.

Kluver and Bucy (1937) described the striking features of the syndrome as what they termed "psychic blindness" or a visual agnosia. That is, the monkeys were not blind but they were unable to attribute meaning to factors in their environment. Kluver and Bucy (1939) suggested that the hippocampus that was the crucial structure involved in mediating emotional behaviour. However, LeDoux points out it was damage to the amygdala rather than the hippocampus that was responsible for the observed phenomena. The amygdala was not brought into the emotion picture until MacLean proposed the notion of the 'visceral brain' and then the 'limbic system' in the early 1950s. Although MacLean included the amygdala in the visceral brain or limbic system, it was thought of only as an output for parasympathetic functions. Furthermore, MacLean's emphasis was on the hippocampus as the centre for emotion. LeDoux points out that we now know that the hippocampus is involved with cognitive functioning, such as memory, rather than emotional functions, and that the amygdala participates in both sympathetic and parasympathetic functions. Moreover, the amygdala now takes the central position in the neurophysiology of emotion, particularly fear (Aggleton, 1992, 2000; Davis, 2000; Gallagher & Chiba, 1996; LeDoux, 1987, 1992, 1993b, 1998, 2002; McDonald, 1998).

### *From 'Limbic System' to 'Limbic Forebrain'*

The term 'limbic system' implies a group of interrelated structures that together perform various neurological functions that are traditionally identified as olfactory and emotional (Martini, 1998; Sitoh & Tien, 1997). The problem with this term is that there is lack of consensus as to which brain structures comprise the limbic system and, furthermore, there is little evidence to support the notion that the so-called limbic structures function as a system. According to Heimer (1995), neuroscientists have included a vast array of brain structures in the 'limbic system'. The principal structures are listed in Table 2.1.

**Table 2.1**

*'Limbic System' Brain Structures*

| | |
|---|---|
| Cingulate and parahippocampal gyri | Hippocampus |
| Amygdaloid body | Hypothalamus |
| Neocortical areas in the basal frontotemporal region | Olfactory cortex |
| Ventral parts of the striatal complex | Habenula |
| Anterior and medial thalamic nuclei | Brain stem areas |

Heimer (1995, p. 525) points out that some of these are separate anatomical and functional structures, for example, the amygdala and the hippocampus, which makes it difficult to conceive of the 'limbic system' as a functional unit. Furthermore, the hippocampus is not primarily olfactory, nor is it significantly involved in emotions - two primary functions of the 'limbic system'. LeDoux (1987) adds, "A commonly mentioned criterion for inclusion in the limbic system is connectivity with the hypothalamus... which places the limbic system brain areas at every level of the neuroaxis, from the cerebral cortex to the spinal cord" (p. 424). There is no doubt that some of the structures referred to in the limbic system are involved in emotion. The difficulty seems to be with the notion of a system, hence LeDoux (1987) prefers the anatomical term 'limbic forebrain' when referring to these emotion-related structures.

For the purpose of this review, and later, the focus on imagery, emotion, and consciousness, it is important to identify which limbic forebrain structures are involved in emotion, and what is known about their afferent and efferent connections. LeDoux (1987) presents an overview of these connections based on the work of a number of researchers in the field. The important limbic forebrain areas are the orbitofrontal cortex, amygdala, rhinal cortices, cingulate gyrus and the hippocampus.

### *Cortical Association Areas*

Ascending sensory stimuli including nociceptive stimuli are relayed by the thalamus to the primary sensory cortices. The primary sensory cortical areas, also called 'koniocortices,' project to cortical association areas. Jones and Powell (cited in LeDoux, 1987):

> Confirmed that each koniocortex projects locally to modality-specific association areas and additionally demonstrated that these latter regions project in turn to limbic regions and neocortical areas in which convergent input arrives from two or more sensory modalities. The cortical areas of sensory convergence also project to limbic areas. (p. 426)

The important point here is that the limbic forebrain areas receive input from the *association areas* not from the primary sensory cortices (koniocortices). This is important because the association areas attach meaning and significance to the information in the sensory areas (Martini, 1998). An inability to attach meaning to sensory input is reflected in the various agnosias (Boss, 2002; Mesulam, 1998; Tranel, Damasio, & Damasio, 1997), which are observed clinically when an association area is damaged. For example in a visual agnosia, the visual association area is damaged. The person is not blind because his or her eyes and primary visual sensory cortex are functional but he or she cannot attribute meaning to what is seen. This phenomenon is also seen in the Kluver-Bucy syndrome in monkeys described earlier. In that syndrome, there is damage to the cortical association areas and the amygdala with extreme behavioural changes being attributed to damage to the latter.

The association areas corresponding to each koniocortex region are unimodal and include visual, auditory and somatosensory processing areas. The unimodal areas project to polymodal (heteromodal) association areas which process sensory information involving multiple senses (Killcross, 2000; LeDoux, 1987; Mesulam, 1998). The polymodal areas project to the supramodal areas that then relay information to the hippocampus and to the cingulate gyrus. Each of these progressions allows for increasingly complex processing of sensory information.

### *Input to the Amygdala*

The amygdala appears to be a crucial structure in the emotional processing of sensory and complex cognitive information (Aggleton, 1992, 2000). LeDoux (1987, 2002) places the amygdala at the centre of his discussion on the neurophysiology of emotion. Beginning with exterioceptive stimuli, that is, impulses ascending the spinal cord to the thalamus, these impulses travel through the primary sensory nuclei, which project, to the koniocortices. In addition, some impulses travel through associated sensory nuclei in the thalamus, which project information directly to the amygdala. LeDoux holds that the information taking this short route is simple and primitive. This includes pain signals. The transmission in this pathway is rapid because it only involves one synapse compared to at least three synapses via the koniocortices and their unimodal association areas to the amygdala. LeDoux also points out that the amygdala receives input from the terminal areas of the spinothalamic tract and the medial lemniscus. This is also a short cut to the amygdala. Nociceptive information travelling up the somatosensory spinothalamic tract can branch off to the amygdala before reaching the thalamus. However, Rolls (1999) argues that cortical analysis of the stimulus is likely to be required for an emotion to ensue.

The mainstream flow of sensory information is from the thalamus to the koniocortices, that is, to each sensory area of the neocortex. Complex sensory information is then transmitted from the koniocortices to each corresponding unimodal association area (Jones & Powell, cited in LeDoux, 1987). The unimodal association areas are visual, auditory and somatosensory and each projects to the amygdala (McDonald, 1998). This is the first of three pathways by which sensory information in the association areas reaches the amygdala. The second pathway is from the polymodal association areas to the amygdala (Killcross, 2000). The polymodal areas receive information from multiple unimodal areas and in doing so, combine visual, auditory and somatosensory input to form more complex formulations about the sensory input. The third pathway by which associated sensory information reaches the amygdala is from the polymodal to supramodal areas, which project to the hippocampus and from there to the amygdala. LeDoux (1987) suggests that this pathway allows for complex interpretation of sensory information prior to emotional processing.

The amygdala therefore receives sensory information at all levels of complexity and processing, from the immediate ‘raw information’ via the terminal areas of the spinothalamic tracts, medial lemniscus and thalamus, to increasingly complex processing from the unimodal, polymodal and supramodal association areas of the cortex. Apart from sensory information, the amygdala also receives input from higher neocortical centres in the brain involved in cognition. It is well known that along with sensory information, thoughts and memories can evoke a range of emotions, complete with physiological effects (Bierman, 1996). LeDoux (1987) suggests that cognition and emotion meet via the hippocampus. "Cognitive processes (thoughts and memories) originating in circuits involving the neocortex and hippocampus might be related to emotional events by projections from the hippocampus to the amygdala" (p.433). The amygdala, projects back to the hippocampus and the cortical association areas so the relationship is not simply linear and unidirectional. Mesulam (1998) refers to this as 'top-down' processing; an important concept, which is developed further in this chapter and contrasted with the bottom-up, sensory – appraisal view.

The limbic forebrain also receives interoceptive information from the viscera. The vagus nerve is the main afferent pathway from the viscera to the brain. The vagus terminates in the nucleus of the solitary tract (NTS) in the medulla which projects to limbic forebrain areas including the central nucleus of the amygdala (LeDoux, 1987). There are also connections between the NTS and the amygdala via the pons and indirectly from the NTS to the pons, insular cortex and then to the amygdala. LeDoux (1987) reports that both vagal and *nociceptive*, that is, visceral and somatic, stimulation produce neuronal excitation in several limbic forebrain areas including the amygdala, insular cortex, hippocampus and striatum. In addition to the vagal afferent pathway providing information to the limbic forebrain, the amygdala is sensitive to changes in blood pressure and biochemistry. Acute fluctuations in blood pressure are mediated, largely, by the autonomic nervous system. The amygdala can therefore detect changes in the body that result from alterations in autonomic outflow from the brain. This places the amygdala in an important position because it can also effect changes in sympathetic outflow through its afferent connections with the lateral hypothalamus. The amygdala, and indeed other limbic forebrain structures, are not just central nervous system targets; these structures also have efferent connections that facilitate in the simplest form, two-way communication with afferent structures. However, the circuitry is often exceedingly more complex than a reciprocal pathway between two structures.

### *Output from the Amygdala*

The amygdala has output to at least three systems involved in the expression and experience of emotion. The systems include the autonomic system, endocrine system and skeletomuscular system (LeDoux, 1987). The autonomic responses that typically accompany emotion result from a shift in the sympathetic-parasympathetic balance towards an enhancement of sympathetic tone. Clinically this is manifest as increased heart rate and force of contraction of the ventricles, together with bronchodilation and a heightened responsiveness that prepares the individual for the fight or flight response. The afferent pathways to the neurons that form the sympathetic pathways in the spinal cord are complex and widespread. They include projections from the medulla, pons and hypothalamus. The lateral hypothalamus receives projections from a number of limbic forebrain structures including the amygdala (LeDoux, 1987). In this way, the amygdala can affect sympathetic output through the lateral hypothalamus.

The other autonomic branch, the parasympathetic, is also affected by output from the amygdala. LeDoux points out that the main parasympathetic output pathway is the dorsal motor nucleus of the vagus nerve in the medulla and that afferents to the dorsal motor nucleus come from the paraventricular and lateral hypothalamic nuclei, the amygdala, midbrain, pons and the nucleus of the solitary tract in the medulla. Clearly, the amygdala is not the only limbic forebrain structure involved in emotion-related autonomic responses. However, in providing a structural account of the relationship between the limbic forebrain and the autonomic pathways, LeDoux (1987, 2002) highlights the role of the amygdala in emotional processing and suggests that it is a homeostatic centre of emotion.

The effects of limbic forebrain structures, including the amygdala on hormone release fall into two categories, an effect on the adrenal medulla, which is an extension of the sympathetic nervous system, and effects on the hypothalamic – pituitary axis, in particular, the subsequent release of cortisol from the adrenal cortex (LeDoux, 1998, 2002). When sympathetic outflow is enhanced, the adrenal medulla, a sympathetic target, releases adrenaline and noradrenaline into the bloodstream. Both of these hormones are sympathetic agonists; they stimulate adrenergic receptors (the receptors at sympathetic target tissue) throughout the body. As an extension of the sympathetic nervous system, the adrenal medulla will release adrenaline and noradrenaline in response to increased sympathetic outflow regardless of what caused the increase in sympathetic drive. If the increase is a reflex response to a drop in blood pressure arising from haemorrhage then the adrenal medulla will respond. Similarly, if the increase in sympathetic drive arises in the limbic forebrain, then the result at the adrenal medulla is the same, namely, release of adrenaline and noradrenaline. The adrenal medulla is outside the central nervous system. However, the effect of the limbic forebrain on the adrenal medulla is rapid because the two areas are linked by sympathetic neurons. The concomitant effect that emotion has on hormones occurs locally in the brain, specifically, in the hypothalamus and pituitary gland.

In humans, focal bilateral damage to the amygdala occurs in the Urbech-Wiethe disorder, a very rare congenital disease that leads to calcification of the amygdala (Killcross, 2000). This disorder provides researchers with a unique opportunity to study the effects of bilateral amygdala damage in humans. Adolphs, Russell and Tranel (1999) reported a study of a 31-year-old woman (SM046) with bilateral amygdala damage from Urbech-Wiethe disorder. Principally, they investigated the role of the human amygdala in recognizing emotional arousal from unpleasant stimuli. Interestingly, they found that SM046 "… showed a specific impairment in judging various classes of stimuli that signal unpleasant emotions: an inability to recognize their arousal, with a spared ability to recognize their valence." (p. 168). This finding suggests that the amygdala may be involved more in emotional arousal than in differentiating between what is pleasant and what is unpleasant. Given that the disorder is congenital and may develop from birth, the researchers suggest:

> SM046 may have never acquired normal conceptual knowledge concerning the arousal of unpleasant emotions, and is hence unable to retrieve such knowledge on the experimental tasks. (p. 170)

Intact association areas in the cortex could account for the ability to recognise a fearful face while bilateral damage to the amygdala would preclude the ability to determine level of arousal. This could be further investigated by putting a subject with bilateral amygdala damage in a series of frightening and neutral situations. Under these conditions, one would expect the subject to be able to differentiate between the experimental conditions but show no evidence of a significant difference in level of emotional arousal.

In summary, the emotion processing in the brain occurs in a group of brain structures that occupy the limbic forebrain. Even though there appears to be little consensus as to what emotion is precisely, there is agreement on the obsolescence of the notion of a ‘limbic system’ as an emotion system. Of the limbic forebrain structures, the amygdala appears to be crucial to the experience, arousal and expression of emotion.

### *Emotions, Neuropeptides and Healing*

While it is true that one brain area, such as the amygdala, can communicate with another area, such as the association areas or the hypothalamus via hard-wired pathways and synaptic transmission, these brain areas can also communicate with distant areas in the body where there are no nerve pathways. It is proposed that an ‘emotion network’ (Pert, 1999; Pert, Dreher, & Ruff, 1998) exists that extends beyond the hard-wired connections in the brain. Current thinking in noetic science is that the balance between health and disease rests on the emotions through the effects of the neuropeptides produced in emotion on the immune system (Ader & Cohen, 1995; Cohen, Tyrrell, & Smith, 1991; Haas & Schauenstein, 1997; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Pert, Ruff, Weber, & Herkenham, 1985). If such a network exists then it would account for the apparent link between the emotions, health and disease that was postulated as far back in time as Galen (A.D. 131-201) who proposed that, “a balance of the “passions” was essential for physical health.” (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002, p. 84). Such a link serves to emphasise that the emotional reaction to painful procedures (terrifying children) may not only have immediate practical consequences in terms of having to treat a so-called ‘difficult child’, it may have long-term health consequences through adverse effects on the child’s immune system.

A peptide is a molecule constructed of amino acids linked together in a linear fashion. A neuropeptide is a peptide made in a nerve cell. For each neuropeptide, there is a corresponding neuropeptide receptor. It is now known that monocytes and lymphocytes secrete and respond to neuropeptides; the term favoured by immunologists is "cytokines" (Pert, 1999). The first neuropeptide receptor was discovered in 1973 by Pert and Snyder; it was the opiate receptor. The endogenous neuropeptide for the opiate receptor was discovered two years later. Since then, neuroscientists have identified nearly 100 neuropeptides.

An understanding of the action of neuropeptides rapidly collapses the reductionist 'systems' approach to human physiology. Neuropeptides are neurotransmitters (nervous system) but some are also hormones (endocrine system) and some are made in the lymphocytes (immune system). Jabbur and Saade (1999) refer to the 'cross-talk' between the nervous and immune systems and state, "The nervous, immune and endocrine systems in vertebrates appear to share common molecular mechanisms that can interact at peripheral and ultimately at central levels, as well" (p. S90). Even at a basic 'hard-wired' level, it is now known that immune tissue is innervated with nerve fibres that influence immune responses (Ader, 2001). In an interview, neuroscientist, David Felten illustrated the traditional discipline boundaries when he said:

> The bad news is now we have to start to talk in each other's language and heaven forbid that immunologists and neuroscientists in the past ever used each other's language – they'd rather use each other's toothbrushes. (Felten in Moyers, 1993)

The common molecular mechanisms are the neuropeptides and their receptors. Furthermore, neuropeptides enter the domain of psychology through their effect on consciousness and the emotions, which has led to the relatively new area of research referred to as psychoneuroimmunology.

The link between emotions and neuropeptides comes from the initial finding (Lamotte, Snowman, Pert, & Snyder, 1978) that the limbic forebrain structures, particularly the amygdala and the hypothalamus, contain a high concentration of opiate receptors. The relationship between the limbic forebrain and neuropeptides is, however, far from restricted to the opiates as these areas contain high concentrations of receptors for most neuropeptides (Pert, Dreher, & Ruff, 1998).

The neuropeptides form a communication network throughout the body. They effect changes in the receiving cells and tissues when the neuropeptide couples with its receptor. For example, changes in carbohydrate and fat metabolism occur in the cell when the neuropeptide insulin locks into an insulin receptor (a specific neuropeptide receptor for insulin). Similarly, analgesia and euphoria result when the neuropeptide, $\beta$-endorphin, locks into an opioid receptor. In fact, all effects of an opioid, either endogenous (endorphins and enkephalins) or exogenous (morphine, heroin), stem from receptor activation. The effect depends upon the location of the cell containing the surface receptor for the neuropeptide.

The common analogy of a lock and key is very useful in understanding the interaction between a neuropeptide and its receptor. The effect of opening the door and entering will depend largely on the location of the door. Fundamentally, neuropeptides and their receptors provide a mechanism whereby cells, in Pert's (1990) terms, can 'talk' to each other.

Following the discovery of large numbers of neuropeptide receptors in the limbic forebrain structures, neuroscientists looked for, and found, other neuropeptide sites both within, and outside the central nervous system. Areas containing large numbers of neuropeptide receptors are called 'nodal points' (Pert, Dreher, & Ruff, 1998). Within the central nervous system, areas other than the limbic forebrain were found to be nodal points. Two areas described earlier, the dorsal horn in the spinal cord and the periaqueductal gray area in the brain, contain large numbers of receptors for virtually all neuropeptides (Lewis, Mishkin, Bragin, Brown, Pert, & Pert, 1981; Pert, Ruff, Weber, & Herkenham, cited in Pert, Dreher, & Ruff, 1998).

The dualistic notion of a central versus peripheral nervous system is also challenged based on neuropeptide distribution and activity. Neuropeptides travel throughout the brain and body and attach to specific receptors with widespread effects (Pert, Dreher, & Ruff, 1998). The entire gut from the oesophagus to the large intestine is lined with cells that contain neuropeptides and neuropeptide receptors. Pert (1990) suggests that the reason people feel emotions in their gut, as 'gut feelings' is the richness of receptors in the area. Neuropeptides and their receptors have also been found in the kidney, testis, pancreas and immune system organs and cells (Pert, Dreher, & Ruff, 1998). Working on the premise that neuropeptides are the biochemical substrates of emotion, Pert (1990) uses the example of angiotensin and thirst to illustrate the relationship between neuropeptides and emotion. It must be said, however, that many would not list thirst as an emotion. It is, nonetheless, a feeling that leads to a behaviour (drinking) that serves a biological end, namely survival. This is consistent with some of the psychological theories of emotion discussed in the next chapter such as Plutchik's psychoevolutionary theory. Angiotensin is a hormone and a neuropeptide made in the kidney and the amygdala. Pert points out that in the brain, angiotensin induces the feeling of thirst, in the kidney, it causes the conservation of water. Together the actions of the neuropeptide in the brain and kidney serve the same end - the homeostatic control of water. The dual function of angiotensin as a hormone and as a neuropeptide illustrates the cross-systems actions of the neuropeptides – actions that extend to the immune system and, since the 1980s, have been the basis of research into psychoneuroimmunology.

### *Neuropeptides and Immunity*

Within the reductionistic biomedical paradigm, nerve cells and immune cells have long been considered as substrates of independent systems - the nervous system and the immune system. However, these cells and systems share common molecular biology and function (Ader, 2001). Both are influenced by neuropeptides and each is capable of storing memory of previous events (Felten, in Moyers, 1993). The nervous and immune systems are no longer considered independent; each has an impact on the other within the body as a whole. Salzet, (2001) said:

> There is growing evidence that the nervous and immune systems can exchange information, through small molecules, either cytokines or neuropeptides. Furthermore, it appears that some so-called neurotransmitters like neuropeptides can function as endogenous messengers of the immune system, and that they most likely participate in an important part in the regulation of the immune response. (p. 467)

Pert, Dreher and Ruff (1998) point out that early work in the field of psychoneuroimmunology identified that monocytes were attracted to specific neuropeptides and that immunocytes, "synthesise, store, and secrete neuropeptides" (p.32). Monocytes are crucial cells in mediating an immune response. Apart from their phagocytic action, they help to orchestrate both the cell mediated and antibody components of immunity by presenting antigens to T and B-lymphocytes. The fact that these cells are influenced by neuropeptides places neuropeptides (and emotions) in the forefront of our defence system. The interplay between the nervous system and the immune system is further illustrated by Pert, Dreher and Ruff (1998) who point out that neuroscientists have now demonstrated that nerve cells produce a number of immune cell products including interleukin-1, interleukin-6, interleukin-10 and tumour necrosis factor (TNF).

As the 'biochemical substrates of emotion', neuropeptides and their association with immunity imply a connection between emotion and immunity. Given that a balanced immune system is essential to healing, Pert, Dreher and Ruff (1998) take the next step, which is the association between emotion and healing. This is not a new concept. The relationship between stress and illness has been evident for a long time (Solomon & Moos, 1964) but what Pert and her colleagues provide, as neuroscientists, is a perspective that focuses on the neurophysiology of emotion and healing. The dominance of the Cartesian paradigm in medicine means that the 'mind' and 'healing' (body) are concepts that do not sit well with medical science. However, many neuroscientists have moved beyond the restrictions of the Cartesian paradigm through psychoneuroimmunology, to embrace mind-body, or holistic, medicine. As Ader (2001, p. 97) said, "Psychoneuroimmunology is an interdisciplinary field that has developed and now prospers by ignoring the arbitrary and illusory boundaries of the biomedical sciences." Such a position demonstrates the importance of how children, particularly those with chronic or malignant disease, respond to procedures. The pain and fear they experience, on top of the stress of illness, may hamper the process of healing.

### *Emotion and Healing*

The effects of stress on the immune system are complex and appear to be determined at least in part by whether the stress is acute or chronic. Research into the effects of stress on the immune system has produced mixed results. Gerritsen, Heijnen, Wiegant, Bermond, & Frijda (cited in, Pert, Dreher & Ruff, 1998) induced a state of social fear (acute stress) in subjects with a public speaking task and found evidence of immunosuppression compared to a control group subjected to a non-demanding task:

> The subjects experienced feelings of tenseness accompanied by increases in blood pressure, elevated levels of cortisol, prolactin, and beta-endorphin, and immunological changes consistent with short-term stress: increased numbers of natural killer (NK) cells, decreases in levels of T helper cells (CD4), and decreased T-cell responses to antigenic challenge. (p.34)

On the other hand, Naliboff, Benton, Solomon, Morley, Fahey, Bloom, Makinodan, & Gilmore, (cited in Pert, Dreher, & Ruff, 1998, p. 34) found that "acute stress associated with activation of the sympathetic nervous system (fight or flight) often causes increase in NK [natural killer] cell activity". On the relationship between emotion and healing, Felten (in Moyers, 1993) holds the view that how a patient perceives a situation may be a very important factor in how their body responds. Felten places great emphasis on the interaction between emotions and the immune system. It is difficult to draw conclusions based on a few studies in an area that has many complex and interrelated variables but Pert, Dreher and Ruff (1998) postulate that an increase in NK cell activity may be needed in a fight or flight response to deal with potential pathogens, while at the same time other components of the immune system might be down-regulated to prevent excessive or prolonged inflammatory reactions and the likelihood of autoimmune imbalance and disease.

It will be some time before neuroscientists are able to define exactly which components of the immune response rise or fall in response to the various types of stress, however, it appears that emotion and immunity are interrelated. Kiecolt-Glaser, McGuire, Robies and Glaser (2002, p. 83) hold that negative emotions are implicated in the morbidity and mortality of a range of conditions whose onset and course may be influenced by the immune system. On the nature of stress and potential for disease, Pert, Dreher and Ruff (1998) hold that the important characteristics are stress that is chronic, inescapable, or unpredictable. Regarding children experiencing pain and distress during medical procedures, the keyword is *inescapable*, and for children undergoing repeated procedures: *inescapable* and *chronic*. In addition to the obvious effects relating to the quality and quantity of stress, Ader (1995) highlights the ability of an individual to cope effectively with the stress as a factor that influences the potential for stress-induced changes in immunity. Again, particularly with repeated procedures, a child's inability to cope would have an adverse effect on the child's immune status.

The effects of inescapable stress on the immune system have been studied by Shavit and colleagues, (cited in Pert, Dreher, & Ruff, 1998) who demonstrated immunosuppression in rats subjected to inescapable or unpredictable stress. Shavit labelled the inescapable or unpredictable stress as 'opioid stress' because the effects were reversed by the opioid antagonist naloxone. Shavit also found decreased median survival time and percent survival rates in rats injected with rat mammary carcinoma cells and exposed to opioid forms of stress. Lysle, Leucken and Maslonek (1992) also found that endogenous opioid activity is involved in conditioned stimulus-induced alterations in immune function in the rat, specifically a reduction in natural killer cell activity and that this effect is reversed by the opiate receptor antagonists naltrexone and N-methylnaltrexone. Du, Jiang, Wu and Cao (1998) also reported antagonism of the immunosuppressive effects of endogenous opioids by naloxone. On the specific effects of the opioid receptors on immunity, Zakharova and Vasilenko (2001) state:

> In most experimental and clinical studies, opioid-mediated analgesia proved to be accompanied by immunosuppression. Opioid receptors of mu, delta, and kappa types are involved in the mechanisms of combined regulation of pain and immunity, with mu and delta receptors suppressing the immune response and kappa receptors enhancing it. (Article in Russian, English abstract cited)

However, while, Ben-Eliyahu, Yirmiya, Shavit and Liebeskind (1990) confirm that the suppression of natural killer cell cytotoxicity in the rat by footshock stress can be attenuated by opioid antagonists, and suggest the effect is mediated by endogenous opioids, they also found that suppression of NK cell cytotoxicity and analgesia persisted in stressed rats pre-treated with naltrexone or saline, which suggests a non-opioid mechanism. The stressed rats in both groups had significantly higher corticosterone levels than the non-stressed controls. Ben-Eliyahu et al. conclude that stress induced suppression of NK cell cytotoxicity may not be solely opioid related. Activation of the hypothalamic – pituitary – adrenal cortex axis by the amygdala, described earlier, is likely to be an important factor in raising corticosteroid levels in acute stress.

Given that children undergoing medical procedures experience stress, distress and pain, a natural response is to produce endogenous opioids and cortisol. In light of the studies demonstrating opioid induced immunosuppression associated with acute, inescapable stress, coupled with the immunosuppressive effects of cortisol, it is possible that many children, particularly those undergoing repeated painful medical procedures, will experience opioid stress and the related immunosuppressive effects.

In contrast to the negative effects of stress on the immune system, Berk, Felten, Tan, Bittman and Westengard (2001) investigated the effects of humorous therapy and mirthful laughter on specific neuroimmune parameters in a group of 52 healthy men in schools of medicine and public health. Blood samples were taken 10 minutes before the subjects viewed a humorous video for one hour. Repeated samples were taken during the video, 30 minutes and 12 hours after the viewing. Increases in natural killer cell activity, immunoglobulins G, A and M, and a range of related neuroimmune parameters were reported with some effects lasting 12 hours after the intervention.

The implications of potentially negative versus positive neuroimmune effects for children with cancer receiving repeated painful and distressing treatments are obvious. A goal of treatment should be to administer the treatment in a way that at the least, reduces, rather than exacerbates, helplessness and fear. Central to the achievement of this goal is an understanding of how emotions are generated, that is, moving from the neurophysiology of emotion to the psychology of emotion, which is the topic of the next chapter.

### *Summary*

This chapter has outlined the neurophysiology of sensation and emotion with a view to describing the neurophysiology of pain. Current pain mechanisms were described which at face value reveal the connection between tissue damage, the perception of pain in the brain and even how these signals are modulated by the central nervous system. However, our understanding of pain neurophysiology is unable to explain complex phenomena such as phantom limb pain. In an attempt to address this shortcoming, Melzack has moved the discussion from pain pathways to processing in the brain and in so doing, he suggests that the brain intrinsically generates the experience of sensation with or without sensory input.

Although pain is defined as an unpleasant sensory and emotional experience, the predominance of Cartesian mind-body dualism in the medical sciences ensures that the balance of pain theory and treatment lies within the physical domain. In both an epistemological and practical sense, the limitations imposed by this dichotomy limit our understanding of what pain is, and how it is best managed in clinical practice. This chapter addressed the neurophysiological basis of somatosensation *and* emotion, both key aspects in the understanding of pain. Of the areas in the limbic forebrain, the amygdala is considered to be of particular importance in modulating emotion, particularly fear. The amygdala receives crude as well as highly processed somatosensory input and it is involved with the expression of emotional behaviour. Of the many connections between the amygdala and surrounding brain areas, the link between the primary or unimodal association cortices and the amygdala are particularly important because these areas are active in the process of mental image formation.

The effects of emotion on the individual are extensive, extending beyond the psychological. Neuroscientists have shown that the neuropeptides released in emotion travel throughout the body and exert widespread effects on cells, tissues and systems including the immune system. The implications regarding the health of children who are already stressed in relation to disease and undergoing painful medical procedures are profound and provide an added dimension to the rationale for improving the management of fear and procedural pain. How this can be achieved, and how distraction and imagery intervene, requires an understanding of how emotions are generated, particularly fear. In addition to the neurophysiological understanding of emotion, there are many psychological theories of emotion – the pertinent theories are reviewed in the next chapter.

# CHAPTER 3

## THE PSYCHOLOGY OF EMOTION

The previous chapter examined the neurophysiology of pain and fear. The focus of this chapter is on the psychological aspects of emotion. The purpose of this chapter is to explore the psychology of emotion within the context of procedural fear in children, with a view to laying a foundation for discussing the results of the two studies and their theoretical implications in Chapter 11. The origins of the psychology of emotion lie in philosophy and the early physiological theories. These are reviewed before moving to a psychoevolutionary theory, then the cognitive theories, and, finally, to two social theories of emotion. The development of these theories demonstrates an increasing effort to capture the complexity of emotional responses.

### *From Philosophy to Early Psychological Theories of Emotion*

Human beings have probably been attempting to understand their emotions since time immemorial. Certainly, emotion is a topic that occupied the minds of the great philosophers as they attempted to answer the quintessentially human question, "What is it that makes me feel what it is that I feel?" The notion of a 'thinking brain' and 'emotional heart' can be traced back to Democritus (460-370 B.C), whereas Aristotle (384-322 B.C) placed both thinking and feeling in the heart (Hergenhahn, 2001). Plato (427-347 B.C) believed that the rational soul was immortal and that the courageous or emotional soul, responsible for emotions such as fear, love and rage, was part of the body, and therefore mortal (Hergenhahn, 2001). For Aristotle, Plato's student, thinking took precedence over emotions, such as pleasure and pain, as can be seen in the Aristotelian hierarchy of souls where the *rational soul* (uniquely human) held a higher position than the *sensitive soul* (possessed by animals). Emotion, in Aristotelian philosophy served to amplify an action tendency. For example, the frightened person ran faster when experiencing fear, but at the expense of the ability to engage in rational thought (Hergenhahn, 2001).

It was, however, not until the 17th century that emotion was considered in a scientific context. At that time, the prevailing paradigm was Cartesian. Descartes, in building on the Platonic dualism of mind (soul) and body had established the dualistic dogma of mind and body as separate entities. Strongman (1987) summarises Descartes view of emotion:

> In animals, he [Descartes] thought that there is simply an environmental input and a bodily output. In man, reason (or choice) intervenes. Emotions (or passions) were vital to his viewpoint since he thought of them as changing the flow of animal spirits, the basic determinant of action. Descartes suggested that there are six primitive emotions: admiration, love, hate, desire, joy and sadness. These combine to produce the introspective feelings which we regard as emotion… Descartes believed emotions to have four main functions. They cause: (1) the appropriate flow of animal spirits in the body; (2) the body to be held ready for the various environmental goal objects which come its way; (3) the soul to desire these objects, which nature has already told us are of use; and (4) a persistence of the desire of these objects. (p. 4.)

Descartes referred to emotions as passions in the soul. While this may seem difficult to comprehend, particularly the notion of 'the soul', what is worth noting is the early conceptualisation of emotions as passions. Averill (1980) draws attention to the link between the words 'passion' and 'passive'; that is, that emotion is not something that we do, rather emotion is something that appears to happen to us, as in, falling in love, being overcome with grief and overwhelmed by rage. Strongman (1987) sums up Descartes on emotion with: "His [Descartes'] theory of emotion can be summarised as suggesting that emotion intervenes between stimulus and response, causing the response to be less rational than it otherwise would have been" (p. 5). It is worth noting that Descartes did not include fear in his shortlist of the six primitive emotions. Most authors on emotion discuss fear at some point.

The mind-body dualism emanating from Plato and later espoused by Descartes persisted for centuries and continues to influence thinking in medicine and psychology. Certainly, James (1884) and Lange (1885), who are credited with presenting what is considered the first psychological theory of emotion, drew on the relationship between person and environment but like most theories before, and since, they incorporated the dualism inherent in the Cartesian paradigm.

### The James-Lange Theory

The emphasis in the James-Lange theory is on the physiological changes that occur in the body during emotion. According to James and Lange, emotion is the feeling that is produced by the physiological changes in the body. The sequence of events in applying the James-Lange theory to the child experiencing fear during a painful medical procedure is: (1) the child sees the needle and feels the pain; (2) her mouth becomes dry, heart races, tummy churns, chest tightens; which leads to (3) feeling scared. What is crucial to the James-Lange theory in this scenario is the order of events: the child feels scared as a result of the physiological changes. It is the child's awareness of these feelings in the James-Lange view that constitutes the emotion. However, as Kalat (1990, p. 426) points out, if James and Lange were right then not actually seeing the threat would not impact on the emotion. According to the James-Lange theory, it is the perception of the state of physiological arousal that *is* the emotion. What James and Lange did not devote much attention to was what caused the physiological arousal in the first place. It appears that the physiological response is linked to the stimulus in a primitive associative fashion with the 'mind' interceding only after the 'reaction' has occurred.

### The Cannon-Bard Theory

While the James-Lange theory is regarded as a physiological theory, the Cannon-Bard theory emphasises the role of the thalamus and is described as a neurophysiological theory of emotion. It emerged in the 1920s. According to Strongman (1987, p. 17), in the Cannon-Bard theory, "An environmental situation stimulates receptors which relay impulses to the cortex. The cortex, in turn, stimulates thalamic processes which act in particular patterns corresponding to particular emotional expressions". Again, the order of events is crucial to the theory. Applying the Cannon-Bard theory to the scenario of the child experiencing fear during a medical procedure suggests: (1) the child sees the needle and feels the pain as impulses are transmitted though the thalamus to the cerebral cortex; (2) the thalamus then discharges impulses to the viscera and skeletal muscles then almost at the same time (3) the thalamus relays information back to the cortex which constitutes the emotion. Functionally, the thalamus relays the majority of sensory input throughout the brain.

The Cannon-Bard model shifts the cognitive, mindful response forward in time to occur simultaneously with the physiological response but like the James-Lange view, it retains an essentially dualistic function of mind and body. Subsequent psychological models have been marked by attempts to integrate the two components at the same time acknowledging that both mindful and bodily aspects are more complex than the early theorists recognised.

In the period between the physiological theories and the cognitive theories of the 1970s lie a number of theories of emotion based on motivation, arousal, physiology, behaviour and psychoanalysis. A brief explanation and critique of these theories can be found in Strongman (1987). These theories are not addressed because they bring little to bear on the focus of this thesis, however, a relevant theory of emotion that emerged in this period is Plutchik's psychoevolutionary theory. This theory has its origins in Darwin's (1872) *Expression of the emotions in man and animals*.

### ***Plutchik's Psychoevolutionary Theory of Emotion***

Plutchik's psychoevolutionary theory began in the late 1950s and was further developed through the 1990s. It has some theoretical relevance to the topic of fear in children undergoing painful procedures. Specifically, Plutchik is included in this review because the behaviour, escape, that he attributed to fear is something that is seen on a daily basis when children struggle and are forcibly restrained during painful procedures. Plutchik has spent more than forty years studying, researching and writing on emotion (Plutchik, 1958, 1962, 1980, 1990, 1993), having developed his theory and model of emotions on an analogy made by McDougall (cited in Plutchik, 1990, p. 109) between primary colours and the emotions:

> The color-sensations present, like the emotions, an indefinitely great variety of qualities shading into one another by imperceptible graduations... [colours are] reducible by analysis to a few simple primary qualities... And the same is true of the emotions.

In 1958, Plutchik decided on eight basic emotions: fear, anger, joy, sadness, acceptance, disgust, expectation and surprise. He built on the colour analogy and represented each emotion as a slice of a circle. The circle represented similarity and polarity among the emotions, although the pattern is far from perfect. Similar emotions are next to each other, for example surprise and fear, joy and acceptance, grief and disgust, and so on. Polar emotions are opposite each other, for example, sadness and joy, acceptance and disgust. Plutchik built in a third dimension, depth, in the shape of an inverted cone, to represent the intensity of the emotion. The centre area of the circle represents mixed emotions, the vertical axis intensity - a maximum state of excitement to a state of deep sleep at the bottom. The shape of the model implies that the emotions become less distinguishable at lower intensities (Plutchik, 1990).

Plutchik's reference to the intensity of emotion, particularly in regard to surprise is relevant within context of this thesis because the intensity domain may be related to distraction. Within his theory of emotion, the low intensity domain of surprise is distraction. High intensity is amazement; as the emotion increases in intensity, so too, does the likelihood of the person becoming aware of it. Another way of conceptualising this is in terms of distraction/surprise as an element on a bipolar construct between boring and amazement; obviously the magnitude and direction aimed at in any distraction intervention will be towards the amazement rather than the boring end of the construct.

While many emotion theorists focus on the subjective feelings and bodily perturbations of emotions, Plutchik's teleological view is evolutionary. This explains his emphasis on biological function rather than the emotion *per se*. However, returning to Plutchik's view that the biologic function of joy is to reproduce would suggest that joy has no biologic function in pre-pubescent children, homosexuals, nuns or any other group of people who do not engage in reproductive behaviour. Plutchik's biologic view of emotion also fails to account for a range of complex human emotions such as grief, jealousy or envy; these emotions are clearly not biologic in an evolutionary sense.

In an attempt to deal with this issue in his later writing Plutchik refers to three component models " the *sequential model*, the *structural model*, and the *derivatives model*" (Plutchik, 1998, p. 368, italics original). The sequential model describes a stimulus – appraisal – behaviour – function sequence. The structural model is based on the inverted cone representing the eight basic emotions, their similarities, polarity and varying intensities. The derivatives model is where Plutchik expanded into related areas of psychology, from which he developed circumplex models for personality traits, personality disorders and ego defences (see Plutchik, 1993, 1997, and 1998). Plutchik (1993) listed what he sees as the relationships between what he considered were the eight basic emotions and their derivatives. Table 3.1 is shortened version showing the relevant derivatives for fear, anger and sadness from Plutchik (1993, p. 58).

**Table 3.1**

*Shortened Version of Plutchik's Emotions and their Derivatives*

| Stimulus | Appraisal | Emotion | Behaviour | Function |
|---|---|---|---|---|
| Threat | "Danger" | Fear | Escape | Protection |
| Obstacle | "Enemy" | Anger | Attack | Destruction |
| Loss of valued individual | "Abandonment" | Sadness | Cry | Reintegration |

In considering the emotional component of pain, Chapman (1993) listed Plutchik's eight emotions together with each corresponding behaviour and function and said, "None of these affects relate to pain directly, but, given that Plutchik views emotions as cognitively mediated and future focused, the basic emotion clearly associated with pain must be fear" (p. 84). However, for a patient with chronic pain who is repeatedly rejected and labelled as a malingerer by a range of health professionals, and who wants to be heard and believed, the basic emotion may be anger (Fernandez & Turk, 1995). Similarly, a child too, might react angrily to being repeatedly 'hurt' especially if the child had, quite reasonably, asked the health professional not to hurt her. Of Plutchik's eight emotions, fear is an obvious choice for the emotional component of procedural pain in children. Yet given the appropriate circumstances, so too is anger. Certainly in procedural pain in children, fear and anger, may be present in the child in varying combinations.

The evolutionary and biologic focus limits Plutchik's theory. For example, the emotion matched with crying is sadness and yet an individual may cry 'tears of joy' or an infant will cry when hungry and indeed, a child will cry when in pain or when afraid. The problem is in reducing a complex behaviour such as crying to a single so-called biological and evolutionary function. Plutchik is included in this review because the distraction – amazement dimension of surprise has theoretical and practical relevance regarding distraction techniques to manage fear and pain in children. The *fear – escape – protection* triad also seems relevant to the emotional component of procedural pain in children. However, this approach is very much consistent with the bottom-up, sensory – appraisal view. That is, a danger situation is appraised as 'dangerous' and the response is fear to effect an escape, which, in Plutchik's view, addresses the biological aim of protection, but it has nothing to say about how a stimulus is defined. Later, the constructivist view taken in this thesis will be presented as an alternative to the sensory – appraisal view. Within the constructivist view, a danger situation is dangerous because it is construed that way. If viewed as the negative pole on a bipolar *danger – safe* construct, a danger situation can be reconstrued towards the safe pole. This approach will be explored more fully in Chapters 4, 5 and 6, and in the Discussion, in Chapter 11. However, a number of other theories of emotion demand consideration first.

### *Cognitive Theories of Emotion*

With hindsight, it seems almost inconceivable that emotion could be meaningfully discussed without addressing the role of cognition. In the main, the emphasis in the cognitive theories is on appraisal. Appraisal is seen as more than merely awareness of sensory input; it is an active process that encompasses meaning and a cascade of complex cognitions regarding self, the environment and others. The cognitive theories are located within the bottom-up, sensory – appraisal model where the emphasis is on the brain as an 'end-point' that attaches meaning to the flood of sensory input. One of the main examples of the cognitive theories, originally developed in the 1960s and 1970s is that of Schachter and Singer.

#### *Schachter and Singer's Theory of Emotions*

Schachter and Singer's theory is essentially a contextual cognitive theory of emotion. According to Schachter and Singer, the state of physiological arousal that accompanies emotion is more or less constant in terms of quality. That is, the physiological sensations that a person feels during joy are much the same as the sensations experienced in the other emotions, for example, fear. 'Physiological sensations' in this view are narrowly defined in terms of enhanced sympathetic output. This is reflected in Schachter and Singer's experimental use of epinephrine (adrenaline) to mimic the 'physiological sensations' that accompany emotion. Bodily perturbations of emotion are however far from being prescriptive or consistent, as in, tears of sorrow, grief, laughter and rage; trembling with cold, fear excitement, laughter and joy. For Schachter and Singer, the sensations (sympathetic) experienced upon being told that you have just one a million dollars are much the same as the sensations experienced by the bank teller looking down the barrel of a shotgun during a robbery. The emotions are obviously different in these examples. The reason they are different according to Schachter and Singer hinges on the cognitive appraisal of the situation; that is, the context in which they occur. The 'million dollar windfall' produces feelings associated with an increase in sympathetic activity, as does looking down the barrel of the shotgun. What follows is a cognitive appraisal of the stimulus, which is then labelled with the appropriate emotion. The recipient of the million dollars labels his autonomic arousal with "I'm rich" and the emotion is *joy*. The bank teller labels his autonomic arousal with "I am going to die" and the emotion is *fear*. However, even appraisal in the given context requires appreciation of the respective roles and properties of the weapon.  An arms instructor might have an immediate rush of adrenaline while inspecting the inside of the barrel but having ascertained that the safety catch was on, and the weapon unloaded, is unlikely to experience fear.  A 'Special Air Services' (SAS) officer trained in unarmed combat collecting his pay during the robbery could construe this scenario as an opportunity to practice combat skills, rather than a frightening experience.

According to Schachter and Singer, the emotion intensity is a function of the level of the autonomic arousal.  Winning $10.00 in a sweep at work might produce brief autonomic arousal and a cognitive label of "I was lucky which feels nice". Similarly hearing a knock on the window on a windy night might induce a mild autonomic arousal and an appraisal of concern: "Was that the wind?"

Schachter and Singer's theory presents a view of emotion that has been criticised on a number of grounds.  Kalat (1990) provides a brief synopsis of Schachter and Singer's experiments.  Essentially Schachter and Singer devised an experiment where college students were given injections of epinephrine (a sympathetic agonist) and placed in euphoria inducing or anger inducing situations.  Some participants were told of the physiological effects of the injection.  Those in the euphoria group reported euphoria, those in the anger group reported anger, and those aware of the effects of the injection showed only a slight emotional response.  Schachter and Singer held that the injection induced the state of physiological arousal that was then labelled appropriately according to the situation that the students were in, and that the informed group did not experience emotion because they labelled the physiological arousal as an effect of the injection.  However, Kalat points to subsequent experiments where subjects were given placebo injections (not inducing physiological arousal) and then put into the euphoria and anger groups.  These subjects reported the emotions congruent with the group. According to Schachter and Singer, they should not report emotions because they were not physiologically primed with epinephrine.  Clearly, our cognitions affect our state of physiological arousal and vice versa.  Often we say "I was okay until I started to think about it.  Then the butterflies started in my stomach."  Strongman presents a critique of Schachter and Singer's theory drawing upon the writings of Izard, Leventhal, and Plutchik and Ax.

> The first and most important point is that Schachter has *not* proved that emotion is dependent on sympathetic arousal and cognition. He *has* demonstrated that it is influenced by both, but this could be so whilst it nevertheless remains independent of them. (1987, p.92; italics original)

The criticism is largely directed at the experimental design and proof of dependence. If emotion were independent of cognition and arousal, there would be little left to define. Furthermore, if 'cognition' is defined as a term that includes 'emotion' (Mesulam, 1998, Roth, 2000) then the dependence – independence debate collapses. Plutchik and Ax (cited in Strongman, 1987, p. 92) questioned the reliability of the epinephrine-induced state and the reliability and validity of pulse rate (used by Schachter) as a measure of sympathetic arousal. Another concern with Schachter and Singer's theory is the alleged lack of attention to the relationship between arousal and cognition, that is, when or how arousal and cognition combine in emotion to result in a particular emotional feeling (Leventhal; Leventhal & Tomarken, cited in Strongman, 1987, p. 92).

Apart form the intricacies between arousal and cognition, Schachter and Singer's theory has been surpassed by a number of cognitive theorists, particularly Lazarus (1982, 1984, 1991a, 1991b, 1991c), Lazarus and Smith (1988), who have focussed more on appraisal, and the social aspects of emotion (Kemper, 1993; Oatley, 1993; Oatley & Jenkins, 1992; Oatley & Johnson-Laird, 1987).

### *Lazarus and the Role of Appraisal in Emotion*

Appraisal is central to the cognitive theories post Schachter and Singer. Strongman (1987, p. 96) on appraisal states, "Essentially, appraisals are viewed as the cognitions which intervene between stimulus and response in emotion… An appraisal is a hypothetical construct which allows us to give some 'meaning' to our environmental situation". Within the traditional view, Strongman sums up Lazarus on appraisal by stating:

> Lazarus suggests that there are two broad types of appraisal: benign and threatening. Benign appraisals have three possible adaptive consequences… automatic coping may occur without emotion… the type of response we may make when crossing the road… A benign stimulus may provide us with more information such that it requires reappraisal… sight of a favourite dish to a hungry person being reappraised on discovering that it has been burnt… [and] Positive emotional states may follow from benign appraisals… Lazarus suggests further that threatening appraisals involve two possible processes. The primary process deals with an evaluation of threat or non-threat and the secondary deals with how to cope with the threat. (p. 99)

In applying Lazarus' primary process appraisal to the context of a child undergoing a painful procedure the primary process is "I am in a threatening situation". In this scenario, the primary appraisal is amplified when the secondary appraisal – how to cope with the threat – reveals no solution other than resistance, which is overpowered by restraint, and screaming that is ignored.

### *Knowledge and Appraisal*

A common clinical assumption about procedural fear in children is that the child is afraid because he or she knows what is going to happen. Lazarus and Smith (1988) hold that knowledge by itself is not the cognition that produces emotion. Furthermore, they distinguish between knowledge and appraisal as separate cognitions and stress that appraisal is what is necessary for an emotion to ensue. Knowledge and appraisal are not the same. In the healthcare setting, a traditional assumption is that there is no difference between knowing and appraising. An example is the unethical practice of withholding medical information from patients, children and adults alike. When death is approaching, the assumption is that it is 'better' if the person does not know his or her prognosis if it is poor. The problem with this assumption is that knowing and meaning are not only assumed to be the same, the health professionals, and sometimes the family, consider that they are the authority on what the child or adult will feel in knowing that death is approaching. Lazarus and Smith (1988) stress the importance of differentiating between knowledge and appraisal:

> In a nutshell, *knowledge*, whether concrete and primitive or abstract and symbolic, consists of cognitions about the way things are and how they work. In contrast, *appraisal* is a form of personal meaning consisting of evaluations of the significance of this knowledge for well-being. (p. 282, italics original)

On the nature of appraisal, Lazarus and Smith (1988) hold that

> In emphasising the distinctions between contextual knowledge and appraisal, and the dependence of appraisal upon knowledge, we are in no sense implying that the appraisal process follows predefined sequences or stages... Nor do we imply that the cognitive processes involved are necessarily conscious, verbally accessible, deliberate, or rational. (p. 285)

Knowing in this context relates to conscious awareness. However much of the emotion activity in the brain is below the level of consciousness. This issue will be expanded in Chapter 6 on the nature of consciousness, emotion and imagery**,** which suggests that an emotion such as fear can at least begin before the eliciting input is consciously known. For a child undergoing a painful procedure, knowledge of the procedure, that a needle and syringe are used to take blood from the arm, is not what produces the fear response. If it were, all children who knew a syringe and needle are used to take blood would be afraid. They are not all afraid. Within the bottom-up, sensory – appraisal view, it is the child's appraisal of impending harm to self that produces the emotion, the fear. Pre-procedural medical play, that is, allowing the child to play with the equipment has been shown to reduce procedural anxiety (Hatava, Olsson & Lagerkranser, 2000). It is possible that medical play allows a child to become familiar with the equipment – more knowledge, but this also provides an opportunity for the child to reconstrue his or her reality for example through role-play. Herein lies a subtle but important difference between appraisal of sensory input and actively constructing the reality to which one responds. This will be developed further.

Returning to the child undergoing a painful procedure, the child does not rationally think "I am in a situation of potential harm to self therefore I am afraid." The child may be worried and un-trusting, something is wrong. For a child who has never had a procedure, it could simply be the 'unknown' that is alarming. This may be reinforced by the overt behaviour of those present (in the extreme – physical restraint of the child), or the covert, for example, using language that the child does not understand. Most of this is registered below the level of conscious awareness. Within the appraisal model, whether or not the wariness escalates to fear, depends upon the attributed meaning for self. Knowledge of the procedure is a factor in producing emotion; but alone, it is not enough. Furthermore, within the constructivist paradigm, if the child's sense of self can be reconstrued to a non-threatening context then even with knowledge of the procedure, it should be possible to reduce or even negate the child's fear. Parents and health professionals should not give up, or assume that a procedure will be distressing simply because "She knows what is going to happen."

Over the past 20 to 30 years, many researchers in emotion have focused on the role of cognition from various points of view. Even if cognition is not considered central, it is at the least considered as an integral part of emotion. The study of emotion, like pain, is best served with a multidisciplinary approach. Whereas the early physiological theories on emotion tended to focus on the bodily responses and the cognitive theories on the mind, the social theories centre on relationships. The social theories by no means exclude cognition. Indeed appraisal is an integral component of these theories but the emphasis is on an appraisal of self in relation to another individual or group. Lazarus and Smith (1988) emphasized the importance of appraisal, but only within the nexus of self and environment. Social theories take appraisal to the social level where the focus is on the relationships between self and others. The impact and relevance of the social setting in emotion is the focus of the social theorists (Kemper, 1978, 1991, 1993, 2000; Oatley & Johnson-Laird, 1992) that will now be considered.

### *Social Theories of Emotion*

Chapman (1993) said, "The emotional expression of pain in the presence of supporting persons is *socially* powerful; it draws on a fundamental sociobiologic imperative, communicating threat and summoning assistance". (p. 86 italics added). Certainly, if for example, a child slips and falls over while playing basketball, and injures her knee, the immediate social group comprising, teammates, referees, parents and coach, respond appropriately by showing concern and assisting her. However, the reaction to the emotional expression of procedural pain is qualitatively, socially and culturally different to the expression of all other types of pain. Procedural pain occurs in a situation where one person is allowed to inflict pain on another. In many procedure rooms to this day, people do not act 'normally', in any other setting, such actions would attract charges of child abuse. The 'social' aspects of emotion in relation to procedural pain cannot be ignored.

Philosophical hegemony of the understanding of emotion has given way to various disciplines including sociology, neurophysiology and psychology, with each putting forward theories of emotion based on bodily responses and alterations to the human psyche. Although neurophysiology and psychology have much to offer in understanding emotion, the sociologists argue that such an approach is incomplete and narrow, and ignores the fact that humans are social beings in a world shaped by social interaction and culture.

Kemper (1991) provides an introduction to the sociology of emotion and illustrates the tension between the disciplines on the topic of emotion:

> At an international, interdisciplinary meeting on emotions a few years ago, I spoke to a plenary session on the topic, "What psychologists, psychophysiologists, and sociologists have to talk to each other about". I proposed that a complete theory of emotions required an integrated set of understandings about body, psyche, and society, and that a dialogue must take place between practitioners in these areas in order to enable such a theory to be constructed. In the question period one psychologist vigorously attacked my position, maintaining that any putative social basis for emotions could be reduced to psychology, thus the sociological contribution was extraneous. (p. 301)

While some researchers and clinicians remain territorial in their thinking, others have moved beyond the restrictions and limitations of their own discipline. Emotions are clearly complex phenomena that cannot be explained in uni-disciplinary terms. As Oatley and Jenkins (1992) argue, " Of all topics, it seems to us, understanding of emotions needs a multidisciplinary approach"(p. 56.). When a child is subjected to a medical procedure, it happens in a social setting. According to Oatley, Johnson-Laird (1987), emotion can be viewed as a means of communicating to the social group. Alternatively, emotion occurs because of introspective appraisal of the social interaction between self and other. Kemper takes this approach.

### *Kemper: Power and Status in Emotion*

Kemper holds that a cause-effect relationship presides in emotion. For Kemper, emotions derive from interactions between self and other, where each is an active participant.

> Undeniably we experience fear, anger, joy, sadness pride, guilt, shame, nostalgia, hope, hate, desire, contempt, and other emotions in consequence of what our interaction partners do to us and what we do to them. (Kemper, 1990, p. 307)

Kemper acknowledges the importance of appraisal in emotion but stresses that appraisal is socially based and derived from an individual's perceived power and status level in the social interaction. Concisely, Kemper places great significance on the power and status level in social relations and holds in many cases, the nexus between each other's power and status causes emotion. In his words:

> … I have proposed that social relations can be usefully expressed in two dimensions, "power" and "status," and that a very large number of human emotions can be understood as responses to the power and/or status meanings and implications of situations. (Kemper, 1993, p. 42)

Here, Kemper goes beyond the cognitive theories by asserting that emotion flows from an individual's cognition of his or her power-status interaction with another human (social) being. This is an interesting view of emotion in regard to relationships between individuals but extreme because of the emphasis on social interaction. For example, Kemper's view has little to offer in understanding the fear an individual may experience during a thunderstorm or a close encounter with a venomous snake or spider. In terms of social interaction, Kemper offers the following definitions of power and status:

> Power is understood as a relational condition in which one actor actually or potentially compels another actor to do something he or she does not wish to do... Status, on the other hand, is understood as the relational condition of voluntary compliance with the wishes, interests and desires of another person. One actor accords status to another through acts of recognition of the other's value. These include considerateness, sociability, caring, respect, esteem, and, at its ultimate, love. (1993, p. 42)

Applying Kemper's power and status view of emotion to a child undergoing a painful procedure suggests that the child's fear goes far beyond the needle. A deeper understanding of the so-called 'needlephobic' child and indeed the contribution of the health professional to the child's fear is revealed. An analysis of the power-status relationships involving the child undergoing a painful procedure emphasises that the balance of power lies with the health professional. In Kemper's terms the health professional exercises his or her power over the child by forcing the child to do something he or she does not want to do (have the procedure). This alone will instil fear in the child even before the so-called stimulus (needle) is produced. The mechanism underlying the fear-power axis, according to Kemper (1993), is an increase in the other's power, which has the same effect as a decrease of one's own power, and the emotion that results is fear or anxiety. The reasoning underlying the fear in this situation rests on the child's appraisal or meaning of the situation. Kemper said that emotions could be understood as responses to the power and/or status meanings and implications of situations. For a child experiencing procedural pain, to lose power means to lose control, to be vulnerable. To summarise, the health professional is all-powerful, the child is powerless; the child construes a power differential, and the resultant emotion is fear.

Kemper's second relational condition is status. To recapitulate, Kemper said that in according status, there is voluntary compliance with the wishes, interests, and desires of another person. Furthermore, status is accorded to another person through acts of recognition of the other's value. On one level, a health professional with many years of experience in caring for children could argue vehemently that he or she values children, is considerate, has respect for children, and is sociable. However, what really matters is how the child construes his or her own status. From the child's viewpoint:

> I told you that I did not want to have that needle but you did not listen, you did it anyway. You obviously don't care what I think or say. You are not being considerate. Nice people don't hurt me. You hurt me…

If the child perceives that his/her status is low because his/her wishes, interests and desires are being ignored by the health professional, then the emotion that will emerge will, according to Kemper's theory be, anger. The issue of who is responsible for the relational outcome is important because it will affect the outcome. Kemper argues:

> Emotions will ensue depending on the particular power and status outcomes, as well as on the factor of "agency" – namely, the attribution of who is responsible for the relational outcome (self, other, or a third party).... Decrease in status leads to anger if the agent is other, shame if the agent is self, and depression if the situation is deemed irremediable. (1993, p. 42)

Presumably, the status level of the other person is also important. If the child had no respect for the health professional and, by Kemper's definition, therefore, the health professional has little status, the impact of the health professional's attitude will be significantly less. However, low status of the health professional is unlikely to be the case for children receiving treatment. More often than not, the health professional is perceived by the child as a special person, an expert, and an authority. These attitudes are shaped by culture and for the child, often reinforced by his or her parents. In most situations, the health professionals are guaranteed status, provided they look as if they know what they are doing, and fear is a more likely outcome.

An important related issue impacting on the child in the procedure room is solidarity between the mother and the child. In daily life, solidarity would be high but if the child perceives that solidarity with the parent has been lost in the procedure room then the consequences could be anger or fear. If the child's construct of the mother not coming to the rescue amounts to a sense of betrayal, then the emotion is likely to be anger. However, if the child's construct of the mother's inaction reveals powerlessness in the mother, this will add to the sense of abandonment and the emotion will be fear.

‘There is nothing that I can do to stop this but even worse, Mum can’t do anything either’.

### *Oatley and Johnson-Laird*

Oatley and Johnson-Laird’s theory is described as a communicative theory (Strongman, 1996). It could also be described as computer-based, cognitive, evolutionary, biologic and social because it draws upon all of these dimensions. Essentially Oatley and Johnson-Laird hold that emotions are signals to the self and the social group. Emotions occur when goals or sub-goals that are desired by the individual are met, giving rise to positive emotions, or not met, giving rise to negative emotions. As signals to the individual and group, emotions are seen as a survival mechanism and motivational system for all mammals including humans.

> Emotions enable social species to co-ordinate their behaviour, to respond to emergencies, to prioritise goals, to prepare for appropriate actions and to make progress towards goals. (Oatley & Johnson-Laird, 1992, p. 206)

Prioritising goals and preparing appropriate actions to respond to emergencies for the benefit of the social group fits with fear but has less to offer regarding the other emotions. Realistically, in the emotional experiences of daily life, most people do not have to respond to emergencies or signal danger to the social group. Oatley and Johnson-Laird see emotions as a necessary way of achieving this emergency response. Necessary because they argue that mammals and humans have “... only limited abilities to cogitate” (p. 206). For Oatley and Johnson-Laird, if faced with an emergency, perhaps a threat, the individual or group needs to respond quickly and there may not be time to think through a sequence of logic: A is happening which is likely to cause B and perhaps C, I had better do D otherwise E might happen. Lazarus and Smith would refer to this as ‘appraisal below the level of conscious awareness’ and say that it occurs almost instantaneously. Oatley and Johnson-Laird (1987) use the term cognitive to include psychological activity both at, and below, the level of consciousness. Not wishing to contribute to the debate on which comes first cognition or emotion, they state, “We do not claim that all emotions derive from thinking. Some do and some do not” (p. 30).

Oatley and Johnson-Laird (1987) describe two distinct communicative cognitive processes: propositional and non-propositional. They hold that propositional signals come from high-level conscious operating systems and that these are only required in complex emotions. They cite jealousy as an example of a complex emotion comprised of anger and fear. For Johnson-Laird and Oatley, (2000, p. 466) "… the emotions we call "complex" always involve at least one basic emotion, together with an evaluation of the self in a social situation". The social aspect is illustrated with reference to the social and cultural variations among the Todas of India described by Hupka (cited in Johnson-Laird & Oatley, 2000, p. 466) where a situation provoking jealousy in the West does not elicit the same effect amongst the Todas.

Oatley and Johnson-Laird (1987) hold that 'basic' emotions result from non-propositional signals, which are unlike propositional signals:

> They do not denote anything. Like hormones, they function purely causally. They propagate globally among the processors to set them into specific modes at particular junctures of multi-goal planning sequences. (p. 32)

Central to Oatley and Johnson-Laird's theory is the notion of the brain as a computer. They refer to modules – autonomous processors that compute data once activated by non-propositional signals. At a neurophysiological level in the case of fear, the amygdala, in Oatley and Johnson-Laird's view, would be one of these autonomous processors and its afferent innervation, the non-propositional signals. The non-propositional signals they say, "sets the system into one of a small number of emotion modes" (Oatley & Johnson-Laird, 1987, p. 33). In respect to the amygdala, the emotion mode would be fear. For Oatley and Johnson-Laird, emotions serve to speed up the cognitive processes in the brain that transpire between input and output by functioning at the non-propositional level. In this sense, emotions are cognitive signals. They call into question the reliability of rational thought given the urgency of the task. Their emphasis however, is more on emergency response than the broad spectrum of emotional nuances.

> Emotions guide individual and group behaviour. Social mammals are unable to determine the best course of action at many of the junctures in their lives. Even in humans, the resources for rational thought are often too slow and too error-prone to solve this problem. The function of emotions is accordingly to bridge the gaps of rationality. (Oatley & Johnson-Laird, 1992 p. 206)

Essentially, for Oatley and Johnson-Laird, emotions are the monitoring or controlling signals between goals, cognition and actions. They come from (at least initially) below the level of consciousness and are modified by higher (conscious) cognition involving appraisal of self, society, setting, culture and so on. The demarcation between non-propositional and propositional cognitions may however be less precise than Oatley and Johnson-Laird advocate. The rush of joy when a primary school child is told who she will be sitting next to for the term because that person happens to be her 'best friend' and even more importantly, is not a 'boy', are examples of propositional cognitions. It is also difficult to discount the propositional cognitions that may race through a child's mind and the rising fear as she lies in bed waiting to be taken back to the procedure room for the morning dressing of a wound. The suggestion here is that emotions can result from propositional and non-propositional cognitions, which are analogous to Lazarus' conscious and subconscious appraisals. At a basic level, Oatley and Johnson-Laird's view is not unlike Plutchik's psychoevolutionary theory, which emphasises the relationship between emotion, behaviour and function but it is not limited to a biologic and evolutionary view. Oatley and Johnson-Laird emphasise the sociality of emotion and use a computer systems model to describe cognitive-emotion processes below the level of consciousness and, at a more complex level, they allow for 'rational' or propositional modifiers. Indeed, Kemper's emphasis on perceived power could be considered in Oatley and Johnson-Laird's model as a propositional cognition involving appraisal of self and setting, which would, in their terms, add to the complexity of the emotion. While it is unlikely that the conscious propositional cognition would be "I am powerless", the gist would be realized through the lack of control. At a basic level, the sensory aspect of the pain would be a non-propositional signal, which sets the emotion system in action. This could then be amplified by a range of propositional cognitions such as a sense of powerlessness, inability to escape, and that nobody is listening. It is possible that the propositional appraisal precedes the non-propositional. A child who is experiencing a high level of pre-procedural fear could, for example, be focussed on a perceived lack of control, which like a pre-amplifier would boost the response from the non-propositional signal. This could account for the progression from an underlying (non-propositional) fear to full blown terror, generally operationalized as distress. Moreover, interventions such as distraction and imagery may operate at the propositional level pre-procedurally and during the procedure by facilitating a construed a sense of control, power and escape

As fear is the dominant emotion in children during medical procedures, Oatley and Johnson-Laird's theory has some relevance. The primary goal is protection of self from harm. The emotion signal is fear; internally it initiates an action plan of escape and externally it sends a signal to the social group who recognise the signal - facial expression, cry, and tremor. The problem for the child is that in the case of procedural pain and fear, the social group are the source of the fear. They recognise the signals but they press on regardless.

### *Summary*

This chapter has reviewed a number of theories of emotion from different disciplines and has revealed considerable variation within and between disciplines on the psychological and social nature of emotion. The aim of this chapter was to explore the psychology of emotion in relation to the fear experienced by children undergoing painful medical procedures and in so doing, to lay the groundwork for the discussion of the psychological aspects of the proposed model of the effects of imagery and distraction on procedural fear presented in Chapter 11. The origins of psychology are in philosophy and this is where the early writings on emotion are recorded. The most important factor that can be traced back to the early Greek philosophers and which continues to influence modern thinking on emotion is the dualism of mind and body. Emotions were seen as belonging to the body and believed to obstruct rational thought and spiritual development. Emotions are certainly accompanied by bodily sensations and as knowledge of anatomy and physiology developed through the 19$^{th}$ century, it was not surprising to find that James and Lange and later Cannon and Bard, focussed on the physiological rather than the cognitive aspects of emotion. The physiological approach is limited because of the primacy of sensation and failure to consider the role of cognition or the impact of social factors. For Plutchik, the emotions and their corresponding behaviour are important survival and evolutionary phenomena. In the case of fear, the behaviour is escape to ensure protection and survival. The clinical reality of a child withdrawing and then thrashing and fighting against restraint suggests that the need to escape is relevant to procedural fear.

From the cognitive theories on, Lazarus has stressed the role of appraisal. While the emphasis shifts from one theory and discipline to another, appraisal is a consistent theme. Lazarus would stress that the child's knowledge of what is going to happen is not sufficient for the emotion. What is required is appraisal, conscious or subconscious, which attributes meaning to the situation (harm to self), and the emotion follows the cognition. In the social realm, Kemper's view is extreme in that emotions are reduced to phenomena that are dependent upon the balance of power and status between individuals. However, given the low status and powerlessness of children in the procedure room, Kemper's views seem relevant. Any intervention that gives the child some sense of power and status will effect a reduction in fear according to Kemper's theory. Plutchik's emphasis on the need to escape in fear and Kemper's view on power can be incorporated into Oatley and Johnson-Laird's model as propositional cognitions. The interaction between imagery and the amygdala via polymodal association areas described in Chapter 2 is a pertinent example of one such non-propositional mechanism that may operate, and indeed modulate an emotion such as fear within Oatley and Johnson-Laird's model of emotion. In this chapter, the cognitive process of appraisal was central to the main theories of emotion, in the next chapter, the cognitive process shifts from appraisal or 'bottom-up' processing to a 'top down' process, that is, a construing of reality. The relevant field in psychology that supports this element of the theoretical framework is Personal Construct Psychology.

# CHAPTER 4

# CONSTRUCTIVISM

The previous chapter focussed on the psychology of emotion in relation to fear. This chapter will broaden the discussion of pain and emotion through an analysis of the constructivist perspective in psychology.

There are many approaches and applications of constructivism in a diverse range of fields including psychology, neuroscience, sociology, education, computer systems and mathematics to name just a few. In this chapter, the philosophical basis of constructivism is reviewed and criticised before examining the constructivist view adopted in this thesis – Personal Construct Psychology (PCP) of Kelly (1955).

## *An Introduction to Constructivism*

Constructivism is a way of viewing the world that addresses both knowledge (epistemology) and being (ontology) (Mahoney, 1988; Neimeyer, 1993, 1996). To construct something means to build, to put the pieces together, and when the process is complete, whatever it was that was constructed is there to be seen, it exists, at least for a time. Whatever is constructed can be pulled down (deconstructed) or modified (reconstructed). In psychology, the term constructivism refers to the notion that humans gain knowledge about the world, themselves and others in the world through a process of mental construction, the act of which is referred to as 'construing'. In the previous chapter on the psychology of emotion, much was said about appraisal, particularly in relation to the cognitive and social theories. While construing and appraisal seem similar, the two differ in terms of direction. Appraisal is an intermediary between stimulus and response. Appraisal fits with the notion of attaching meaning to 'upstream sensory input', that is, it is the essential cognitive process in determining emotional, physiological and behavioural responses. An assumption underpinning the theories discussed in the previous chapter is that there is a knowable objective reality, the appraisal or personal assessment of which, conscious or unconscious, precedes the emotional response. However, for the constructivist, the process of construing is active and involves a feed-forward process. Reality is not subject to sensory appraisal; each of us actively constructs our own sense of reality. It is worth noting the emergence of constructivist language in neuroscience, specifically in regard to top-down modulation of bottom-up sensory input (Courtney & Ungerleider, 1997; Greenfield, 2000; Hugdahl, 2000; Frith, 2001; Mesulam, 1998; Pally, 1997). For example, Greenfield (2000) posed the problem of understanding the neurophysiology of vision in constructivist terms.

> How can we find out how our eyes and brains collaborate to create the sense of vision *that makes up our own version of reality?* … For every connection carrying information from the eyes, there are at least ten coming in exactly the opposite direction from the higher areas of the brain. (p. 73 and 79, italics added)

Here Greenfield is emphasizing the role of top-down processing in vision. She goes on to reject the Cartesian notion of the brain as a mere receiver of sensory input.

> There is far more to the senses than the brain acting as a mere sponge to the flood of light, sound, taste, smell and touch sensations coming from the outside world. (Greenfield, 2000, p.79)

It is difficult (at least neurologically speaking) to consider reality outside of our conscious awareness. The primacy of neural functioning in constructing what we are aware of both externally in the sensory world and internally in the inner world of the mind is the view held by Crick and Koch (2000) who place great emphasis on consciousness as awareness of our sensory representations. Reality and consciousness are discussed with imagery in Chapter 6 but for now, the emphasis is broadly on constructivism and the notion that reality is construed rather than being concrete. An example of the diversity of reality in a group of people is the individually construed reality of flying in a large passenger jet aeroplane at an altitude of 10,000m. Presumably, all the passengers have the knowledge that they are in an aeroplane but the reality of 'being in an aeroplane' in the constructivist view is not a given; each passenger constructs his or her own 'practical' reality. For some, "I am seated in a large room, which is a bit like a restaurant, with many other people and the very polite serving staff bring us food and drinks." For another, "I am attached to a fuel tank with wings; I am surrounded by highly flammable aviation fuel and there is only a thin metal skin between me and the solid ground 10,000m below me." Some passenger aircraft are equipped with small monitor screens staggered along the underside of the overhead storage compartments. During take-off and landing, a camera projects the view from the front of the aircraft – a disturbing experience for some passengers because the projected visual field is inconsistent with the passenger's construed reality. Similarly, many people prefer to fly in large rather than small aircraft. The larger the aircraft, the easier it is to construe one's own reality.

Another pertinent example is the construed reality of a trip to the dentist. For some, the dentist's surgery is a frightening place, and dentists really are nasty people. They are to be avoided until the pain of a toothache forces an appointment. While for others, being in the dentist's surgery is of no more concern than an appointment with the accountant. The point is that for each individual, the nature or reality of a dentist's surgery depends upon his or her own personal construing of "the dentist's surgery". As Mahoney (1988, p. 3) said, "We are literally cocreators of the realities to which we respond". For the constructivist, we do not awaken each morning and stumble through a predetermined and fixed reality. Each of us actively creates/constructs our own reality and as we stumble along, we discard some aspects, construe and reconstrue others and in doing so, we constantly shape and re-shape our own version of reality.

The above illustrations reflect the variability in personal constructions around a spatial and interpersonal reality. Regarding the individually construed reality of interpersonal relationships, the relationship between the health professional and child is a pertinent example. Comments about children (and parents) are sometimes delivered as if a statement of truth, of what is 'real'. For example, "It is obvious what is going on here. John, like many children at his stage in development, is difficult, manipulative, calculating, and lacks insight." A statement such as this is nothing more than a personal opinion and yet the health professional may argue adamantly that John 'really is a nuisance', and if others share this view, it becomes the 'reality'. However, within a Personal Construct view, the difficult and manipulative reality of John is only real to the health professional because he or she construes him as such. It is unlikely that every health professional, teacher, adult or child who encounters John shares the same reality.

This introduction to constructivism began with a philosophical statement about epistemology and ontology that is, about knowledge and being. The origins of constructivism lie in philosophy. The following is a brief review and critique of the philosophical origins of constructivism. The intent is to illustrate the basis upon which this perspective stands.

### *Philosophical Origins of Constructivism*

According to Mahoney (1988), the philosophical underpinnings of constructivism did not appear in Western thought until Vico's *Scienza Nuova* in 1725. At this time, the Cartesian mind-body dualism was the dominant paradigm. Mahoney (1988) states:

> Vico opposed the Cartesian dualism between thought and extension. He began by asking how it came to be that the human mind could have evolved its capacities beyond those of animal mentality, and concluded that it was the power to transcend immediacy that gave rise to our symbolic abilities… He recognised the "conceit of scholars" in having assumed that human knowledge and knowing processes had been adequately rendered by the classics… The cornerstone of his "new science" was the concept of "imaginative universals" (*universali fantastici*): "that is, imaginative class concepts or universals, to which… to reduce all the particular species which resembled them" (Vico, 1725/1948, p.74)… His concept of imaginative universals did not imply a "bottom up" induction process so much as a "top down" constraint on experience. (p.13)

Modern constructivism is exemplified in what Mahoney describes as the shift from a "bottom up", sensory based knowing of the world to a "top down" construction of reality. The origin of this paradigm shift is in Vico's writings. Mahoney sums up the connection between Vico and constructivism with:

> Vico's contributions to constructive metatheory stem from his recognition that "knowing" is not a form of disembodied intellectual reflection but, rather, and active and embodied engagement with life's challenges. Anticipating the constructive emphases of Piaget, he argued that "to know" is "to make". (p. 15)

With the origins of constructivism in Vico's writings, Mahoney reveals the next step in the philosophy of constructivism was to transcend the epistemology and ontology debates in modern philosophy. Ontological arguments are about the nature of being or theories of reality; they are sometimes referred to as existential, that is, relating to existence. On the other hand, epistemological arguments are about the nature of knowledge, specifically, "What is knowledge?" and, "How is it that we know what we know?" On the first of these arguments, ontology, Mahoney points out that the thrust of the debate has been between realism and idealism and, furthermore, scientists and historians of science frequently misuse these two terms. In order to consider the ontological basis of constructivism or indeed to make any meaningful comment about ontology in the philosophy of science one must be clear at the outset on the difference between realism and idealism. Mahoney (1988) draws upon Hirst for a straightforward distinction:

> [Realism is] the view that material objects exist externally to us and independently of our sense experience. Realism is thus opposed to idealism, which holds that no such material objects or external realities exist apart from our knowledge or consciousness of them, the whole universe thus being dependent on the mind or in some sense mental. (Hirst, 1972, p. 77)

Philosophers who have held the realist view include Bertrand Russell, William James and G.E. Moore, whereas the idealists include Berkeley, Kant and Hegel. The problem with any dichotomy is that the answer, and it is assumed that there is an answer, must lie at one end or the other.

The other main debate in philosophy is epistemological, that is, it is about knowledge. As the ontological debate is dichotomous, so too is the epistemological debate. On one side is rationalism and on the other is empiricism. The rationalist view is that knowledge of the world ‘out there’ can only be known by reasoned, that is, logical thought. Major rationalists include Descartes and Spinoza. Empiricism on the other hand, holds that all knowledge is based in experience. That is, we ‘know’ what know because of our experience of it. John Locke is credited with the origins of empiricism, the counter argument in Britain to the Continental rationalist views of Descartes and Spinoza.

Constructivist philosophy aims to transcend the traditional realism-idealism and rationalism-empiricism dichotomies. Whether it does, or not, or indeed if such a transcendence is possible are matters of ongoing philosophical debate. Mahoney (1988) identifies the inadequacy of the realism-idealism and rationalism-empiricism dichotomies and holds that constructivism moves the debate to another critical level through an analysis of the philosophy of Kant. Essentially, as an idealist, Kant criticised the empirical belief that all knowledge is experiential. Moreover, the link with constructivism is that Kant drew attention to the role of the mind in shaping knowledge. On Kant and constructivism, von Glaserfeld (1995) states:

> Kant’s analysis of the rational domain then confirmed the inaccessibility of anything posited beyond the reach of experience and maintained that the world we understand and live in becomes real to us, because we complete the picture by means of rational heuristic fictions. (p. 49)

Mahoney too makes a clear connection between Kant and the philosophy of constructivism.

> While agreeing that all knowledge begins with experience, he challenged the idea that all knowledge is based in experience. For Kant, sensation must precede and provoke the operations of thought, but once sensation has begun it is immediately moulded by the cognitive categories that constrain our knowing. (Mahoney, 1988 p. 19)

There is however, a problem with internal consistency in what Mahoney is saying about Kant and indeed with Kant’s reasoning. One cannot be, on the one hand, anti-empiricism and on the other say, “sensation must precede and provoke the operations of thought". The latter part of this quote drew the constructivists to Kant, "once sensation has begun it is immediately moulded by the cognitive categories that constrain (or as the constructivists would say construe) our knowing". An analogy in brain neuroscience is the notion of top-down processing, the closest neural correlate of construing.

While Mahoney holds that constructivism reframes the old ontological and epistemological arguments, Matthews (1992) argues that constructivism is essentially empirical and Aristotelian.

> Constructivism maintains the widespread, commonsensical, subject-centred, Aristotelian-empiricist epistemological paradigm, and by correctly pointing to a major error in empiricist assumptions, it then swings to a relativist epistemology without abandoning the paradigm itself. The relativist conclusion only follows *within* the empiricist paradigm, if this paradigm is rejected – and there are good reasons for so doing – no such relativist epistemological conclusions follow, and certainly no idealist ontological conclusions follow. (p. 1)

Matthews (1992) is by no means anti-constructivism, he acknowledges the value of constructivist theory particularly in teaching. Matthews merely points out what he believes to be an epistemological inconsistency in constructivist theory and argues that constructivism has not transcended the doctrine of empiricism.

According to Mahoney (1988), the next figure in the origins of constructivist philosophy is Vaihinger (1852-1933). The essence of constructivism is in Vaihinger's writing. Vaihinger implies with his 'As if' world that we constantly construct ideas about the world and then seek to validate or invalidate them in terms of what is real. However, the problem for constructivism in this statement is that, on the one hand, realism is denounced while on the other, it appeals to 'reality' to confirm or refute thought constructs. Fundamentally, reality cannot be considered a construct in the mind of the individual and at the same time a gold standard against which constructs are measured. Mahoney (1988) sums up the process of thinking in Vaihinger's 'As if' mind as a series of ideational shifts whereby some ideas pass through three stages of development, from the fictional, through the hypothetical, to the dogmatic. The cognitive process in Vaihinger's philosophy of mind within the constructivist framework is construing. The idea, be it a fiction, hypothesis or truth is a construct which can be reconstrued in either direction. According to Vaihinger, the idea is never lost, even if it was at one time perceived as a truth and then reconstrued to a fiction, it has not vanished; the idea exists but its validity may have shifted. Furthermore, because the process is dynamic, a fictional idea could again become a truth. An example would be shifting religious faith. As a child, an individual may be 'raised' within a particular faith and have a religious construct that is held as a truth. This truth may be discarded in adulthood. The religious construct does not disappear, it exists as a fiction, which may or may not be reconstrued in later life to a hypothesis or even again as a truth. This example illustrates many aspects of constructivist theory, which leads to Kelly (1955) and Personal Construct Psychology.

### *Kelly: Personal Construct Psychology*

In 1955, George Kelly published *The Psychology of Personal Constructs*. It heralded the beginning of an approach in psychology, which, to this day, remains controversial. That is nothing new; a controversial theory could be defined as a theory that is outside the accepted, dominant paradigm or culture. Given the persistence of Cartesian dualism as the dominant paradigm in the social sciences (Capra, 1983), it is not surprising that Kelly's theory remains on the outer of mainstream psychology, a view supported by Sarbin and Kitsuse (1994, p. 5) who said, "The prevailing mechanistic world-view has favoured the competing perspectives – psychoanalysis and learning theory". Despite this, there have been 14 biennial 'International Congress on Personal Construct Psychology' meetings throughout the world and there is an extensive and ongoing literature and research base and clinical focus in the field.

Personal Construct Psychology is based on a holistic theory of the person whereby, in Kelly's view, each individual creates his or her own way of seeing the world. Kelly based his theory on the philosophical premise that our version of reality is constructed by each of us in our own unique way. This is an idealistic view that PCP shares with Kant, but Kelly's background was in science, and his theory also has a scientific, and certainly empiricist, flavour. He viewed the individual as a scientist, each with his or her ideas or views about the world, which are tested out rather as the scientist tests his or her hypotheses.

> The long-range view of man leads us to turn our attention toward those factors appearing to account for his progress rather than those betraying his impulses. To a large degree – the blueprint of human progress has been given the label of "science." Let us then, instead of occupying ourselves with *man-the-biological-organism* or *man-the-lucky-guy*, have a look at *man-the-scientist*. (Kelly, 1955 p.4 italics original)

Kelly's emphasis is on a (pro)active individual seeking to predict a changing world, Vaihinger's 'As if' world where ideas shift between fiction and truth. Kelly likened this process to the scientific method and suggested that this process underpins the manner in which we construe and reconstrue reality. Not straying for the moment from Kelly's sexist language: Man-the-scientist could be seen as an empiricist in the scientific tradition, that is, construing and then reconstruing, or not, as the case may be, based on impressions and judgements that can only be constructed because of the feedback gained in experience. Kelly said:

> Man looks at his world through transparent patterns or templates which he creates and then attempts to fit over the realities of which the world in composed. The fit is not always very good. Yet, without such patterns the world appears to be such an undifferentiated homogeneity that man is unable to make any sense out of it. Even a poor fit is more helpful to him than nothing at all. Let us give the name *constructs* to these patterns that are tentatively tried on for size. (p. 9, italics original)

Kelly's phrase, 'the realities of which the world is composed' strikes a chord of realism. Either reality exists in this argument in a known and predictable form or it is created. Constructivists favour the latter but as Matthews (1992) points out, there are strong arguments that constructivism is essentially empirical. Presumably, the judgements Man-the-scientist makes when he tests his constructs are in relation to his interaction with his environment, that is, they are inextricably based on experience, the central tenet of empiricism. Essentially, what Kelly is saying is that our actions, inactions, passions, thoughts, feelings and all aspects of being human exist within a reality that we co-create through, and is represented in, our constructs.

### *Constructs and Construing*

At first glance, constructs are ways of seeing the world, ideas, impressions or perhaps concepts.  Kelly has much to say about what a construct is, and indeed, what it is not.  The term is complex and defies a simple definition.

> They [constructs] are ways of construing the world.  They are what enables man, and lower animals too, to chart a course of behaviour, explicitly formulated or implicitly acted out, verbally expressed or utterly inarticulate, consistent with other courses of behaviour or inconsistent with them, intellectually reasoned or vegetatively sensed. (p. 9)

A construct has a similarity – contrast dimension, and a range of convenience.  Kelly illustrates this point with a construct of tall versus short.

> One may construe tall houses versus short houses, tall people versus short people....  But one does not find it convenient to construe tall weather versus short weather, tall light versus short light or tall fear versus short fear.  Weather, light and fear are, for most of us at least, clearly outside our range of convenience of tall vs. short.  (1955, p.69, italics original)

As for constructs being concepts, Kelly acknowledges their similarity but suggests that constructs are also ‘percepts’.  “The notion of a ‘percept’ has always carried the idea of it being a personal act – in that sense, our *construct* is in the tradition of ‘percepts’” (Kelly, 1955 p. 70).  Katz (1984) clarifies the terminology in a succinct and readable introduction to Kelly’s theory.

> A ‘construct’ is loosely seen as a discrete bipolar dimension of discrimination. Within an individual’s construct system, each construct is related to others via implicative or subsumptive relationships. The objects dealt with, or upon which these constructs are focussed, are called elements. Moreover, each construct possesses two ‘poles’ – a ‘likeness’ pole and a ‘contrast’ pole. The association of an element (be it a person, an event, a situation, or even another construct) with one pole or the other constitutes the basic act of construction [construing]. (p. 315)

McCoy (1977) makes the point that consciousness is not an essential feature of construing, which, as previously stated, puts appraisal and construing in a similar camp. However, within Kelly’s theory, the process of construing is more than merely attaching meaning; the purpose of construing is to predict events in our constructed world and how one would react to such events.

### *Constructive Alternativism versus Accumulative Fragmentalism*

Constructive alternativism is a philosophical position underpinning Kelly’s psychology of personal constructs. Kelly holds that there is no known objective truth, only our constructions which are subject to alteration through the process of reconstruing. For the individual though, a particular construct may be held as a truth for a period of time or indeed indefinitely. The point is, if the individual construes something as true and real, then for the individual, it is true and real. For example, a young child attached to an intravenous infusion pump may construe her reality as this monster has hold of me, and is killing me. An infusion pump is a thing; it has certain qualities, including reliability. It is difficult to discount its existence beyond our construction of it. The essence of Kelly’s approach in this example lies in how the child constructs the meaning of the reality of being attached to a pump, the impact of the construed reality on the child, and in a therapeutic sense, how the child could reconstrue his or her reality. This is more than an appraisal of sensory input. Simply, for the individual, there are truths but they are only truths for as long as the individual construes them that way. Kelly argues:

> Even the constructs we daily take for granted are probably open to an incalculable number of radical improvements... What we tend to do is to accept familiar constructs as downright objective observations of what is really there ... The fact that familiar constructs have equally subjective -- though possibly more remote -- origins usually escapes us. We continue to refer to them as objective observations, as the "givens" in the theorems of daily existence. Yet it is doubtful that any of the "givens" we accept so "realistically" has yet been cast in its final form. (1955, p. 5)

Rather than categorically arguing that nothing is true or given (itself a given) the essence of Kelly's constructive alternativism perhaps lies in the clinical application of PCP namely, nothing *has* to be a given. Clinically this underpins what Kelly described as loose versus tight construing, the notion of freeing up the tightly held constructs and considering different shades, or a different colour altogether. In the example above of the child attached to the monster, an approach might be, "What sort of monster is this monster?" "A bad monster." "Okay, if he was not a bad monster, what sort of monster could he be?" – loosening the tight construing around 'bad' to entertain the idea of a shift through an 'okay monster', to the other pole – 'good'. Then perhaps, if he were a 'good monster' what would he look like? A little temporary creative artwork on the monster involving the child might help in the process of reconstruing from the frightening to the wonderful – 'look what I made' – version of reality.

Kelly refers to the jigsaw puzzle approach to science as *accumulative fragmentalism* where the pieces (knowledge) that have been discovered are considered truths, which will eventually come together in a simulation of the universe. The study of pain is a good example of accumulative fragmentalism. Both the neurophysiology and psychology of pain tend to abide by the assumptions that there are pieces that are known, and chunks that are not yet, but will in the future, be known. However, for Kelly:

> What we think we know is anchored in our assumptions, not in the bed rock of truth itself, and that world we seek to understand remains always on the horizons of our thoughts" (1977, p. 6).

The night sky could be construed as a constructivist analogy of pain. Rather than a static, yet to be nailed down but we are working on it, picture, the night sky is dynamic, forever changing, and what you see depends upon your point of view. Kelly holds that the constructions that we believe are givens are always open to reconstruction. However, this requires, amongst other things, curiosity, effort and willingness. The individual might be quite content or bound by the tight construing of the status quo.

In regard to procedural pain in children, the view of the child, parent, nurse and doctor, each of whom is variously informed by experience and knowledge, is that the medical procedure is going to hurt. Furthermore, it is very likely that the child will become distressed. These are the givens in procedural pain in children – *pain, fear* and *distress*. Underpinning this so-called reality is the notion of accumulative fragmentalism – we know the child will scream and have to be restrained. However, if the paradigm is shifted to embrace Kelly's constructive alternativism then the givens are no longer there. This way of thinking has significant implications for practice but the paradigm does not shift on its own. Kelly (1977) referred to this as 'transcending the obvious'; anything, including pain, fear and distress is only obvious because it is based on a set of assumptions. Essentially, Kelly calls for the review of long held assumptions and refers to this as constructive alternativism. But 'calling for change' and effecting change are not the same.

Kelly sums up his theory of the Psychology of Personal Constructs with a fundamental postulate and 12 corollaries (Kelly, 1955, pp.103-104). The corollaries specify the various relationships and processes that govern constructs and construing with in the fabric of his theory. A detailed exploration of the 12 corollaries is beyond the scope of this review, however, Kelly's fundamental postulate is worth stating:
"A person's processes are psychologically channelized [governed] by the ways in which he anticipates events." (Kelly, 1955, p.103)

It is intended to expand on personal construct theory later but before closing on Kelly, some criticisms other than the philosophical issues raised earlier must be considered. Commonly, Kelly is pigeonholed as another cognitive theory, or criticised for failing to adequately deal with emotion. Kelly anticipated this form of criticism and was adamant regarding the redundancy of traditional approaches in psychology "The classical threefold division of psychology into cognition, affection, and conation has been completely abandoned in the psychology of personal constructs" (Kelly, 1955, p.130). However, a cogent criticism relates to the origin of constructs.

Katz (1984) expressed a concern regarding the origin of constructs in Kelly's theory. He points out that Kelly "assumes that constructs are elaborated through the use of other constructs" (p. 317) and that this leads to a fundamental flaw in the psychology of constructs, a question that has not been adequately addressed "From where does one actually get one's first constructs?" (Katz, 1984, p.317). Katz refers to this as the 'Origin Problem' and suggests, "All one need to do to make the Origin Problem disappear in a Kellian manner is to formulate this as a new postulate to be incorporated into the theory's assumptive structure" (Katz, 1984, p.318). Katz offers the following as a solution to what he sees as the Origin Problem - that is, the origin of the first constructs.

> Origin Postulate: Each individual possesses phylogenetically rooted primitive constructs which emerge during characteristic periods in the individual's ontogenic development, and which serve as points of departure for the elaboration of the individual's personal constructs. (Katz, 1984, p. 318)

Katz (1984) suggests that primitive constructs have evolved through natural selection, that they form the interface between the world of the biological and the ecological with the world of the psychological and personal. He is cognisant of Kelly's theory and describes primitive constructs in Kellian language in an attempt to maximise the fit with the psychology of personal constructs.

### ***Personal Construct Psychology and Emotion***

The word *emotion* is not in the index to Kelly's *Psychology of Personal Constructs*. This is not an omission, the term is excluded. In the preface to the text, Kelly is frank about where he is taking the reader:

> For example, the term learning, so honourably embedded in most psychological texts, scarcely appears at all. That is wholly intentional; we are for throwing it overboard altogether. There is no *ego*, no *emotion*, no *motivation*, no *reinforcement*, no *drive*, no *unconscious*, no *need*. (Kelly, 1955, p. x)

This is not to say that Kelly does not deal with emotion in his theory, he does. Kelly incorporated four terms in his theory that elsewhere would be called emotions: they are threat, guilt, fear and anxiety. Kelly defined these terms within the psychology of personal constructs as "experiential or psychological phenomena" (Kelly, 1955, p. 489) associated with the transition of constructs rather than discrete constructs as defined in the theory.

According to Kelly's theory, the constructs that we construe are in a constant state of flux. We construe and reconstrue the world in which we live; sometimes this is achieved with relative ease, at other times with great difficulty. Threat, guilt, fear and anxiety are said to be associated with difficult transitions. The following is an overview of Kelly's approach to threat fear and anxiety, within the context of procedural pain and fear in children. Before explaining this, several of Kelly's terms have to be defined.

*"Comprehensive Constructs are those which subsume a relatively wide variety of events*" (p. 477). Kelly illustrates what he means by a relatively wide variety of events when he discusses threat. Reconstruing Kelly's example to that of a child going to hospital, the hospital is a comprehensive construct because it represents a wide variety of events. The *hospital* is full of potentially disruptive events, different food, separation from parents, medicine and so on. In contrast to *Comprehensive Constructs* are *Incidental Constructs*.

"*Incidental Constructs subsume a small variety of events*" (p.478). For a child with leukaemia, a painful medical procedure would be an example of an incidental construct. It represents a small variety of events in the child's construction. It relates to an incident, which, in the child's construing, is defined by specific characteristics whereas the complex treatment program and associated implications would be a comprehensive construct.

"*Core Constructs are those which govern a person's maintenance processes – that is, those by which he maintains his identity and existence"* (p. 482). As the name suggests, core constructs are vital to one's sense of self and well-being. For Kelly, in achieving a state of health, one's mental processes should follow core structures, which subsume a wide range of events (comprehensive) but are not overly permeable. A construct is permeable if new elements are admitted that were previously not construed within its framework; this broadens the range of convenience of the construct. Kelly suggests that if the person's core constructs are too permeable then the person may construe everything as having deeply personal significance and that this underpins paranoia or hypochondriasis.

*"Peripheral Constructs are those which can be altered without serious modification of core structure*" (p. 482). Kelly points out that peripheral constructs can be comprehensive, incidental, permeable and impermeable. The notion that they are peripheral to the core structure means that they carry less significance regarding the sense of self. Kelly highlights the importance in therapy of getting it right regarding a person's peripheral and core structures. This presumably is particularly important when dealing with children. Our adult construing of what is peripheral and what is core may lack validity. A simple example would be a child's teddy bear. To the staff in a hospital, the teddy bear amongst a bag of toys brought in by the child might be construed as just another toy – a peripheral construct. For a child however, the teddy bear might be tied in some way to his or her sense of identity, a shared existence. In this case, it would be a core construct and should be recognised as such. In Kuttner's follow-up video "No Fears, No Tears, 13 Years Later", she made a point of finding out, from the child's mother, the name of a child's teddy (*Maxi*), who was used to comfort the child during a procedure.

### ***Threat, Fear and Anxiety in Personal Construct Psychology***

It is interesting that Kelly differentiates between threat, fear and anxiety. Mainstream psychology tends not to consider threat alone, and fear and anxiety are often used interchangeably. As stated earlier, for Kelly, these psychological phenomena are associated with the transition of constructs. The following is an overview of how threat, fear and anxiety are defined in personal construct psychology together with the relevance of this approach in regard to procedural pain in children.

"*Threat is the awareness of imminent comprehensive change in one's core structure*" (Kelly, 1955, p.489, italics original). Kelly adds, "In order for the threat to be significant, the prospective change must be significant" (p.489). The example given earlier of a child going to hospital is a situation in which the child might feel threatened. The change in the child's core structure is significant but at the same time, it is comprehensive. There are many elements to this change, so by definition it is comprehensive. The difficulty for the child in effecting the change in his or her core structure is manifest as threat. What differentiates threat from fear is the global or comprehensive nature of the change.

"*Fear is like threat, except that, in this case, it is a new incidental construct, rather than a comprehensive construct, that seems about to take over*" (Kelly, 1955, p.494, italics original). Kelly adds, "The incidental construct is still a core construct, and hence the person's maintenance processes are at stake, just as they are in the case of threat" (p.494). Returning to the example of the child with leukaemia who is to undergo a painful procedure, the change in the child's core structure is significant but this time it is incidental, it is related to the child's construal of the painful procedure. This is an extremely important concept. Within personal construct theory, a child undergoing a painful procedure is frightened because of the way he or she construes the reality of the procedure. It follows that if we can help the child to alter (reconstrue) his or her reality then we might be able to facilitate a reduction in fear. This point will be expanded in the discussion in Chapter 11. The last feature associated with difficult transition of constructs in Kellian terms is anxiety.

"*Anxiety is the recognition that the events with which one is confronted lie outside the range of convenience of one's construct system*" (Kelly, 1955, p.495, italics original). Again let us take the example of a child with leukaemia but this time the child normally copes with the medical procedure, say a lumbar puncture. During one of these procedures, the needle enters the subarachnoid space and the cerebrospinal fluid drips out. The doctor says to the nurse "You had better page the neurologist, I have never seen anything like this before." The child, the parent, and the doctor are probably all going to experience anxiety. The doctor is confronted with events that lie outside her range of convenience, and critically, she does not know what to do. The child and the parent experience anxiety because of what the doctor said. Part of their construct system is "the doctor knows what she is doing and everything is okay." When the doctor expresses concern, this is outside the range of convenience of both the child's and the parent's construct system. The phenomenon that accompanies this transition is anxiety.

To conclude the discussion of Kelly's views on anxiety, fear and threat, the following is a second illustration of Kelly's views applied to an adult scenario that most health professionals could identify with and yet has similarity with the procedural pain reality for a child.

Consider, for argument's sake, a male health professional subpoenaed to appear in a Coroner's court in relation to the death of a patient. He has knowledge of all the 'what ifs' that could damage him, and feels threatened because in Kelly's terms, he is faced with a comprehensive change to core structure. If council representing the deceased's relative identified something that he did or did not do that would lay the blame right on him then his emotion might be fear. The change to core structure, in Kelly's terms, would be incidental, over and above the existing comprehensive constructs. In this case, the health professional would be experiencing an underlying sense of threat with a sudden influx of fear. The reason that this manifests as fear is that he is suddenly faced with something that can seriously damage him, over which he has no control, he lacks power, and there is no escape. This is analogous to the procedure room for a child. Kelly emphasizes the unknown in fear versus the known in threat. "We are threatened by hauntingly familiar things and frightened by unexpectedly strange things" (Kelly, 1955, p. 494). The child who has had previous procedures feels threatened by the known elements and is afraid of the unknown. In this case the unknown could be, "I don't know how I am going to get through this" – particularly given what happened last time. This 'unknown' is frightening. There is much more to procedural fear than the needle or the big machine; these are factors, certainly, rather like Coroner and the barristers, but the issue is also about the sudden unknown.

### *Summary*

The philosophical origins of constructivism were reviewed and critiqued at the beginning of this chapter. The claim that constructivism has transcended the epistemological and ontological debate is bold, particularly in light of cogent arguments that link constructivism with empiricism. However, despite the philosophical vicissitudes and various interpretations of the origin of constructivism, it has developed through its main exponent in psychology, George Kelly, into a practical theory of personality. The opinion that reality is constructed rather than static or given is common to Kelly's psychology of personal constructs and the current thinking about the neural functioning of the brain. The constructivist view forms part of the theoretical framework in this thesis because, as a theory about reality, it encompasses the psychological and neurophysiological aspects of fear and pain. The key points from Kelly applied in this thesis are, firstly, that we construct the reality which guides our actions rather than simply or complexly responding to a given reality; secondly, Kelly's philosophy of Constructive Alternativism reveals that nothing, specifically in the context of this thesis, about fear and pain, *has* to be a given; and thirdly, our version of reality, which by definition includes our sense of self in the world, can be reconstrued.

The issues surrounding procedural pain and fear in children are complex. So far, the theoretical framework in this thesis has drawn upon the neurophysiology of pain and emotion, the psychology of emotion, and constructivism. The next chapter is on the problem of procedural pain in children.

## CHAPTER 5

# PROCEDURAL PAIN AND FEAR IN CHILDREN

> The previous chapter introduced Personal Construct Theory and related this approach in psychology to procedural fear and pain in children. The aim of this chapter is to explore the problem of procedural pain in children not simply from the health professional's viewpoint but to gain a wider view of the problem by looking through the 'eyes of a child'. The chapter begins with a critique of the mechanistic biomedical view of procedural pain and fear in children. The widely held assumption that fear is dependent upon pain is challenged. Within the related developmental model, there is a view that fears arise in children because of 'incorrect appraisal'. This view is criticised and contrasted towards the end of the chapter with a constructivist view of procedural pain and fear. The importance of acknowledging fear rather than anxiety in procedural pain is emphasised and discussed within the context of studies that have combined drug (anxiolytic) and psychological approaches. The implications of context and meaning on pain are discussed with reference to a seminal study of wounded soldiers. The last section focuses on the concept of seeing (constructing) a child-like view of the world as an important factor in communicating with children and understanding their fear and pain.

The effective management of procedural pain in children is a worldwide problem. Members of The International Association for the Study of Pain (IASP) special interest group, Pain in Children, frequently discuss procedural pain in children and report on research in symposia held triennially. Despite the surge in interest in procedural pain since the early 1980s, in many settings, children continue to suffer pain as a consequence of medical treatment.

A medical procedure is "…any procedure conducted or supervised by medical personnel for the purpose of evaluating or modifying health status…" (Steward & Steward, cited in Steward, 1993, p.173). Children undergo medical procedures in a range of settings including emergency, out patient and nuclear medicine departments, ward procedure rooms, and increasingly, with the advent of ‘hospital in the home’ programs, the child’s home. There are many reasons why children continue to suffer procedural pain. The range of settings identified above has to be a factor; not all staff in these settings will be aware of the strategies that can be used to manage procedural pain. Even within a single hospital, the management of procedural pain in children can vary greatly between one department and another. Some areas are progressive in terms of staff attitudes and interventions, both pharmacologic and psychological, and procedural pain is well managed, yet, in other areas, distressed and terrified children continue to be restrained during medical procedures.

Having the skin punctured by another is distressing for many people. Fassler (1985) states that needle phobias have been studied in adult populations with an estimated incidence of 1 in 7 among 20-year-olds (Agras, Sylvester, & Oliveau, cited in Fassler, 1985, p. 371). Clearly, many children carry their fears about procedural pain into their adult life. Fassler also points out that Oswalt and Napoliello (cited in Fassler, 1985, p. 371) have reported that fear of needles was the major reason for reluctance to donate blood. It is likely that adult fears of needles originate in childhood experiences. With the advent of routine immunization, even the healthiest of children will have some experience of needle pain.

For children, procedural pain is certainly negative, threatening and frightening. However, apart from acknowledging that fear exists, little is known about why children are fearful. The obvious explanation is that children are afraid because of the pain that accompanies the procedure. In this view, pain or the anticipation of pain, causes fear. This view has been advanced in the biomedical literature and taken to the logical conclusion that if the pain (cause/stimulus) is taken away then, the fear (effect/response) will disappear. McGrath and McAlpine (1993) posed:

> Why are children afraid? Generally, because needles hurt… Although no studies have been published on the topic, it is very likely that if the pain were eliminated, the fear would extinguish. The diminution in fear might be gradual or might occur suddenly once the child experienced pain-free venepuncture. (p. S5)

The cause-effect view of procedural pain and fear is typical of the dominant biomedical paradigm in pain theory and practice. The assumption is that the child's fear is a function of the pain. The exemplar described at the beginning of this thesis cites the case of the boy in an emergency department having a laceration on his leg sutured who was terrified despite the administration of more than adequate local anaesthesia. Furthermore, modern dental treatment is relatively pain-free and yet millions of people are afraid of going to the dentist. Clearly, the fear of medical procedures in children, and indeed adults, goes far beyond the pain. Although effective management of pain will undoubtedly help, and is certainly the preferred option, it does not necessarily follow that fear will dissipate with adequate analgesia.

The traditional cause – effect view of pain and fear has also been challenged (Bolles & Franselow, 1980) with the suggestion that fear can inhibit pain. Bolles and Franselow proposed *a Perceptual-Defensive-Recuperative Model of Fear and Pain*. Essentially, they hold that pain and fear are best thought of as separate and conflicting motivational systems. The motivational intent with pain is to rest and recuperate. If one sprains an ankle, the function of the pain is to ensure rest and healing. Fear on the other hand invokes a motivational response aimed at protection (Plutchik's view). The key point in Bolles and Franselow's model is their contention that fear inhibits pain. They assume that fear moderates pain by activating the endogenous opioid system. Bolles and Franselow argue that in a fear response where the animal is primarily concerned with protection, fight or flight, the perception of pain is counterproductive. Only after the animal escapes will it sense the pain of its wounds. Again, the function of the pain is to aid in recuperation.

Bolles and Franselow's argument makes sense especially for animals faced with life-threatening situations. However, their analysis is based on two important assumptions. The first assumption is that the endogenous opioid system is activated during a fear response and, secondly, that endogenous opioids are produced in sufficient amounts to cause effective analgesia. Shavit, Lewis, Terman, Gale and Lieberskind (1984) showed that opioids are released in a stress response particularly in the case of helplessness (see Chapter 2), however, it is unlikely that the levels of opioids are sufficient to cause analgesia. In 1980, when this model was published, the most likely explanation of 'natural' analgesic effects was the endogenous opioids, however, this model has not received much support. There was a period when analgesia in hypnosis was thought to be an endogenous opioid effect. However, hypnoanalgesia failed to be reversed by the opioid antagonist naloxone (Spiegel & Albert, 1983), which suggests some 'other' mechanism is involved. Furthermore, endogenous opioid levels have been studied in humans at birth (an undoubtedly stressful and painful event for the neonate) and even the highest recorded levels are unlikely to induce analgesia. In their seminal paper on pain in the human neonate and foetus, Anand and Hickey (1987) cite the research into endogenous opioids as a factor supporting the now recognized reality that neonates feel pain, or are at least receptive to nociceptive input. Pain sensations in neonates are technically described as nociception rather than pain to avoid the difficulty in establishing the emotional component of pain in a neonate. Anand and Hickey (1987, p. 1323) state:

> Endogenous opioids are released in the human fetus at birth and in response to fetal and neonatal distress (Gautray, Jolivet, Vieth & Guillemin, 1977). Umbilical-cord plasma levels of beta-endorphin and beta-lipotropin from healthy full-term neonates delivered vaginally or by cesarean section have been shown to be three to five times higher than plasma levels in resting adults (Csontos, Rust, Holt, Mahr, Kromer, & Teschemacher, 1979; Wardlaw, Stark, Baxi & Frantz, 1979).

Anand and Hickey cite a number of investigations that showed high levels of endogenous opioids in the foetus and neonate under certain conditions including breech presentation, vacuum extraction, prematurity, hypoxaemia and infections. While it is tempting to assume that the high levels of endogenous opioids will mediate adequate analgesia (as in Bolles and Franselow's model), Anand and Hickey argue:

> … these high levels of beta-endorphin are unlikely to decrease anesthetic or analgesic requirements (Lerman, Robinson, Wills & Gregory, 1983), because the cerebrospinal fluid levels of beta-endorphin required to produce analgesia in human adults have been found to be 10,000 times higher than the highest recorded levels in neonates (Foley, Kourides & Inturrisi et al., 1979). (Anand & Hickey, 1987, p.1323)

Bolles and Franselow's model of fear and pain is biological and assumes a level of efficacy of the endogenous opioids that has not been substantiated. For a child undergoing a painful medical procedure the context is one of fear and helplessness. It is distinctly possible that such a state will induce the opioid stress described by Shavit. Any assertions that the child does not feel pain or that endogenous opioids are produced in sufficient amounts to effect analgesia are unfounded in both research (Anand & Hickey above) and clinical observations of terrified children screaming in pain and fear during medical procedures.

### *Procedural Pain and Distress in Children: Anxiety or Fear?*

In the early 1980s, researchers (Katz, Kellerman & Siegel, 1980) held that pain and anxiety experienced by children during medical procedures could be combined to form a single construct – distress. Jay, Ozlins, Elliott, and Siegel (1983) subsequently developed the Observational Scale of Behavioural Distress (OSBD) for use in research into the distress associated with medical procedures. What followed were a number of studies and papers on pain and distress and concern regarding anxiety associated with medical procedures (Katz, Kellerman, & Ellenberg, 1987; Kuttner, 1989; Kuttner, Bowman, & Teasdale, 1988; Peterson & Shigetomi, 1981; Jay, Elliott, Katz, & Siegel, 1987; Jay Elliott, Woody, & Siegel, 1991; Zeltzer & LeBaron, 1982).

In children, the assumed cause-effect relationship between pain and fear is exemplified in the label 'distress'. The term is useful in practice because most people can identify with what is meant by a 'distressed child', but it fails to shed light on the relationship between fear and pain. On the one hand, most would agree that fear and pain are positively correlated. As pain increases, fear increases. Fradet, McGrath, Kay, Adams and Luke (1990) found distress in children about to undergo venepuncture was correlated with pain behaviour. McCaffery and Beebe (1994) suggest a spiralling relationship between *pain*, *muscle tension* and *anxiety* where an increase in pain heightens muscle tension and anxiety, which exacerbates the pain. McCaffery and Beebe suggest the efficacy of relaxation in pain management is centred on removing muscle tension from the pain triad and thus breaking the cycle. This model makes immediate sense, particularly with regard to muscle tension, but pain and anxiety are unaccounted for after muscle tension is removed from the equation. Muscle tension (physical) is the obvious choice for the focus of relaxation, particularly within the dualistic mind-body paradigm but relaxation also ‘feels good’; it is possible that relaxation also has an effect on pain at the cognitive/emotional level.

Concern regarding the anxiety associated with medical procedures in children continued in the 1990s. Anderson, Zeltzer and Fanurik (1993) wrote, “Procedures such as venous cannulation, lumbar puncture, bone marrow aspiration… are themselves often painful and *anxiety* provoking”. (p.435, italics added). Fradet, McGrath, Kay, Adams and Luke (1990) conducted a prospective survey of reactions to venepuncture in children and adolescents (3-17 years). The authors state that the children “were asked to report on their pain and *anxiety*” (p.53, italics added). Fradet et al. (1990) used the Children’s Hospital of Eastern Ontario Pain Scale (CHEOPS), a tool developed to measure postoperative pain in young children, as a measure of distress, which they then labelled as ‘anxiety’. In another study, concern about the anxiety experienced by children during medical procedures led Jay, Elliot, Woody and Siegel (1991) to investigate the effect of combining Cognitive-Behavioural Therapy with oral Valium (an anxiolytic) in managing distress in children during painful medical procedures. Jay et al. said, “The OSBD consists of eight operationally defined behaviours that indicate pain and *anxiety*” (p.319, italics added). The authors found:

> The results of this study demonstrate that orally administered Valium did not potentiate the efficacy of CBT aimed at ameliorating children’s distress associated with BMAs [bone marrow aspirations] or LPs [lumbar punctures]. (p. 320)

In 1993 the U.S. Department of Health and Human Services, Agency for Health Care Policy and Research (AHCPR) released a clinical practice guideline booklet on acute pain management (including procedural pain) in infants, children and adolescents. Again, the emphasis was on anxiety. “What is the expected intensity and duration of *anxiety*?” (AHCPR, 1993 p. 7 italics added). Regarding repeated procedures, the report suggested, “… provide maximum treatment for the pain and *anxiety* of the first procedure to minimize the development of anticipatory *anxiety* before subsequent procedures” (AHCPR, 1993 p. 8 italics added)

All of these research articles, reports and papers refer to *anxiety* in children associated with procedural pain. However, the point of contention here is that children do not experience anxiety with procedural pain, they experience *fear*; there is a difference. The difference is evident in theoretical and clinical psychology, psychiatry and lay language. Although associated with emotion, many theorists do not consider anxiety to be a specific emotion but fear is usually listed among the 'classic five' – fear, anger, sadness, disgust and joy. Anxiety is a generalized state of heightened physiological arousal. It is also a medical diagnosis. Patients with anxiety are commonly treated with anxiolytic medication such as those in the benzodiazepine group (e.g. Valium and Serepax). In everyday language, it is common to hear "I am feeling anxious today", we do not hear "I am feeling fearful today". No one speaks of 'free-floating fear" because fear has a focus, even if it is the 'unknown'. The labelling of the affective component of procedural pain and distress in children as anxiety is consistent with the dominant paradigm, the biomedical model of health care. The consequences of this approach are far-reaching. A trembling, withdrawn and bracing child is experiencing fear as the health professional approaches. As long as children in this state are continually labelled as anxious, the locus of the problem will always be with the child. People suffer anxiety for many reasons but in all cases, the problem is considered to be the individual's. If we say, "This child is anxious" we are, in effect, removing ourselves from the child and reporting an observation in much the same way as saying, "This child is febrile" or "This child is dehydrated". If, on the other hand, we say, "This child is afraid", the onus is then on us, as health professionals to identify what the child is afraid of, and to do something about it. For many health professionals, the focus on anxiety may simply reflect the powerful traditions of education and practice. If one has a word that describes a perceived state that everyone understands, there is no need to introduce another term. The emphasis in the foregoing statement is on the word, 'perceived'. Of concern is the validity of the judgement and the consequences for the child and the health professional who misses the key issue that the child is scared. It is also quicker and easier to 'objectively' label the child as anxious than to reflect on the object of the child's fear, particularly if the child is afraid of the health professional and what he or she is going to do to the child. A reluctance to consider the child's fear may be exacerbated if the health professional has some residual guilt about what he or she is doing to the child in the name of treatment.

Given that children experience fear and not anxiety during medical procedures, it is not surprising that Jay et al (1991) found no potentiating effect in combining CBT with oral Valium. It is also interesting to note that the researchers use the terms fear and anxiety interchangeably. In a previous study Jay, Elliot, Katz and Siegel (1987) investigated one group of children who had Valium prior to the procedure, another that had CBT during the procedure and a third who had attention control. They found that "Valium reduced anticipatory anxiety, the CBT package gave children coping skills that helped them throughout the BMA." (cited in Jay et al., 1991, p.317). In the combined Valium with CBT study (Jay et al., 1991) the aim was to see if combining Valium with CBT was more effective than either alone in reducing fear and distress. To their credit, the researchers measured anticipatory fear rather than anxiety with a 5-point faces scale. They also applied the Observational Scale of Behavioral Distress (OSBD) before, during and after the procedure. The upshot was that the Valium did not potentiate the efficacy of the CBT and if anything may have hindered the learning of the cognitive-behavioural strategies (Jay et al., 1991, p.320). While Valium might calm a child prior to a procedure (reducing overt signs of anxiety), it does little for the fear experienced during a medical procedure. Drug companies are yet to produce a drug that will stop you being afraid. The Valium-CBT study conducted by Jay et al. (1991) is pertinent to this discussion because it is illustrative of the difference between anxiety and fear. The distress scores during the procedures (representing fear in this argument) were not reduced with the introduction of Valium.

Returning to the Agency for Health Care Policy and Research (AHCPR) booklet on acute pain management cited earlier, the first question it posed, "What is the expected intensity and duration of anxiety?" is typically biomedical in that the locus of the problem (anxiety) is transferred to the child. This approach would be fine when considering the intensity and duration of fever in a child with septicaemia but it is not helpful in considering the effect of intervention on emotion. Even if the expected intensity and duration of anxiety could be identified, any gain in knowing this is doubtful. The focus should be on fear. In the question framework, (1) "What is/are the object(s) of the child's fear?" (2) "How do we as health professionals contribute to the child's fear?" (3) "What can we do to help the child to reconstrue his or her fear?"

The second point made in the AHCPR booklet recommends the provision of maximum treatment for pain and anxiety including anticipatory anxiety. Apart from general anaesthesia, one assumes that the authors advocate maximum local anaesthesia, analgesia, and anxiolytic medication despite the findings of Jay et al. (1991) that Valium did not reduce the distress associated with painful procedures. The upshot is, in continuing to refer to *anxiety*, the AHCPR panel have missed the point, that it is pain and fear, not anxiety, that should be the focus of our interventions.

### *Limitations of a Biomedical View of Procedural Pain in Children*

The following quote from the Australian National Health and Medical Research Council is typical of the biomedical approach to procedural pain in children.

> Non-pharmacologic strategies can be effective for pain and anxiety associated with *minor procedures*, especially if repeated on a regular basis. They are *less useful in the acute situation*. (NHMRC, 1999, p. 71, italics added)

The terms, 'non-pharmacologic', 'anxiety', 'minor procedures' and 'acute situation' in this short quotation demand close scrutiny. The term 'non-pharmacologic' is exclusive rather than inclusive and implies drug or non-drug as the defining characteristic of a particular strategy. The term does not define any set of strategies, it simply implies what they are not – namely, they are not drugs. The term is also stereotypical and fails to acknowledge the range of interventions that elsewhere are described as psychological, cognitive and behavioural. This approach is as meaningless, as defining a treatment as surgical or non-surgical. The diagnostic term 'anxiety' is used, when the word 'fear' would be a more apt descriptor of the emotional component of procedural pain. The term 'minor procedure' is a value statement from a panel of expert 'grown- ups'. For a child, a seemingly insignificant procedure could be construed as 'major', even if it occupies a low position on the hierarchy of procedures. Usually, bone marrow aspiration is at the top of this hierarchy, closely followed by lumbar puncture, then cardiac catheterisation, burn dressing changes, insertion of intravenous cannulae, venepuncture and lastly fingerprick (capillary sample of blood). Bone marrow aspirations and lumbar punctures are certainly painful and distressing, but so are all the rest. The point is, pain and fear, as experienced by a child is not a function of perceived invasiveness, degree of difficulty or medical skill required to perform the procedure. Anecdotally, we sometimes see children with acute leukaemia who have coped with their lumbar punctures and the effects of chemotherapy who become very distressed every time they have a fingerprick or a venepuncture. A parent or health professional may be puzzled and believe that if the child can cope with a lumbar puncture he or she ought to be able to cope with a fingerprick. That is, of course, an assumption made by an adult. There is no simple explanation as to why some children find these so-called 'minor procedures' distressing other than for the child, they are major procedures. From the child's perspective, one factor might be that a lumbar puncture is out of sight whereas a fingerprick or venepuncture is well within the child's view. Actually seeing the needle, the hole and the blood may, in some cases make these so called 'minor procedures' more frightening.

The phrase 'less useful in an acute situation' ignores available evidence. The NHMRC do not define "acute situation" however, these strategies have been used with effect to manage procedural pain and distress in children in a range of "acute settings" including emergency departments, pathology out patients and ward procedure rooms (Anderson, Zeltzer, & Fanurik, 1993; Bullock & Shaddy, 1993; Kuttner, 1998; Syrjala & Abrams, 1996; Pederson, 1995; Sparks, 2001; Wells, 1998). Psychological approaches to managing fear and pain are well suited to a range of 'acute situations'. A common myth about the use of psychological approaches is that these techniques take too much time, which might be what underpins the term 'acute situation'. The author has had a previously distressed child intravenously cannulated in imagery in three minutes in an emergency department. Olness and Kohen (1996) describe the timely use of hypnosis with children in a range of 'acute settings' including the emergency department. Moreover, the NHMRC should perhaps consider what is most important: getting a procedure over with in record time regardless of the impact on the child, parent and health professional, or performing the procedure in a manner that reduces the pain, fear, distress and stress on all involved.

The importance attached to technical aspects and associated risks of medical procedures clearly influences professional's views of a person's pain and fear. Health professionals who perform medical procedures including doctors, nurses, ambulance personnel and phlebotomists, who practice within a biomedical framework (the dominant paradigm), tend to focus on the technical aspects of the procedure rather than the whole procedure, which includes the impact of the intervention on the child. Harrison (1991), in an article on preparing children for venepuncture, takes a procedure-oriented view and places emphasis on a ‘cooperative child’.

> If a child is tense or struggles, venepuncture is more difficult to complete, and the risks of accidental injury are greater…. There is a need, therefore, to find ways of encouraging children to be less anxious and more cooperative during venous blood sampling. (p. 299)

A noticeably telling phrase is “… encouraging children to be less anxious and more cooperative…” – More ‘grown-up’ perhaps. Issues of compliance and cooperation could also be considered as concerns about ‘control over’ or ‘power over’ the individual with an emphasis on getting the procedure done, as evident in a paper aptly titled *Tips and tricks for pediatric I.V. insertion,* (Frey, 2000). Frey begins with “Children and nurses alike dread the insertion of an intravenous (I.V.) device” (p. 54). In a question-answer format, the first question posed by the author is, “Should parents be present?” The notion of parental presence is supported, to reduce ‘apprehension’. “Encourage the parent to calm and comfort the child, but don’t ask her to help restrain her; *let another nurse take on this role*. (p. 54 italics added). The second question attempts to address pain and anxiety: “How can I minimize the child’s pain and anxiety?” Frey suggests a simple explanation of the procedure and then states:

> Try these *tricks* to promote *cooperation* (italics added):
> Administer a local anaesthetic before venepuncture, according to policy.
> Perform I.V. insertion outside of the child’s hospital room. Allow her room to be a safe haven.
> Give an age-appropriate explanation…
> Always be honest. Tell the child that the venepuncture will hurt, but only for a short time…
> Provide as much privacy as possible and give her permission to cry.
> Allow her to have items that calm her…
> Let older children participate, which will help distract them, by ripping tape, opening alcohol swabs, and holding tubing… (p. 54)

The bulk of the article is on technical aspects of the procedure (pp.54-56):

> What size device should I use? … How do I choose a suitable site? … How do I distend a child's vein? … How do I keep a child still during venepuncture? … How do I secure the device? … How do I protect a joint site? … How long can I leave a peripheral device in place?

The procedure-oriented view is exemplified in Frey's concluding 'formula for success':

> The next time you perform venepuncture on a child, put these pointers into practice. They'll help you approach your patient with less apprehension and more confidence. (p. 56)

For procedure-oriented clinicians and researchers, what matters is that the child does exactly what he or she is told with a view to achieving the intended medical outcome. For example, when performing venepuncture the health professional is primarily concerned with maintaining control (power) over the child and obtaining the blood. As Frey (2000 p. 55) said, "It's better [for whom?] to restrain the child and obtain I.V. access in one attempt than to make multiple attempts in a flailing distressed child". This statement articulates the widely held assumption that when restraint is used, the procedure will be quicker and therefore distress will be minimised. Moreover, given Frey's 'formula for success', 'It's better' presumably relates to the nurse rather than the child.

The medical practitioner performing a lumbar puncture is primarily concerned with the placement of the needle and getting the cerebrospinal fluid; the person performing a venepuncture is primarily concerned with getting the blood. More often than not, if the result is obtained then the procedure is deemed a success, regardless of the impact on the child. Sometimes, even within this limited view of practice, the procedure is unsuccessful, for example, the vein is missed. In such a case, it is common for a health professional to keep trying until a suitable vein is accessed. This can involve any number of venepunctures, sometimes three of four attempts by one or more health professionals before the blood is eventually obtained and the procedure is deemed a success. If the pain and fear experienced by the child are acknowledged at all, these are justified in terms of, ‘He or she will get over it’ and, “At least we got the blood” or as stated by Frey (cited above) ‘It will only hurt for a short time’. While it is fair to say that health professionals generally would prefer not to see children in pain, for many, the pain of a procedure is rationalized in terms of the proposed benefit of treatment for the child. Even if procedural pain is identified as a problem, within the biomedical model it is seen as the child’s problem.

The procedure-oriented focus of the biomedical model is most damningly evident in the following statement from a National Health and Medical Research Council (Australia) report on acute pain. The section on procedural pain in children states:

> To *optimise compliance*, preparation of children for painful procedures must be approached systematically and properly handled by health care professionals. (NHMRC, 1999, p. 71, italics added)

Issues of ‘compliance’ in medicine reflect the belief that the patient ought to behave in a manner that is expected, prescribed or ordered. Either patients comply, or they do not comply, with treatment schedules. The essence in the quotation above is that the child should do exactly what he or she is told to do during the procedure. There is an assumption that if the child complies (behaves) then, for the health professional, the procedure will be easier, over with quicker, and better – better for the health professional and for the child. The compliant child may sob throughout the procedure but in ‘being compliant’, the child will appear less distressed than the non-compliant child. This reinforces the health professional’s belief that the compliant child feels less pain and therefore less fear. Conversely, a non-compliant child becomes distressed, and resistant to treatment. This increases the level of difficulty in performing the procedure for the health professional and is coupled with an increase risk of complications or injuring the child. The effect on the health professional is anxiety, and sometimes anger. At the same time, the health professional may construe the increase in the child’s distress as logical because the risk of injury has increased. The health professional is stressed, anxious and angry and the whole procedure becomes a disaster. The blame is laid, by the health professional, and sometimes also by the parents on the child, “You are only making it worse for yourself.” “If you had not pulled away, I would not have to do it again." "If you had stayed still, it would not have hurt so much, and it would be over with by now." The health professional who has to repeatedly perform procedures begins to dread the thought of another screaming and resistant child, and wishes, "If only they would hold still and do what they are told, it would not be as painful." All of this reinforces the misguided belief that being compliant is the key to feeling less pain, and therefore less fear. In both cases, the stereotypical, *compliant – passive – non-complaining*, (no pain) and the *non-compliant – resistant – complaining*, (painful) assumptions essentially arise from pre-causal or transductive reasoning, where two unrelated events occur simultaneously and the individual assumes that a causal relationship exists between them even as the non-complaining child might be terrified and hurting deeply but not obviously.

### *Impact of Context and Meaning in Pain*

Certainly, there are situations where pain would be expected but it is not verbalised or even noticed. This probably has more to do with conscious awareness and how the individual construes his or her reality than it does with endogenous analgesia. It is possible that the fearful animal or human faced with a life-threatening situation does not notice pain because attention and behaviour are aimed at survival. However, for a child undergoing a venepuncture, his or her attention is focussed on the procedure. An accidental prick to the finger while pruning roses on a sunny Sunday afternoon may not be noticed until the blood is seen, whereas having a finger pricked by a phlebotomist in a pathology department, hurts.

The notion that context can modify the experience of pain was first raised by Lt. Col. Henry Beecher, an army anaesthetist who treated men wounded in combat during World War II on the Venafro and Cassino Fronts and the Anzio Beachhead in Italy. Beecher (1946) classified the wounds received by a soldier in battle into one of five categories: "extensive peripheral soft tissue injury, compound fracture of a long bone, a penetrated head, a penetrated chest or penetrated abdomen" (p.96). He asked each patient "As you lie there are you having any pain?" Beecher found,

> Of all the patients considered [n=215] only one-quarter, on being directly questioned shortly after entry in a Forward Hospital, said that their pain was enough to cause them to want pain relief therapy; three-quarters did not need such relief. This was the case notwithstanding the fact that the most recent morphine had been administered hours before. (p.104)

It is important to note that Beecher's observations were some 19 years before Melzack and Wall's gate control theory. In 1946, Beecher made the following comments on the findings of his study.

> Pain is an experience subject to modification by many factors: wounds received during strenuous physical exercise, during the excitement of games, often go unnoticed. The same is true of wounds received during fighting, during anger. Strong emotion can block pain. That is common experience. In this connection it is important to consider the position of the soldier: His wound suddenly releases him from an exceedingly dangerous environment, one filled with fatigue, discomfort, anxiety, fear and real danger of death, and gives him a ticket to the safety of the hospital. His troubles are over, or at least he thinks they are. (p. 99)

Given the extensive tissue damage associated with any one of the five categories, and the soldiers' apparent lack of pain, Beecher's passing footnote regarding the wounded soldiers' reactions to venepuncture is most important.

> A badly injured patient who says he is having *no wound pain* will *protest as vigorously* as a normal individual at an inept venepuncture. It seems unlikely that the freedom from pain of these men is to be explained on the basis of any general decrease in pain sensitivity. (p. 98, italics added)

Incredibly, Beecher's comments suggest the wounded soldiers were more concerned with the procedural pain associated with an inept venepuncture than any pain from their wounds. Beecher's comments are profound, particularly given the comparatively limited understanding of pain in 1946. He acknowledges alterations in pain perception, the interplay between pain and emotion, the role of appraisal and finally the social context of pain. The only statement that bears critique is *strong* *emotion can block pain*. It is likely that the circumstance of the emotion rather than the emotion *per se* alters perception of pain. Even in his own study, if strong emotion blocked pain, the wounded soldiers would not have complained at what Beecher describes as inept venepuncture. Beecher later compared postoperative analgesia requests in soldiers and civilians (Beecher, cited in Schechter, 1985):

> On returning to the United States he [Beecher] noted that 82% of civilians who had undergone similar operations requested pain relief. After interviewing these patients, Beecher surmised that the context or meaning of pain was a critical variable in the perception of pain. For the soldiers, pain was representative of injuries received for valour and offered a ticket home. For the civilians, pain represented potential disability and an uncertain future. (p. 17)

Within a PCP framework, Beecher's soldiers actively construed the reality to which they responded both in battle, and in the forward hospital. In the heat of battle, the construed reality for many soldiers is one of fear. In Kelly's terms, fear is the phenomenon that accompanies an awareness of an imminent incidental change in one's core structure. *Staying alive – death* is a core construct that is subject to an incidental change (the bullets and shrapnel flying about). Suddenly, the soldier is wounded, and despite the severity of the wounds, the soldier reconstrues to the positive (staying alive) pole. It is possible that for the soldier, extreme pain equated with a severe (enough to be moved to safety) wound. In this reality, the wound and associated pain (but not the pain of an inept venepuncture) represent life, whereas in Beecher's follow-up study on post-operative pain, the pain represented disability and uncertainty.

### *A Constructivist View of Procedural Pain and Fear in Children*

The problem with 'the problem of procedural pain and fear' is the health professionals' adherence to a mechanistic and reductionistic biomedical approach to practice, which either ignores the problem of procedural pain and fear or sees these as the child's problems. The projection is exemplified in the focus on anxiety rather than fear. Certainly, over the past 20 years, many health professionals have identified a need to improve their practice regarding the management of procedural pain in children.

However, many continue to practice within a biomedical disease oriented approach where the problem of procedural pain is conceptualised as the child's problem.

The Report of the Subcommittee on Assessment and Methodologic Issues in the Management of Pain in Childhood Cancer (McGrath, Beyer, Cleeland, Eland, McGrath, & Portenoy, 1990) proposed:

> … that clinicians develop and use a Pain Problem List for every child with cancer. The Pain Problem List is the outcome of an assessment process that begins with the pain history. The history is used to characterize the pain according to its mechanism… the related syndrome… and other key features that may influence the decision to implement one therapy rather than another. (p. 815)

Children with cancer suffer with many pains, clearly, not the least of which is procedural pain. On one level, the identification of pain problems is an important step towards improving the management of pain in children with cancer. However, in compiling a list of the child's problems, the focus is limited to the child. McGrath et al. (1990) state:

> The purpose of the Pain Problem List is to identify problems amenable to intervention and to assist in selecting the most appropriate treatment to reduce pain in accord with the cause and contributing factors. (p. 816)

The report contains an example of a Pain Problem List for a 4-year-old girl with acute leukaemia and mucositis after chemotherapy. Briefly, the stated problems are severe mouth pain, mild bone pain, anxiety, reduced eating, nightmares and disturbed sleep related to bone marrow aspirations (p. 816). Even within the biomedical paradigm, the absence of procedural pain from this pain Problem List is puzzling. As a matter of course, procedural pain would be a significant pain experienced by a child with leukaemia. Most important though, all of the pain problems are listed as the child's problems arising from a diagnosis of leukaemia. An alternate way of viewing this is that the health professional has a number of problems associated with the treatment of a child with leukaemia. This requires a fundamental shift in the way health professionals think and practice. The shift however has both a legal and an ethical foundation.

Health professionals have a legal duty of care and an ethical responsibility to deliver care in a manner that causes the least harm to the child. If a standard of care that reduces harm to a child is possible but not delivered then the health professional may be deemed derelict in his or her duty of care. Such practice could also be considered unethical. The continued projection of problems associated with treatment on to the child is suspect and will no doubt result in litigation. One way of addressing this would be to compile a Pain Problem List for the child and a Pain Problem List for the health professionals. Taking the example given by McGrath et al. (1990) of a 4-year-old girl with leukaemia and mucositis, the child's Pain Problem List should include procedural pain related to bone marrow aspiration, lumbar puncture, venepuncture and fingerprick and any other painful procedure inflicted on the child. The Pain Problem list for the health professionals should identify the pain of medical procedures *as a problem for the health professional* and lead to strategies that will minimize harm to the child. Another problem would be fear, not as the child's problem but the health professionals', as a consequence of their interventions, which should be linked to strategies aimed at reducing the fear.

If the problem of procedural pain is reconstrued as the health professional's problem then the standard of pain management in children is likely to improve. An approach to practice predicated on, "What strategies can I implement while doing this procedure to cause the minimal pain, fear and distress?" would seem to be an essential starting point if one is genuine about improving the management of procedural pain and fear in children. There is no doubt that this approach drives a number of clinicians and researchers in the field but it is time the view was articulated.

One way of expanding our understanding of the fear experienced by a child in a medical procedure is to view the child, health professional, the parent, setting and procedure through the constructivist lens. This approach was discussed in the previous chapter. The obvious source of fear is pain. Kelly (1955) suggests that in order to understand a phenomenon, we should 'transcend the obvious' – an approach that is, in this case, likely to lead to a deeper understanding of fear and pain in children undergoing medical procedures. McGrath and Hillier (1996) suggest a progressive approach to pain management in children that transcends the notion of a simple cause-effect relationship between tissue injury, pain and fear.

> Although the causal relationship between an injury and a consequent pain sensation seems direct and obvious, the things children know, do, and feel all affect their pain. It is essential to recognize and evaluate the impact of these factors in order to relieve any type of pain that children experience. (p. 334)

The 'things children know, do and feel' within a Personal Construct framework are the basis of the construed reality. Again, a pertinent question from Personal Construct theory is "How does this child construct his or her sense of reality?" Within the constructivist framework, the child's fear and pain are part of their construed reality and as such may be reconstrued. This however requires a level of analysis and intervention that transcends the traditional bottom-up, sensory – appraisal, and developmental views of fear and pain. The child's construct of reality is just that, *it is the child's* and is as real to him or her as any other person's construct is to them. The developmental view has little to offer because the notion that the child is forever attempting to know and understand the 'real and known' (adult-like) reality is rejected. Unlike the developmental view, the child's reality is considered unique rather than deficient. The developmental (deficiency) model, evident in much of the pain literature has even been applied to appraisal. For example, Peterson (1989) states:

> In addition to the absence of mature cognitive skills that could aid in appraisal of the stressor, young children may be more subject to *cognitive distortions* that influence appraisal. *Errors in appraisal* undoubtedly occur at all ages, but seem more likely in young children whose cognitive development predisposes them to *unfounded inaccurate beliefs*…. Consider the child who, when told he would have eye surgery, believed his eyes were to be removed (Petrillo & Sanger, 1972) or the common childhood fear that all of one's blood will leak out during a venepuncture (Sheridan, 1975). Thus, distortions in perception of the stressor are often a direct product of the child's cognitive level (Burbach & Peterson, 1986). (p. 381, italics added)

Within the developmental framework, ‘error in appraisal’ means that the child does not attach the ‘true, correct and real’ (adult) meaning. The child’s cognitive skills are considered deficient compared to an adult’s. The constructivist position, however is more concerned with the child’s version of what is real, the impact that the child’s constructs have on the child, and whether it would be helpful if the child were able to reconstrue his or her reality. The constructivist position is less concerned with what is supposedly right or wrong. Similarly, in regard to ‘unfounded inaccurate beliefs’, the child’s beliefs are founded, they are based on the child’s construction of the situation.

To appreciate the full force of the constructivist view, consider the example of fear of the dentist. The fear that many adults experience in the dentist’s surgery is frequently based on painful treatment in childhood (Arntz, van Eck, & Heumans, 1989; Rainer, 2000; Walker, Milgrom, Weinstein, Getz, & Richardson, 1996). Doebling and Rower (2000) estimate that about 40 percent of modern western society is apprehensive about dental visits, 20 percent are highly fearful, and about 5 percent avoid oral health care completely. This makes the dentist’s surgery a meaningful setting to reflect on what it is like to be disempowered, afraid, and to suffer procedural pain. The following scenario represents one avenue for thinking about procedural pain through the eyes of a child, an approach that will be developed later in this chapter.

Imagine every time you go to the dentist, a couple of very strong, large, overbearing assistants hold you down as the dentist drills your teeth. The dentist’s assessment of your fear, if at all, is essentially developmental. Your knowledge base of dentistry is not as advanced as his/hers is. You fear the worst – being ignored, no control, being held down, and excruciating pain, “What if the dentist drills through the nerve?” There is no escape; you are powerless, vulnerable and afraid. The dentist knows that he or she is not going to drill through your nerve. In Peterson’s (1989) terms you have made an, ‘error in appraisal’, you have ‘an inaccurate and unfounded belief’. The dentist’s comments: “You are brave – aren’t you?” “You had better hold still or it will take longer” or “This will only sting a little bit” are unlikely to resolve your fear and yet this is exactly the sort of treatment many children receive during painful medical procedures.

A significant limitation of the developmental approach is a tendency to assess the child's understanding in comparison to one's own professional and adult knowledge base, which is considered the incontrovertible objective reality. The child who believes that all his blood will leak out during venepuncture may not be convinced that it will not, simply by being corrected by the health professional. In fact, there are coagulation disorders, for example, haemophilia, Von Willebrand's disease and disseminated intravascular coagulation (McCance & Huether, 2002), when profuse bleeding is a problem. In simply correcting the child, the health professional will fail to address the child's fear. Unfortunately, the fears experienced by children in health care settings are commonly poorly understood because many health professionals are unable to consider the child's perspective. A constructivist approach with a child who believes that he or she is going to bleed to death would certainly not be to simply deny the child's view and to attempt to argue against a perceived deficiency in cognitive ability. The child's version of reality is acknowledged and understood.

Constructively, one could begin with an overview of A.A. Milne's description of Piglet and Winnie-the-Pooh walking, on a very windy day, to Owl's house. Nervously, Piglet contemplates the possibility of a big tree falling on them, Pooh construes alternatively to the opposite pole, and Piglet is comforted:

> One day, Piglet and Winnie-the-Pooh were walking to Owl's house. It was a very windy day, so windy that they had to lean into the wind to walk along and Piglet's ears were blown back like banners. Eventually they got to the shelter of the Hundred Acre Wood, where they could stand up straight and listen to the wind roaring through the treetops. Then Piglet said, 'Supposing a tree fell down, Pooh, when we were underneath it?' 'Supposing it didn't,' said Pooh after careful thought." (Milne, 1990, p. 130).

Do you know what happened next? The tree didn't blow down, they walked on, and soon they were knocking on Owl's door. The idea of course is to illustrate the notion of an alternative view. Linking the child's reality with the story and introducing the notion of an alternative would follow:

> I guess this worrying about all your blood leaking out is a bit like Piglet worrying about the tree falling over. The tree could have fallen over, but did the tree fall over? No. You know, blood actually does not like to be on the outside because it dries up, like glue dries up when it is out of the tube and it cannot be runny anymore. Have you ever seen dried up blood, or dried up glue on the outside of the tube?"… "If your blood did not leak out, where would it be?" – "On the inside". "Okay, sometimes other things get leaks don't they?" "Have you ever seen a flat tyre on bike, or on a car get fixed with a patch?" A balloon, needle and tape could be used to demonstrate. "What could we use to stop the blood leaking out the tiny hole that the needle makes?" – "Tape, not just any old tape, but special tape". This would be followed with a discussion about skin growing, like hair and nails grow, and the body's own glue – dried up blood.

There is little doubt in practice, and in the literature (Broome & Hellier, 1987; Fradet, McGrath, Kay, Adams, & Luke, 1990; Hart & Bossert, 1994; Tichy, Braam, Meyer, & Rattan, 1988) that children fear painful medical procedures. For example, Tesler, Savedra, Ward, Holzemer, & Wilkie (1989) investigated the language that children use to describe pain. An interpretation of their findings within a PCP framework is outlined below. Tesler et al. compiled a list of 129 words that children had reported using to describe pain and printed these individually on cards. The authors randomly presented the cards to 958 children aged 8 to 17 years across a number of urban and suburban high schools, middle schools and primary schools. The children sorted the words into three categories

> … "words they knew and used," to describe pain, "words they did not know," and "words they knew but did not use," to describe pain. The children were also asked to assign an intensity value to the words they used to describe pain, by sorting them into categories denoting small, medium, large, and worst pain. (p. 61)

The words that related to the affective component of pain that were selected by 50% or more of the sample and categorised with an intensity value of Large or Worst Pain were:

| | |
|---|---|
| Awful | Killing |
| Terrible | Horrible |
| Never go away | Dying |
| Frightening | Screaming |
| Suffocating | Deadly |
| Uncontrollable | Unbearable |
| Terrifying | Dreadful |
| Torturing | |

On face value, these terms provide some insight into the construed reality of pain for child. While certain terms might be used by an adult, such as, 'awful, terrible, never go away, dreadful', others, such as, 'killing, deadly, screaming, suffocating' are particularly insightful. There is clearly a difference between an adult construing pain as 'awful' and a child as 'deadly'.

It is also worth examining these terms for clusters and themes. For example, frightening, terrifying and screaming cluster on a personal state, a *feeling*. Awful, terrible, horrible and dreadful constitute an experiential theme that is extremely *bad*. Never go away, uncontrollable, unbearable and torturing could centre on *powerlessness*. Suffocating, killing, dying, deadly, cluster on a theme of *death*. Torturing and suffocating – suffering at the *hands of another*. Collectively, severe pain carries a feeling that is extremely bad, there is nothing that you can do, you could die and they are doing it to you. The customary "Pain is an *unpleasant* sensory and emotional experience …" seems rather short of the mark. For a child, pain is a *terrifying* sensory and emotional experience… Pain is a *horrible* sensory and emotional experience… Pain is an *unbearable* sensory and emotional experience… Pain is a *deadly* sensory and emotional experience; and, pain is torture.

In addition to a qualitative thematic analysis, the impact of some of these pain terms for a child can be extended within a PCP framework by considering the term as one end of a bipolar construct and matching each with a corresponding pole.

For example:

| | | |
|---|---|---|
| Awful | – | Great |
| Killing | – | Allowed to live |
| Dying | – | Living |
| Deadly | – | Alive |
| Suffocating | – | Breathing/life |
| Terrifying | – | Safe |
| Uncontrollable | – | In control |

Essentially, being alive and feeling great, safe and in control are states and qualities that are central to life. In Kelly's terms, these are core constructs; they represent part of an individual's core structure. If an incident suddenly threatens the core structure, represented in this example by a shift to the negative pole, the feeling that accompanies the transition is fear. The focus of an intervention to address the fear would be on reconstruing to the positive pole, that is, restoring a sense of being alive, feeling good, safe and in control. Clinically, we can have an immediate and direct effect on control. We can give control, or we can take it away. This, it would seem is an important starting point.

Context and meaning are clearly important factors in shaping the experience of pain and fear. If we are to understand the impact of context and meaning on pain and fear for a child, then, an ability to appreciate the world of a child must be an advantage. Being an adult can be an obstacle to understanding the construed realities of childhood. However, it can be argued that some of our childhood constructs and ability to construe as a child construes remains, in varying degrees through our memories and emotions. Elsewhere, this concept has been referred to as the 'child within' or the 'inner child' (Capacchione, 1990; Mills & Crowley, 1990). Within a PCP framework, the nexus between construing as a child and construing as an adult could be considered as a core construct of *child construing – adult construing*. For an adult, the ability to construe as a child construes could be a function of how tightly he or she is fixed around the *adult* pole. In Kelly's terms, loosening around the *adult* pole would facilitate a shift towards the *child* pole.

Much emphasis is placed in mainstream psychology on development. Certainly, in a biological sense, the word 'develop' means "to grow into a fuller, higher, or maturer condition" (*Shorter Oxford English Dictionary*, Little, Fowler, Coulson, Onions, & Friedrichsen, 1991, p. 534). Somehow, socially and culturally, the fuller, higher, or maturer condition became advanced, complete, preferred and more valuable. A slightly older meaning of the word develop is, "To unfold more fully, bring out all that is contained in" (*Shorter Oxford English Dictionary*, Little et al., 1991, p. 534). In this sense, developing as an adult might include the ability to call upon, and apply, a range of life experiences and skills, including the ability to construe as a child construes.

For many clinicians who are 'good with children' unfolding and revealing the ability to construe as the child construes is the basis of really communicating with children. Mills and Crowley (1991) employ the extreme metaphor of 'the child within':

> For those of us who work with children, "Return to the beginning, become a child again" [Tao Te Ching] can truly be a helpful passage to remember…. There is general agreement on the need for providing a safe environment in which the qualities of rapport, respect, and cooperation can be fostered. For us, *contacting the child within* is the pivotal element in building these many dimensions of the therapeutic relationship. Indeed, it may even be the single most critical element in ultimately reaching the child. (p. 217, italics are original)

The proposed constructivist view, however, is not so much on 'becoming a child again', rather, maintaining the adult perspective but loosening around the adult pole and allowing a little permeability to an *adult construing – child construing* core construct. Arguably, the ability to fluctuate between construing one's world as an adult and as a child, underpins the brilliance of children's writers such as A.A. Milne who first published *Winnie-the-Pooh* in 1928. Essentially, the art of being a children's author is to communicate, with intrigue and appeal, a story that will be understood by children. In sum, for anyone who works with children, seeing the world as a child sees the world is essential for effective communication and understanding.

For the procedure-oriented health professional, the notion of ‘construing as a child construes’ may be perceived as ‘new-age garbage’. Such practitioners may be highly skilled and competent at ‘getting the job done’. However, in getting the job done, children often suffer extreme pain and fear at the hands of the clinician. Yet it must be said, one can be a technical expert, and at the same time, be concerned with the impact of procedural pain and fear on the child, and furthermore, willing to do something about it. For those health professionals who are willing to confront the pain and distress that they cause, seeing the procedure through a child’s eyes can be a difficult but profound experience. Construing as the child construes, constructs a child-like interpretation of the situation and provides *insight* into the fear experienced by the child. The development of insight usually means that the client has adopted the language and views of the health professional. The argument here is the reverse: in order to understand a child’s fear during a medical procedure, one must be cognisant of what the experience means for the child. If one views medical procedures through the eyes of a child, it is not surprising that the child is terrified and even less surprising that so-called words of reassurance are often ineffective. It is one thing to say “this child is distressed”, it is another to see distress in a child and to do something about it.

### ***Summary***

The aim of this chapter was to explore the relationship between procedural pain and fear from the child’s point of view. Mainstream thinking about pain and fear in children is largely structured within two related pervasive models, the biomedical, and the developmental. Within this paradigm, fear is seen as a function of the pain and it is assumed that if the pain is managed, the fear will disappear. This assumption is challenged when we see frightened children undergoing procedures with adequate local anaesthesia and in a vast number of adults who are afraid of visiting the dentist. The notion that fear inhibits pain was challenged. Certainly, with regard to current knowledge about endogenous opioids, it seem highly unlikely that sufficient opioids are released to effect any significant level of endogenous analgesia in a fear response. Furthermore, common sense clinical observation of a terrified child screaming in pain and fear would suggest that if anything, the fear exacerbates the pain.

An important distinction was made in this chapter between anxiety and fear. If an affective component of pain is considered at all, then within the biomedical view, it is passively labelled as anxiety, whereas the identification of fear demands attention. Most importantly, if health professionals recognise that children experience fear in relation to procedure pain then the basis of the fear can be explored and the 'problem' and indeed the challenge of procedural pain becomes the health professional's. Projection of the 'problem of procedural pain' on to the child is reflected in the emphasis on compliance, where the 'problem child' is the non-compliant child. Within the biomedical view, children who comply and behave do not appear to be distressed, they tend not to complain and it is assumed that these children feel less pain and 'anxiety' because they do what they are told. On the other hand, the belief that underpins the non-compliant and resistant child's, screams of pain and fear, is that they are only making it worse for themselves by not holding still and not doing what they are told. Constructively, from the child's perspective, a sense of control, empowerment, status, being included and participating, factors discussed earlier, are more likely to impact on the emergence, of fear than issues surrounding the biomedical notion of 'compliance'.

In contrast to the developmental view, which views children as partially developed adults making 'errors in appraisal,' the constructivist view, in which a 6 year-old is considered a complete and whole person who happens to be aged six, is favoured. Arguably, it is better to understand how a particular six year-old construes his or her reality than to define the child in terms of what he or she cannot achieve in relation to an adult. Beecher's (1946) study of wounded soldiers is an interesting account of the personal reality of pain and fear, but in terms of procedural pain, it is his passing footnote on the observation that the soldiers with horrendous wounds would complain bitterly at an inept venepuncture that is most revealing. Beecher's comments illustrate the uniqueness of procedural pain. Here were a group of soldiers with serious wounds, some of whom presumably would not survive, not complaining of wound pain but complaining bitterly at someone having difficulty performing a venepuncture. This observation does not fit with the 'hierarchy of procedures' and the mechanistic biomedical view of pain. Beecher rightly concluded that the soldiers' lack of wound pain was unlikely to be related to altered sensitivity. If however, one moves from a bottom-up, sensory – appraisal view to a top-down constructivist view of pain then the solution to Beecher's observations lie in the soldier's construed reality.

Finally, the notion of calling upon one's ability to construe the world as a child was raised as an important factor in communicating with children and understanding the impact of procedural pain and fear on children. With regard to procedural pain in children, the word 'unpleasant' in the IASP definition of pain is vastly inadequate. Drawing on Tesler et al. (1989), a more apt definition is perhaps, "Pain is an unbearable, horrible, terrifying and deadly sensory and emotional experience…" The word 'experience' in the IASP definition pertains to consciousness, which together with imagery and hypnosis, are the topics of the next chapter.

CHAPTER 6

# THE CONCEPTS OF CONSCIOUSNESS, IMAGERY AND HYPNOSIS

The previous chapter identified the limitations of the biomedical view of procedural pain in children and stressed the importance of considering the child's view. The aims of this chapter are to explore what is meant by consciousness, and imagery, to differentiate between imagery and hypnosis and to describe the imagery technique employed in this study.

## *Consciousness, Altered States of Consciousness and Imagery*

The pursuit of knowledge about consciousness and what some might refer to as 'altered states of consciousness' and imagery encompasses religion and science. Within the scientific realm, the main domains in which consciousness is considered are cognitive psychology and brain neurophysiology. Whatever the stance, like emotion, consciousness and imagery are not easily defined. As with emotion, a diverse range of views can be adopted when defining consciousness and imagery, even within the scientific domain. If the discussion is extended to consider 'reality' then one turns once again to the philosophical domain. Although conceptual boundaries are foggy, it is important to establish the particular perspective adopted in this thesis with regard to consciousness and imagery.

### *Cerebral Lateralization and Consciousness*

The human brain is grossly divided into two hemispheres, the left hemisphere and the right hemisphere. The concept of lateralization attributes specialized functions to each hemisphere. For example, language in most people is localized in the left hemisphere. Many of the perceived functions and apparent specialization of each hemisphere were discovered during clinical observations of patients with unilateral cerebral damage. Commonly a person who has suffered a left sided cerebral lesion with a contralateral hemiplegia is dysphasic or aphasic. This is attributed to lateralization of language to the left hemisphere. Conversely, speech deficits are less common in patients with a right-sided cerebral lesion. Nass and Gazzaniga (1987) state:

> The left hemisphere appears crucial to intellectual functioning as evidenced by the frequent impairment in aphasics and the lack of depth of such skills in the right hemisphere even in those commissurotomy patients with rich language skills. (p. 724)

Intellectual functioning is not, however, dependent upon language. Nass and Gazzaniga (1987) also point out that intellectual functioning can continue in the aphasic and that dementia may or may not interfere with language.

Nass and Gazzaniga (1987) hold that the concept of human consciousness is more than cognition and perception of the environment. "It [consciousness] is what makes us self-aware and directive in our actions" (p. 724). Regarding laterality of the brain and consciousness, Nass and Gazzaniga point out that the prospect of laterality playing a part in consciousness is largely determined by how consciousness is defined. If consciousness is synonymous with arousal and wakefulness, then the relevant brain structures are the brain stem, reticular formation, and deep midline structures; these structures are not lateralized. If, however, levels of arousal or degree of vigilance are part of consciousness, then the right hemisphere may be thought to dominate (Nass & Gazzaniga, 1987). Consciousness can however be construed as more than wakefulness and awareness.

> If one considers consciousness in a more philosophical sense (Globus, Maxwell & Savodnik, 1976), then at first approximation it is the process that allows for our subjective sense of *reality*. (Nass & Gazzaniga, 1987, p. 724, italics added)

With this definition, the left hemisphere would be dominant, again, reflecting the variance regarding laterality, depending upon how consciousness is defined.

### *Consciousness, Reality, and Working Memory*

Without becoming embroiled in the intractable realist – idealist debate, it is necessary to reiterate the various positions that can be adopted concerning the relationship between 'reality' and 'consciousness'. At one extreme is common sense 'realism', the taken for granted view that there is an external reality and that consciousness simply reflects that reality. At the idealist extreme, the notion of reality is laid aside as a determinant of consciousness and there is only consciousness that exists in its own terms. The middle of the road positions vary in as much as some presuppose an external reality to which consciousness approximates, others, the social constructivists, see consciousness jointly produced through social interaction, while others, holding the PCP view, maintain that reality is individually construed. The everyday examples that clearly upset the extremist camps, such as dreaming and phantom limb pain, could ultimately be explained by both positions but this thesis strongly favours the constructivist camp. In so doing, it not only takes seriously the phenomenon of phantom limb pain, it holds that the mental operations that give rise to the experience of pain in parts of physically non-existent limbs and body areas can also serve to negate actual pain sensations from existing limbs and regions. In holding this position, this thesis must briefly articulate some of the research that has been devoted to isolating the neurophysiological activity that parallels these mental activities.

There is a clear constructivist parallel between consciousness and neurophysiology. LeDoux, Wilson and Gazzaniga (1979) said:

> It [consciousness] is the system that is continually observing our actual behaviour, as well as our cognitions and internal moods. In attributing cause to behavioural and psychological states, an attitudinal view of the world, involving beliefs and values, *is constructed*, and this becomes a dominant theme in our self-image. (p. 553, italics added)

Thus for LeDoux, Wilson and Gazzaniga, consciousness is a multifaceted construct. It involves monitoring and appraisal of the self in a psychological, social, and culturally determined world. The question that is hotly debated in neuroscience (Metzinger, 2000) relates to the where and how consciousness is represented in the brain.

The consciousness literature expanded in the 1990s and focussed on the relationship between working memory and consciousness (Baars, 1996; Baddeley 1993; Phaf & Wolters, 1997; Schachter, 1991). In proposing the notion of a ‘working memory’, Baddeley (1986) emphasised the active, or ‘working’ aspects of thinking and memory. This was in contrast to the traditional 'short-term memory', which was considered more as a transient space for the temporary storage of information. LeDoux had earlier (LeDoux, Wilson, & Gazzaniga, 1979, cited above) spoken of consciousness as a monitoring system; some 20 years later, for LeDoux the 'system' is working memory. Moreover, LeDoux provides an overview of the possible relationship between working memory, consciousness and fear. In particular, LeDoux (1998) emphasises the 'information storing' role of the cortical association areas and refers to these areas as 'buffers'. Each sensory system has one or more buffers, which make up part of the working memory. For LeDoux, we are conscious of what we are currently thinking about and what we are currently thinking about is in working memory. The difficulty is in defining what 'conscious of', or 'aware of' actually means. This is the topic of much ongoing debate and is clearly beyond the scope of this thesis. Consciousness could be construed as the 'working aspect' of working memory. Certainly, general anaesthetics suppress neuronal activity – the working aspect of neural tissue and, with this, consciousness is impaired, and then lost.

The principal brain areas involved in working memory are the lateral prefrontal cortex, the anterior cingulate cortex, orbital cortex and association areas (LeDoux 1998). These structures do not function in isolation or simply as receivers of information. Back projections with other brain areas provide input and feedback. For example, the cortical association – hippocampal connections are important in laying down new memories in the neocortex. The critical areas relevant to imagery and fear are the two-way connections between the association areas and the amygdala. These areas and their connections were described in Chapter 2. Regarding conscious awareness of activity in cortical regions, awareness is not necessarily associated with activity in the primary and secondary sensory and motor areas of the cortex. Conscious awareness is, however, associated with activity in the association areas and the cingulate cortex (Roth, 2000). Similarly, activity in the primary visual cortex is necessary but not sufficient for the 'seeing' of things. Crick and Koch (1995) hold that we are no more aware of neural activity in the primary visual cortex than we are of activity in the retina. Similarly, regarding the conscious perception of pain, the somatosensory cortex is a pathway rather than an endpoint for awareness of pain. The sensation of pain is associated with activity in the anterior cingulate cortex and the somatosensory association areas (Roth, 2000). Both of these areas are included in the working memory view of consciousness. A most important concept to grasp regarding the functioning of these brain areas is the reciprocal nature of the connections between them; they are active processors, not passive 'receivers,' of information. The notion of an active working memory over a passive 'short-term' storage mechanism is a prime example of the shift in focus in brain neurophysiology from the brain as an 'end-point' processor, to the brain as, not only a processor, but a generator of neural activity and concomitantly, a generator of what is loosely described as conscious experience.

With this in mind, this thesis holds the association between 'consciousness' and the activity in the working memory structures as the most tenable neurophysiological accompaniment to the constructivist position.

This position allows the development of a model describing how imagery and the imaging aspect of hypnosis could serve analgesic functions. If the construed reality in imagery is the core of consciousness and it is pain-free, then in imagery, subjects would report significantly lower levels of pain during a medical procedure than those who were not engaged in imagery. Furthermore, given the connectivity of these areas with the amygdala, the activity in these areas is central to the generation and experience of a fear response. Similarly, if the construed reality in imagery were non-threatening, then subjects would report significantly lower levels of fear than those who were not engaged in imagery.

In a slightly different manner, Chapman and Nakamura (1998) draw upon a constructivist approach to consciousness and hold that hypnotic 'focused' analgesia could work through a combination of two mechanisms, both of which depend on the view that suggested alterations to sensation take 'primacy in consciousness'. The first mechanism is described as 'hypnotic obstruction,' whereby the suggestion of analgesia could give rise to the creation of novel (hypnotic) schema that takes a higher priority in consciousness. In so doing, the hypnotic 'analgesia' schema block the emergence of what Chapman and Nakamura refer to as 'normal' (pain) schema. The second mechanism suggested is that hypnotically focussed and sustained attention may keep the 'analgesia' schema in the forefront of consciousness, that is, to keep the block in place. Chapman and Nakamura argue:

> … somatosensory imagery is the key element in the contents of consciousness, and that the mechanisms behind hypnotic analgesia phenomena are largely related to the competition among schemata for a dominant position within the contents of consciousness. (p. 23)

It is interesting to note Chapman and Nakamura's constructive approach to consciousness. Their model provides insight into the role of suggestion in hypnotic analgesia whereby the susceptible individual incorporates, through somatosensory imagery, the suggested schemata 'into' his or her consciousness. The model preferred in this thesis emphasises the *process* of imaging which alters the experience of fear and pain through a complex web of interactions between brain areas for fear, pain, mental imagery and consciousness. The Chapman and Nakamura model tends towards a linear view that consciousness is a space that admits or does not admit, schemata, images, neuronal impulses, and the like. In this thesis, consciousness is construed as a phenomenon that emerges within the collective activity of neurons, groups of neurons and their inter-connectivity. To illustrate, consciousness of the odour of Chanel No. 9® is not a case of 'olfactory impulses' carrying the 'Chanel No. 9® impulse set' into consciousness. Consciousness of the odour of Chanel No. 9® is a phenomenon that emerges within the activity of a host of neurons that fire in a particular manner. The olfactory impulses merge in the working memory with many other sensory and internally generated impulses concerning the context and significance of the odour. Moreover, it is argued that in imagery, consciousness of the odour of Chanel No. 9® can emerge within intrinsic neuronal activity. In an equivalent manner, when considering the what, where and how of mental images, Kose and Corriss (1996) draw upon the writings of Sartre and Wittgenstein and suggest that the focus should be on the process of imaging rather than the image per se.

> "What is an Image?" or "How is an image processed?" are clearly the wrong kinds of questions. Such questions presuppose answers that treat images as "objects" in the mind (or brain). (p. 161)

In paraphrasing Sartre, Kose and Corriss (1996) said, " ... within imaginative consciousness, an image is not in consciousness but is a consciousness" (p. 158). Marks (1999) takes this view to the extreme when he claims that mental imagery is the basic building block of all consciousness. Certainly, the view taken in this thesis is that the process of imaging is conscious, and the process can be initiated, and indeed, modified by external (bottom-up) or internal (top-down) mechanisms. The approach of Sartre reminds us that it is one thing to be able to identify the regions of the brain that are active during the conscious experience of ‘external’ events or ‘willed images’, it is quite another to be able to claim precisely what consciousness is. Nonetheless, sufficiently impressive advances have been made in the search for the neurophysiological correlates of consciousness to enable us to explore the practical matter of imaging and its effects in a more informed manner than even ten years ago.

### *Images, Imaging and Imagery*

Most people are familiar with mental images; however, the task of defining a mental image or imagery is problematic. Beyond the experiential, a definition of a mental image requires a neurologically based explanation of the what, where and how of image formation. Research using functional MRI (fMRI) into mental image generation has produced conflicting results, mainly regarding localization and laterality. When mental imagery is investigated, the imagery is usually limited to a visual task, for example, asking subjects to imagine particular shapes, objects or scenes. However, imagery can involve any or all of the senses, and a range of cognitions involving language, memory and emotions. Certainly, when imagery is used as a therapeutic intervention to control pain and fear, the imagery is considerably more complex than simply visualizing a rectangle. Indeed, in guided imagery, multiple brain areas will be active, possibly including those concerned with working memory, language, auditory, somatosensory and visual areas.

As a cognitive process, mental imagery is a construed reality that has both conscious and unconscious qualities. The obvious conscious qualities relate to the sensory aspects – “Mental imagery refers to the activation of sensory representations that are not part of the ambient reality” (Mesulam, 1998, p. 1034). As to which brain areas are involved in mental imagery, Mesulam holds:

> The neural substrates for mental imagery appear to include the same areas that would have supported the corresponding acts of perception if the imagined scene were actually unfolding in the external world. (1998, p. 1034)

However, there remains a question as to whether all those areas are actually required to be active during imagery.

D'Esposito, Detre, Aguirre, Stallcup, Alsop, Tippet, and Farah (1997) point out that the conflicting results regarding the brain areas activated in imagery may be due to "particular aspects of the methods, experimental designs, and subjects used in each case" (p.725). In an attempt to overcome the limitations of previous studies D'Esposito et al. (1997) used fMRI to scan two groups of normal subjects. One group, labelled *concrete*, engaged in a simple imagery task generated with words 'apple', 'house', 'horse', the other group, labelled *abstract*, engaged in more difficult imagery also generated with words, 'treaty', 'guilt', 'tenure'. The authors report that the left inferior temporal lobe (Brodmann's area 37) was the most reliably and robustly activated area across subjects. They also found "in two subjects the activated region in area 37 in the lateral lobe extended superiorly into area 19 of the left lateral occipital lobe" (p. 727). They were therefore unable to determine which was the primary site of activation. Importantly though, they report that, no activity was observed for any subject within the primary visual cortices (area 17). The researchers concluded with:

> The results of this experiment support the hypothesis that mental imagery is a function of visual association cortex, and that image generation is asymmetrically localized to the left. (p. 727)

Similarly, support for areas other than the primary visual area being involved in visual imagery comes from Goldenberg, Mullbacher and Nowark (cited in Kosslyn, Behrmann, & Jeannerod, 1995) who report on a case of a cortically blind, brain-damaged patient who retained the ability to form visual mental images.

> … her primary visual cortex was almost totally lesioned… Thus, her imagery apparently did not depend on intact area 17. but rather relied (at least in large part) on higher-level visual areas that were not damaged. (p. 1341)

Kosslyn et al. report that the patient denied that she was blind and they suggest, "… this belief could have been based on her confusing visual mental images for actual percepts." (p. 1341). What is particularly interesting about this patient is the impact of top-down processing (from the undamaged higher-level visual association areas) in her construction of visual reality. Furthermore, there is a suggestion, quite contrary to Mesulam, that the areas involved in perceiving the 'real' world will be active when a person is engaged in imagery.

D'Esposito et al. (1997) focussed on visual imagery and found that the visual association area of the left temporal lobe was a major site of image activity. The findings are, however, not conclusive. Mellet, Tzourio-Mazover, Bricogne, Mazover, Kosslyn and Denis (2000) used regional cerebral blood flow (rCBF) to investigate cerebral activity in subjects who performed a task that required high-resolution visual mental imagery. They found no activity in the primary visual area, which is consistent with other studies, but significant activity in the right inferior temporal cortex. Mellet et al. suggest that the left inferior temporal lobe may be involved in simple imagery and that complex imagery is localized to the right side. Bilateral activity in the temporal lobes would be expected if the visual association areas were active in visual imagery because the visual association areas extend bilaterally into the temporal lobes, and in humans, the temporal lobe is activated during the conscious experience of a visual stimulus (Logothetis, 1999).

The functional brain studies are also important regarding the interplay between imagery and emotion because they locate image activity in the association areas of the temporal lobe and these areas have strong connections with the amygdala. Moreover, the heteromodal (polymodal) association areas exert a top-down influence on activity in the unimodal association areas (Mesulam, 1998), and these regions interact with the amygdala. In this way, input to the amygdala can be modulated by the imagery-based activity in the association and related working memory areas. However, in noting the connections between the association areas and the amygdala, we are reminded of the pitfalls of mind-body dualism where the association areas, working memory and the phenomenon of consciousness might be taken to be the 'mind'. The position taken in this thesis, and presented in Chapter 2 is very much that the mind and body are one. The mind does not preside over so-called 'matter', the body. It is important to point out that as the brain is part of the body-mind whole, the effects of imagery are not simply confined to alterations in conscious awareness. The hard-wired connections between brain regions, together with the extensive communication network afforded by the neuropeptides (Pert 1999; Pert, Dreher, & Ruff, 1998), are a template via which emotion and imagery can exert widespread effects throughout the body. Imagery-based sexual arousal is a clear example of the potentially widespread effects of mental imagery. Similarly, if a person actively constructs a mental image that is frightening, it is frightening because of the unconscious flow-on, from the association areas in working memory to the amygdala and from the amygdala back to the association areas together with the extensive autonomic and hormonal output effects of amygdala activation. Collectively, these are effects of imagery in consciousness within a person.

### *Practical Issues in the use of Imagery*

Having considered some of the broad philosophical and neurophysiological aspects of consciousness, it is now necessary to review the various practical aspects of imagery as a technique. The manner in which imagery was used in this research will be described in some detail. This will provide a focus to consider related techniques such as hypnosis.

Imagery can be loosely defined as "the internal experience of an event without the external stimuli" (Zahourek, 1988, p. 8); "Any thought representation that has a sensory quality" (Horowitz; cited in Zahourek, 1988, p. 8), and "quasi-sensory or quasi-perceptual experiences of which we are self-consciously aware and which exist for us in the absence of those stimulus conditions…" (Richardson, cited in Zahourek, 1988, p. 8). Of these definitions, Zahourek's "internal experience of an event without the external stimuli" is perhaps the easiest to comprehend. It is easily demonstrated in the lemon tree exercise where a person imagines a lemon tree, picking a lemon, cutting it in half and biting into the juicy flesh. Most people will experience some aspects of imagery, that is, the internal experience of biting a lemon without actually having a lemon. Some will describe the colour and texture of the lemon, the shape, smell and taste. All of these experiences are aspects of imagery. Some will even experience salivation as a physiological response to the image of biting into the lemon.

In clinical practice, one needs to be able to provide a simple and straightforward explanation of what imagery is. This is especially the case when working with children where even Zahourek's definition is likely to be confusing. The task of explaining to a six-year-old what imagery is requires a basic illustration of something with which the child is familiar. In this study, the researcher approached the topic of imagery by drawing on the analogy with dreaming:

> "You know when you wake up in the morning, and you have been dreaming, those dreams seem very real, like it was just happening. Well, did you know that you can do that in the daytime? I call that imagery or using our imagination, like a daydream."

By linking the concept of imagery to a commonly experienced event, children are generally able to understand what imagery is. With younger children merely talking and engaging in story telling can invoke images. In discussing the use of imagery in the management of procedural pain in children, Zahourek's definition "the internal experience of an event without the external stimuli" is a practical starting point. The imagery used in this study and much of the literature and research on pain and imagery is referred to as 'guided imagery'.

### *Guided Imagery*

Guided imagery is a technique, often combined with relaxation, that can be used with children as young as five years, through to adolescents, adults and the elderly. The focus in this study was with children so the technique will be described in relation to children, however, imagery techniques can be used across the life span.

The first step is to approach the topic of imagery with the child. The analogy with dreams outlined above is a useful way of achieving this. It is also helpful to approach the topic in a positive manner, such as "I know a way that we can make this easier, would you like to try?" The foggy window analogy is another useful way of illustrating imagery.

> "You know when you breathe on a window and it all fogs up, you can't see through the window. Sometimes you can see a little bit but it looks different. Well, imagery is a bit like fogging up the window, you might be aware of some things happening but it is different"

The next step is to identify something that the child likes to do. This can be done with a direct, open-ended question "What do you like doing, what is good fun?" The aim here is to allow the child to choose what he or she would like to imagine, something that is experiential and enjoyable. A little prompting may be required to identify the child's interests. At this stage, it is better to focus on activities that involve others rather than solitary pursuits such as reading a book, although this is not imperative. Some children enter into imagery imagining a favourite computer game but more often children say that they like playing sport, playing in their backyard, playing on the swings and slides, swimming or being at the beach. When the child has identified what he or she would like to imagine, for example, playing on the swings and slides at the local playground, the process is simply explained and it can begin with a relaxation phase.

> "Okay, that sounds like good fun. What we can do is, while you are imagining and playing on the swings and slides, and telling me about what is happening there, we will do the blood test. I will tell you when we will do the test so there will be no surprises. The first step to relaxing is to take a big, deep breath in.... and... out. That's good, another deep breath in... and out. What we are going to do is let our muscles go all floppy and we will start with feet. Just notice the feeling of your feet on the floor and wiggle your toes. Ah! That's good. Now we will work our way up through your legs noticing the sensations at the back of your legs and across your knees and letting them go all floppy. Take another deep breath in... and out. Now notice the feeling of your weight on the chair (or lying on the bed) and up your back to your shoulders. When we get to shoulders, the best thing to do is to let them drop. Ah! That's good. Now we are going to work our way up through your neck. Notice the feeling of your hair around your neck and your ears. Now around to your eyes and your forehead. If you like you can close your eyes. (At this point, most children will close their eyes. It is not essential that eyes are closed and this should certainly not be pushed.) Now we will go back down to your shoulders and down both arms together, through your elbows to your fingers".

> Sometimes you can ask a child to relax each finger as if he or she was tracing around each finger with a pencil.
>
> "Now I don't know what it looks like, where your playground is. What does it look like? Is it a sunny day, or a cloudy day? Is there a swing? What are you going to go on first?" The intention here is to give the child choices and to establish the present tense rather than describing a memory of a previous event. The 'guided' part of guided imagery involves asking the child simple questions about his or her imagery. For example, "Where are you now?" The child might say "I'm going over to the slide." "Okay, when you get there go up to the top but count how many steps there are to the top and tell me when you get there." "I am at the top." "How many steps up to the top?" "Eleven." "Okay, have a look around and tell me what you can see from the top." "I can see my brother." What is he doing?" "He is on the swing" "Okay when you are ready, slide down the slide and we will do the blood test thing. Tell me when you are sliding down the slide." "Now I'm going down the slide." "There goes the blood test, are you at the bottom? Where are you going now?" "Back up again." "Okay, tell me when you get to the top..." The child may then have another go on the slide or the swing or engage in some other activity. Another couple of minutes in imagery and then he or she is informed that the procedure is over and we can finish the imagery. "When you are ready, you can finish your imagery and the way we do that is to count backwards in our mind from four to one and when you get to one, open your eyes, look at the floor and then look up, and we are all finished."

The way children respond to imagery varies greatly. Some children will go through the experience unaware of anything that is happening to them. Some children will open their eyes and check out what is happening. This does not necessarily mean that they are 'out of their imagery'. Frequently, on coming out of imagery, children stretch and appear a little displaced. Sometimes the exercise may appear to have failed but in procedural pain and imagery, there are many levels of success. The following case from a previous study (Whitaker, 1994) illustrates this point.

> An 11-year-old boy presented to the pathology out patient's department to have a venepuncture. On each of the preceding two days, he had been restrained and given intramuscular procaine penicillin by a general practitioner. His father brought him in, the boy was visibly terrified. He sat on a raised bench-like structure that had a mattress, sheet and pillow. The relaxation and guided imagery technique described above was used with the boy. His imagery focus was swinging on the swing with his father pushing him higher and higher. As he did this, his eyes were moving up and down behind closed lids. The nurse then inserted the 23-gauge butterfly needle into his arm. At this point, he opened his eyes and began to cry. He sat there throughout the venepuncture quietly sobbing. After the child and his father had left, the comment to the nurse was that case was not particularly successful. She replied "Oh yes it was, normally it would take two of us to hold a child like that down and another to do the venepuncture." The boy had cried when the needle was inserted but he did not move and certainly did not require the slightest restraint. He was upset but he was also in control.

The emphasis in guided imagery is on communicating with the child about whatever it is that he or she is imagining. The aim is to allow the child to construct an experience in imagery and to share that experience with the person guiding the child's imagery. The child's imagery is experiential, involving the child and usually familiar others. The child describes his or her imagery as it unfolds and the person guiding the imagery simply asks the child about various aspects of the imagery.

The constructivist position taken in this thesis extends to the child's sense of self in imagery; that is, in imagery, the child constructs his or her sense of self in a scene that transcends the immediate physical reality and becomes a reality in imagery. At a theoretical level, the following definition is offered:

> Guided imagery is a therapeutic technique that allows two people to communicate on a reality that one of them has chosen to construe in the process of imaging.

The guide as it were adopts the role of an inquisitive blind person in the world of the child, and, with the exception of brief references to the medical procedure, endeavours to "inhabit the child's world" as completely as possible. The ability to access one's child-like constructs is clearly an asset in achieving this. Occasionally, the child will involve the guide in his or her imagery. For example, a child with a long history of very painful and traumatic procedures once said, in imagery, after skating across a frozen lake to his house, "Now we are having tea and you are here." I asked, "What are we having for tea?" He replied, "Pizza, and you're having two pieces!"

In guided imagery, the person has chosen what it is that he or she would like to imagine. Often children do not choose a quiet peaceful and relaxing scene. Frequently imagery involves playing a sport or at a playground or playing in the backyard. Often the imagery is active and engaging. For example when asked "What was the easiest part of your imagery to see?", one five year-old boy, who had been playing football in imagery said, "When I was up forward and smashed someone". In guided imagery the flow of communication tends to be from the child to the person guiding the imagery. The child simply verbalises his or her imagery. The person guiding the imagery follows the description and asks questions that are pertinent to the imagery. For example if a child was playing a game of netball in imagery, the person guiding the imagery might ask: "What does it look like where you play netball?" "Is it inside or outside?" "Who has got the ball?" "Where are you?" "Tell me when you go for a shot." "What is the score?"

Interspersed in this would be the child's description of the game. Some children in imagery will talk and talk with detailed description of their imagery. When this happens the role of the guide is reduced. Others verbalise less of what is happening in their imagery. In these cases the guide, if experienced, may feel comfortable in letting the child go but usually more questions are asked.

For anyone who is familiar with hypnosis, the above will sound very much like hypnosis. The following is a comparison of imagery and hypnosis together with the rationale for why the distinction is important in this study.

### *The Difference between Hypnosis and Guided Imagery*

Where guided imagery focuses on the mental 'imaging' aspect of imagery, hypnosis focuses on the individual achieving a state whereby he or she is more receptive to suggestion, which may be achieved with or without the use of imagery. Barber (1996) acknowledges the difficulty in defining hypnosis and offers the following as a working definition:

> Hypnosis is an altered condition or state of consciousness characterized by a markedly increased receptivity to suggestion, the capacity for modification of perception and memory, and the potential for systematic control of a variety of usually involuntary physiological functions (such as glandular activity, vasomotor activity, etc.). (p. 5)

Inherent in Barber's definition is the use of suggestion, but crucially, the suggestion is given with a particular therapeutic goal in mind. In differentiating between hypnosis and imagery, Syrjala and Abrams (1996) state:

> "Imagery" and "visualization are synonymous in our use of the terms and generally indicate incorporation of visual images, whereas "hypnosis" *may or may not* include visual imagery. … hypnosis implies an effort to achieve a state of highly focussed attention, during which time the patient is more susceptible to suggestion. *Suggestion is an integral part of hypnosis*, whereas suggestion may or may not be offered in imagery, relaxation or meditation strategies. (p. 231, emphasis added).

With regard to the distinction between imagery and hypnosis, three cardinal differences stand out. They are, first: in guided imagery there is no deepening of a trance like state. In hypnosis, there is typically an induction phase where the aim is to deepen the trance state through focussed attention and suggestion. In imagery, the person simply verbalises the imagined scene. Second, therapeutic suggestion is not used in imagery. Suggestions for analgesia or altered sensations for example, are not given. These are integral to the hypnotic techniques. Third, post-hypnotic suggestion, (a suggestion given in hypnosis coupled with a cue), is not used in guided imagery.

These are commonly given in hypnosis. All three aspects – induction and trance, hypnotic suggestion, and post-hypnotic suggestion, require further consideration.

Hypnosis usually begins with an induction process, which is when the deepening of trance state begins. With adults, the induction process is standard but with children, LeBaron and Zeltzer (1996) argue that because children readily engage in make-believe and fantasy, "… an adult-style "induction" process as a prelude to using imagery and suggestion in children seems redundant". Similarly, Kuttner (1993) points out in hypnosis with children that there is much less emphasis on hypnotic induction compared to adults, as children are usually highly suggestible. Ellis and Spanos (1994) hold that the lack of an induction procedure in guided imagery as the main difference between the two approaches to treatment.

> The imagery-based strategy was not defined as hypnosis… [it] did not include a hypnotic-induction procedure. Thus it is more accurately described as a guided imagery treatment than a hypnotic treatment. (p. 102)

Ellis and Spanos defer to hypnotic induction as the criterion of differentiation between hypnosis and imagery but they do not explain what a hypnotic induction is. Furthermore, they do not define imagery beyond saying what it is not, namely, hypnosis. Opinion is divided on the relevance of a 'trance' in hypnosis. Syrjala and Abrams (1996) said:

> Hypnosis and imagery are widely agreed to be states of highly focussed attention during which alteration of sensations, awareness, and perceptions can occur. More in dispute are the questions of whether hypnosis is an altered state of consciousness requiring a trance, and whether it is distinct from imagery because of this. (p. 231)

Hypnotic induction techniques are numerous and most importantly regarding children, they are varied. Olness and Kohen (1996) provide an excellent overview of induction techniques used with children and group these under visual, auditory imagery, movement imagery, storytelling, and ideomotor, progressive relaxation, eye fixation, distraction and group inductions. Olness and Kohen emphasise, "Any induction method may also be used as a method of deepening, or intensification of the hypnotic experience …" (1996, p. 52).

Images are used in hypnosis but they are dovetailed with suggestion. A central tenant of hypnosis is that the efficacy of the hypnotic experience lies with the suggestion rather than the image, which is a direct contrast to imagery. Rosenberg (1990, p. 207) said, "Images do not intrinsically evoke specific effects; the practitioner's verbalization must include therapeutic suggestions." It is important to point out that Rosenberg is referring to images within the hypnotic paradigm. Certainly in hypnosis, the goals of treatment are achieved through suggestion. When imagery is incorporated in hypnosis, it is a vehicle for the suggestion. However, images are not confined, nor necessary, within the hypnosis paradigm. As LeBaron and Zeltzer (1996, p. 312) point out, "Although hypnotic techniques for children often make use of imagery, the two are not at all the same".

Classically in hypnosis, the clinician will offer direct or indirect suggestions that are intended to be therapeutic. The use of a pain switch is an example of a hypnotic technique for pain reduction. The suggestion may be direct as in, "As you turn the switch down, you will feel less and less pain in your hand". Alternatively, the indirect equivalent would be "After you have found the switch that will turn down the pain sensations, you can turn it down, and as you do this you may be surprised at the change in sensation in your hand." A plethora of examples of direct and indirect suggestions used in hypnosis and pain management can be found in Barber (1996), Elton, Stanley and Burrows (1983), Hammond (1990) and Zeltzer and LeBaron (1982). Olness and Kohen (1996, p. 204) describe a number of techniques of hypnoanalgesia used with children. These range from direct suggestions, such as painting on numbing medicine, glove anaesthesia or a switchbox, distancing suggestions, as in moving pain away from the self or transferring pain to another body part, to suggestions for feelings that are antithetical to pain such as comfort, laughter and relaxation.

Hypnosis, for some, places much emphasis on language and in particular the phrasing of suggestions. Hammond (1990, p. 40), stresses the importance of mastering the hypnotic language and lists 82 examples of hypnotic phrasing designed to "… assist you to become smoother in your delivery of inductions and suggestions." These phrases are so central to the hypnotic technique, in Hammond's opinion, that he stresses, "It may be useful to tape record these phrases and listen to them repeatedly. This will assist you in internalising this new way of speaking." The following phrases are examples from Hammond's list.

> And I wonder if it will surprise you when …
> One of the things I'd like you to discover is …
> I wonder if you'll enjoy how naturally, how easily …
> I'd like you to begin allowing …
> And maybe you'll enjoy noticing …
> I don't know if you're aware of these changes, and it doesn't really matter.
> I wonder if you'll decide to … or …
> I want to remind you of something you already know, which is… (pp. 40-41)

The degree of emphasis on 'new ways of speaking' varies from one practitioner to another but seasoned practitioners in hypnosis hold that the art of the hypnotic technique is embedded in the subtleties of language and suggestion.

The last factor to be presented here that differentiates hypnosis and imagery is the use of a particular type of therapeutic suggestion in hypnosis: post hypnotic suggestion. A posthypnotic suggestion is a therapeutic suggestion given by the clinician to the patient while he or she is in hypnotic trance. The type of posthypnotic suggestion will depend upon the goal of the treatment. A cue is given to the patient that will invoke the posthypnotic suggestion. Posthypnotic suggestions are given for relaxation, anxiety reduction, and trance induction or behaviour modification, for example, with the aim of reducing cigarette smoking or excessive eating. The following are examples of posthypnotic suggestions; each has a cue that is linked to a desired outcome.

> "Whenever you take a deep breath [or whatever cue you determine appropriate], you might notice how curiously comfortable you feel, with nothing to bother you, and nothing to disturb you." (Barber, 1996, p. 26 parentheses in the original)

"Whenever I gently touch your arm, like this [cue], you will discover, at that moment, how really comfortable your arm feels." (Barber, 1996, p. 93)
Any time they [patients] would like to recapture this feeling of comfort, they need only take a deep, slow breath [cue] and take out their mental picture; they can once again feel their bodies relax as the tension flows out and the comfort flows in. Syrjala and Abrams (1996, p.245)

Whenever you start biting your nails … the moment you put your fingers in your mouth [cue] … you will get a horrible bitter taste in your mouth. This will become stronger and nastier … and will make you feel sick. (Waxman, 1990, p. 430)

Posthypnotic suggestion can be used in procedural pain management in children. An excellent example can be seen in Leora Kuttner's (1986) videorecording *No Fears, No Tears: Children coping with cancer pain*. Kuttner demonstrates a number of hypnotic techniques with children undergoing painful procedures in the treatment of cancer. The one referred to here is with a child named Leslie, the cue is stroking Leslie's finger, and the desired outcome is deep relaxation transferred to the child's back during a bone marrow aspiration. The following passage from the tape illustrates the incorporation of a posthypnotic suggestion in hypnosis to manage procedural pain in a child.

*Pre-procedure*

Kuttner: "Now, as I stroke your back, can you feel the difference? Can you feel your back feeling rested and relaxed?

Leslie: "Yes"

Kuttner: "Excellent!… Okay, so all that I will have to do during the procedure is rub this hand and remind you that we can transfer it to your back, okay"

*During the procedure, while stroking Leslie's finger:*

Kuttner: Okay, Allow the sleepiness to come into your back. And, as I stroke your hand, your back feels more and more comfortable. Can you feel that beginning?

Leslie: Mmm mm

Kuttner: Excellent!

In conclusion, of the three aspects which have been argued to distinguish hypnosis from guided imagery, the two that revolve around suggestion may be the most significant in theoretical terms. Given the model of consciousness proposed in this thesis it is clear that the trance-like state or focused attention that is a feature of hypnosis may be akin to the child's imaging in as much as both represent a top-down construction of a 'reality' other than the immediate here and now. Where hypnosis and imagery differ in the management of procedural pain is that in hypnosis, the clinician, by means of suggestion, attempts to direct the person's attention towards an altered sensation, that competes with the sensations of the procedural reality, akin to Chapman and Nakamura's model of competing schema. In guided imagery, on the other hand, the guide works assiduously to sustain the child's construction of an alternative 'reality' with only minimal reference to the here and now. The guide may let the child know when the needle is being inserted and about other significant procedural events but otherwise the child is encouraged to maintain an image of a place and time quite apart from the procedural setting. What remains confusing is that the boundaries between hypnosis and guided imagery have never been well described and, furthermore, hypnosis is a technique that often draws on imagery.

At this point, it is worth re-emphasising that the aim of this study is to investigate and differentiate between the effects of imagery, distraction and relaxation as they apply to any technique – guided imagery or hypnosis. In so doing, the proposed effects of imagery and relaxation may also apply to the 'imagery' and 'relaxation' components of hypnosis but suggestion is absent. Certainly, clinically, in using hypnosis, there are situations where the use of suggestion will afford a better outcome than the use of imagery alone, particularly if the child has difficulty with imagery. For example, hypnotic techniques for managing procedural pain, are commonly used with children under the age of five years, and would be preferred over imagery because children under about four-and-a-half to five years have difficulty in engaging, describing, and sustaining imagery. Thus, in some particular situations hypnosis, with an emphasis on suggestions may be an ideal strategy to alleviate pain and distress. However, in other circumstances it may be that it is the consistent shift in consciousness, achieved through either imagery, or hypnosis, that performs best, by invoking a construed reality that works to invalidate afferent pain signals and renders fear inappropriate.

## *Summary*

The aims of this chapter were to explore what is meant by consciousness, to relate consciousness to imagery, to define guided imagery at both the theoretical and practical levels, and to differentiate between guided imagery and hypnosis. The chapter began with a discussion on consciousness, altered states of consciousness and imagery.

The tentative view taken in this thesis is that consciousness is a phenomenon that emerges from a range of brain activities and that consciousness is represented in the reality of the moment. The view in contemporary neuroscience is that consciousness is awareness of what is in working memory. A problem arises here in nailing down what 'aware of' actually means. The language used also tends to encourage the view that 'things' enter a space, when they are in that space, they are conscious, and when they are out, they are not conscious. As a concept, consciousness is not easily defined. The notion of a working memory view of consciousness has merit, but the stance taken in this thesis is that consciousness is more related to the 'working' aspect of working memory than something temporarily bouncing around in a group of brain structures.

Similarly, identifying what an image is, is problematic because if imaging is the stuff of consciousness then 'an image' does not 'enter' consciousness, rather, imaging is consciousness. Neuroimaging studies, although conflicting, point to the association areas of the temporal lobe as active areas during visual mental imagery. The primary visual area appears an unlikely site for the generation of visual images or perhaps more accurately, the process of imaging. The association areas are however part of the working memory structures and if consciousness is a phenomenon that emerges from activity in these regions, then whatever is imaged would be consciousness. When this is advanced within the constructivist view, whatever is imaged becomes reality. Furthermore, the important links to emphasise regarding a potential effect of imagery on fear are the two-way connections between the association areas (involved in imaging) and the amygdala (involved in modulating), the experience of fear.

The upshot of all of this is that the structures that are common to the phenomenon of consciousness, including awareness of pain, the association areas and the anterior cingulate cortex, are also involved in the process of imaging. Moreover, given that that which is visually real and conscious in visual imagery pertains to activity in the visual association areas rather than the primary visual area, that which is somatosensorialy real and conscious in imagery may pertain to activity in the somatosensory association areas regardless of afferent upstream nociceptive input to the primary sensory cortex.

If one person talks to another who has his or her eyes closed, many people assume that what they are observing is hypnosis. Imagery and indeed guided imagery focuses on the mental act and effects of imaging. The difference between guided imagery and hypnosis is centred on the use of suggestion in the latter. The practical aspects of the guided imagery technique employed in this study were described in this chapter. In the next chapter, research into imagery and distraction techniques in the management of procedural pain is reviewed but the two approaches are also compared and contrasted, by drawing on, and developing, the themes related to neurophysiology and consciousness presented in this chapter.

CHAPTER 7

# IMAGERY AND DISTRACTION IN THE MANAGEMENT OF PROCEDURAL PAIN IN CHILDREN

The previous chapter delineated a constructivist view of consciousness and reviewed brain neurophysiological processes thought to underpin mental imagery and conscious awareness. In this chapter, two psychological approaches to the management of procedural pain are reviewed: imagery and distraction techniques. The imagery studies are complicated by the lack of consistency in definition and technique. Despite this, the main approaches are reviewed within the context of procedural pain in children. Distraction techniques also vary enormously but they do converge on a central tenet, that is, distracting attention from the painful procedure. The chapter concludes with a discussion of imagery and distraction within the constructivist view of consciousness and reality and related neurophysiology.

## *Imagery and Procedural Pain in Children*

Over the past decade, there has been an enormous increase in interest and application of imagery in the management of procedural pain in children. While researchers and authors on the topic are clear about the procedural aspect, be it venepuncture, bone marrow aspiration, lumbar puncture and the like, they are not clear, or consistent, in referring to 'imagery'. Furthermore, the frequent shifts in terminology between imagery, guided imagery, relaxation, and hypnosis add to the confusion. Lambert (1996), for example, refers to hypnosis/guided imagery as a single intervention to improve the postoperative management of pain and anxiety in children. Langley (1999) highlights the difficulty in making sense of the literature in her review of the effectiveness of guided imagery in the care of children. "Reviewing the literature on guided imagery was not straightforward because authors use the terms, 'relaxation/imagery' and hypnosis interchangeably" (p.18). When reviewing an article on imagery, the reader will frequently find many interpretations of the term, including: 'imagery scripts', 'imagery audiotapes', 'emotive imagery', 'healing imagery', 'memory recall', 'imagery/hypnosis', 'hypnosis' and 'guided imagery'. The term 'guided imagery' can refer to all, some, or only one of the above. Furthermore, it is not uncommon to find that an author refers to 'imagery' without defining or describing what is meant by the term.

### *Vague use of the term 'Imagery'*

The vague or undefined use of the term 'imagery' in the literature occurs at two levels: firstly in articles that generally advocate the use of imagery (e.g., Kasson, Sentivany & Kato, 1996; Medforth, 1995), and, secondly, in research papers that fail to define or outline the technique in the method. For instance, in a review of approaches to the preparation of children for painful procedures, Broome (1990) advocates the use of relaxation, distraction and imagery. Reference was made to a number of strategies for preparing children, including books, puppets enacting the procedures, videotaped modelling (p. 539), and imagery (p.540). There was however, no description of what imagery is. Similarly, in a subsequent article Broome, Lillis, McGahee and Bates (1992) use the term 'imagery' loosely. The researchers investigated the use of relaxation, imagery and distraction exercises on pain, fear and parental anxiety in children aged 3 to 15 years, who underwent lumbar punctures for the treatment of cancer. The imagery technique was not outlined and it was not clear if the distraction exercises were part of the imagery or whether they constituted a separate intervention. It is not possible to say whether any effects were due to the imagery, the relaxation, or the distraction exercises, or a combination of these.

Later, Broome, Rehwaldt, and Fogg (1998) investigated temperament in relation to distress and pain responses in 19 children and adolescents aged 4 to 18 years who underwent lumbar puncture for the treatment of cancer. The researchers taught the child/adolescent and parents imagery, relaxation and distraction exercises. In each case, the parents 'coached' their child or adolescent in the 'behavioural techniques' during the procedure. Again, the imagery technique was not defined and it was not clear as to whether the distraction exercises were part of the imagery or a separate intervention. The researchers gave subjects and their parents a teaching package for use at home.

> The package included a videotape of a mime demonstrating the techniques, a booklet for the parents explaining how to use the techniques with their child… audiotape of instructions and music to practice relaxation and imagery. (p. 50)

Broom et al. found a significant improvement in pain reports over a 5-month period but behavioural distress did not change significantly. Apart from the limitations of a small sample size coupled with a wide age range, it was not possible to identify which effects were due to relaxation, imagery, or distraction. The description of the learning package suggests that music and audiotaped instructions were included but it was not clear whether these were used during the procedures.

Similar issues emerged in the study by Kazak, Penati, Boyer, Hilmestein, Brophy, Waibel, Blackall, Daller, and Johnson. (1996) who used guided imagery, breathing exercises, and counting, as part of a psychological intervention devised to reduce child and parental distress in children undergoing lumbar punctures and bone marrow aspirations for the treatment of leukaemia. Again, it was not possible to identify which effects were due to guided imagery, breathing or counting. There were three groups of children: a control group accessed three months before the instigation of the psychological interventions; a pharmacology only group; and a combined (drug and psychological intervention) group. The children in the combined intervention group received the same premedication as the children in the pharmacology only group. The premedications listed were injectable 1% lidocaine, midazolam and morphine sulphate.

The findings of Kazak et al. were mixed. The mothers in the combined intervention group reported lower levels of distress in their child compared to the ratings of the mothers in the pharmacology only group. The nurses' ratings supported this finding but the researchers report, "… the majority of measures… showed no significant effects of the CI [combined intervention] condition over the PO [pharmacology only] condition. (Kazak et al., 1996, p. 626).

There were a number of distinct flaws in this study. The parents were trained in imagery and they undertook the role of guiding their child's imagery but there was no indication of how successful this was for the parents or the child. Furthermore, it was not clear whether parents and children used some, or all of the interventions. In addition, the level of medication was problematic. Kazak et al. state, “The use of additional doses of midazolam and/or morphine to a maximum safe dose was encouraged to attain adequate sedation” (p. 620). ‘Adequate sedation’ in this context would be deep sedation. The term ‘conscious sedation’ is frequently used to describe the level of sedation attained pharmacologically to manage procedural pain in children. In this study, the researchers use the term conscious sedation to describe the effect of the premedication. “Conscious sedation implies that the patient remained responsive to verbal and tactile stimuli.” (p. 620). The researchers do not comment on any effect that the premedication might have had on a child’s ability to engage in the psychological interventions – a problem that Jay, Elliot, Woody and Siegel (1991) found in combining Valium with Cognitive Behavioural Therapy in their study. Conscious sedation with midazolam and morphine achieves a significantly deeper level of sedation than small doses of oral Valium. It is possible (in fact desirable) that a child’s attention span and ability to concentrate would be greatly affected in a state of conscious sedation.

In conclusion, this sample of studies demonstrates a lack of consistency in guided imagery interventions and highlights some of the methodological trappings that plague studies with multiple interventions.

### *Emotive Imagery*

Jay, Katz, Elliott and Siegel (1987) used what they referred to as imagery/distraction in the form of emotive imagery as part of a cognitive-behavioural package to investigate the efficacy of nonpharmacologic intervention in the management of distress during bone marrow aspiration (BMA) in children. In addition to the cognitive-behavioural intervention, the researchers also used oral Valium and minimal treatment-attention as additional interventions with the latter being the control condition. The authors cite Lazarus and Abramavitz as the source for the emotive imagery used in their study. The following excerpt describes what the authors mean by emotive imagery.

> In this technique, emotive images are used to inhibit anxiety. Children's hero images, such as Superman, Wonderwoman, or the Incredible Hulk, were ascertained by discussions with the child. Then a fanciful, age-appropriate story designed to elicit positive affect was created by weaving together the medical situation with one of these hero images. For instance, a child may wish to imagine that he or she is Superman's agent and that Superman has asked him or her to undergo the painful medical procedures as part of a special mission. (p. 861)

The other components of the cognitive-behavioural package were filmed modelling, breathing exercises, positive incentive and behavioural rehearsal. The filmed modelling consisted of the child viewing a video of another child undergoing a BMA and coping. Fifty-six children underwent a BMA in each of the three groups. The measured dependent variables included observational behavioural distress, self-reported pain scores, pulse rate, and blood pressure. With regard to the findings, the researchers stated:

> Repeated-measures analyses of covariance indicated that children in the cognitive-behaviour therapy condition had significantly lower behavioural distress, lower pain ratings, and lower pulse rates than when they were in the attention-control condition. When children were in the Valium condition, they exhibited no significant differences from the attention control condition except that they had lower diastolic blood pressure scores. (p. 860)

In this study, the imagery was one component of a five part cognitive-behavioural intervention. The authors suggested that the results provide support for the efficacy of the cognitive-behavioural intervention in reducing pain and distress. It is, however, not possible to identify which aspect of the intervention or combinations were effective given that the intervention was essentially not a single intervention but a combination of at least five interventions.

### *Healing Imagery*

In an article titled "Guided imagery gets respect", Davenport (1996) acknowledges that there are many styles of guided imagery. The two approaches described focus on healing and psychotherapeutic aspects of imagery.

> Two of the major ones are called scripted imagery and receptive imagery. In the first approach, the guide directs the patient to imagine a designated scenario, whether it is a relaxing walk on the beach for stress management, or a picture of vital cells within the immune system combating disease during cancer treatment.
>
> Receptive imagery elicits the most personally meaningful images as they arise during the session. The guide encourages the patient, while in a deeply relaxed state, to focus all his or her attention and to allow images to form that are descriptive of her or his present state of experience. (p.28)

The emphasis in Davenport's 'scripted imagery' is on incorporating specific suggestions aimed at achieving a particular therapeutic goal, which, as outlined in the previous chapter, is the basis of hypnosis. The second example, 'receptive imagery' describes an imagery based psychotherapeutic intervention where the aim is to elicit deeply personal images that reflect the patient's personal state, feelings, concerns and so on. For Davenport, the essence of receptive imagery is, "… the reclaiming of those parts of oneself that have been disowned, forgotten, or covered over, and reconnecting with the full scope of one's human potential" (p. 26). Both of these approaches are very different to the guided imagery technique described in the previous chapter and employed in this study in which children simply select and describe activities that they know and enjoy and 'create' with the help of the guide.

### *Memory Recall*

Foertsch, O'Hara, Stoddard and Kealy (1998) investigated the use of what they referred to as an 'imagery-based' intervention on distress in 23 children aged 3 to 12 years who underwent a series of four burn-dressing changes. The apparent failure of imagery to alleviate distress in children in this study was perhaps more related to the imagery technique than alleged concerns regarding the procedure. Burn-dressing changes are certainly a source of great pain and distress for children. Burn pain is complex and often difficult to manage. Allodynia, hyperalgesia, wind-up and subsequent resistance to the analgesic effects of opioids compound the problem. The intervention was based on Kuttner's (1988) 'favourite stories' technique. The keywords here are 'based on'. Kuttner's technique is pure hypnosis. Kuttner (1988) refers to the 'favourite stories' as "A hypnotic pain-reduction technique for children in acute pain" (p. 289) and does not refer to her technique as imagery. It is highly unlikely that Kuttner would agree that this study was a replication of her study for the following reasons.

Foertsch, O'Hara, Stoddard and Kealy (1998) describe their 'familiar imagery treatment' as

> … presenting familiar stories to the child that were based on memories and experiences from his or her life. Information for the creation of the stories was gathered from brief interviews with the parent and the child before the dressing change. For example, a three-year-old child particularly enjoyed going to the local K-mart, where he would watch toy trains on display. Another child had just decorated her home for Christmas and had enjoyed putting up stockings and a Christmas tree. (p. 220)

The researchers in this case were asking the children to recall memories of previous activities that the children had engaged in and that they enjoyed doing. Kuttner's 'favourite stories' were imaginative rather than experiential. Kuttner gives three examples in her article: 'Grandma Tiddly and the Elephant', Cinderella and the Magic Fairy' and 'Goldilocks eating baby bears porridge' (pp. 291-294). Kuttner also places great emphasis on the central tenets of hypnosis – suggestion and metaphor – in the 'favourite stories' technique.

> The hypnotic process used during the surgical procedure incorporated aspects essential for a child's hypnotic trance, such as an active involvement with the child, flexibility, informality, and narrowed and increased absorption of attention. Procedural and sensory information was interwoven within the story line. This included weaving indirect or direct suggestions for comfort, diminishing pain awareness, and increased coping within the story line. (p. 291)

Foertsch, O'Hara, Stoddard and Kealy (1998) give no indication that these principles were incorporated in their 'familiar imagery technique'. Simply asking a child to recall a memory of an enjoyable experience is neither imagery nor hypnosis. It is therefore not surprising that Foertsch, O'Hara, Stoddard and Kealy found no support for their main hypothesis, that imagery treatment would be superior to control treatment in the alleviation of distress with burn-dressing changes. At the same time, there are some similarities between this technique and guided imagery, the notable exception being that the child was asked to recall these events, presumably from his or her current position. In guided imagery the child constructs the image and participates in it. It would be interesting to find out what 'tense' the children used in their descriptions.

### *Imagery Scripts and Audiotapes*

The use of imagery scripts or pre-recorded audiotapes is also an approach that is referred to as 'guided imagery'. Mannix, Chandurkar, Rybicki, Tusek and Solomon (1999) used a 'guided imagery' tape to determine the effect of adjuvant imagery on patients with chronic tension type headache. The authors found that subjects who listened to the tape experienced reduced headache frequency and severity, reported improved quality of life and a decrease in disability caused by headache. Kolcaba (1998) tested the effects of 'guided imagery' (using a guided imagery tape) on comfort enhancement in women undergoing conservative treatment for cancer of the breast (lumpectomy and radiotherapy). This study revealed a significant improvement in comfort scores related to radiotherapy between the treatment and control groups but not on the total comfort measure.

Guided imagery, as defined and described in the previous chapter, is a technique that is dependent upon communication. It is hard to see how a pre-recorded tape could be included in this definition of guided imagery. A tape could be an example of directed imagery but certainly not guided. In order to guide a person's imagery, one has to listen and respond to the description of imagery. It would not be possible to employ the technique in this study without engaging the child in two-way conversation.

In the same way, it is desirable, though not necessary, to be physically present with the subject when using the technique described in this study. The author once used guided imagery in an interview on radio. The author was in the Australian Broadcasting Studio in Melbourne while the interviewer was in a studio in Sydney (Whitaker, 1998). In this case, the interviewer (a Scotsman) described walking up a mountain track in the Scottish highlands. He described in detail the terrain of the track and the surroundings – 'boulders', trees, the view and the mountain air – a detailed description despite the physical absence of a guide. The importance of interaction remains however, and in this case, the mechanics of verbal communication, (listening, anticipating, pausing and speaking), were intensified because of the lack of visual cues.

The use of a guided imagery tape is similar to a self-hypnosis tape. The subject can enter a state of relaxation, listen to a story, sometimes with music, and follow the instructions and suggestions provided by the clinician. An example of this sort of tape used with children is the *Magic Island Audiotape* (California Publications cited by Smart, 1997). Smart used this tape in a study investigating the use of 'guided imagery' with children aged 4 to 8 years who underwent Magnetic Resonance Imaging (MRI), an investigation that frequently causes distress in children. Data were collected from 20 subjects who were randomly allocated to an experimental group, who listened to the Magic Island Tape through headphones, and a "control group, who heard no music through their headphones" (p. 238). Smart does not say if the children in the control condition heard anything through their headphones. Smart states, "Seven out of 10 children who listened to the music and imagery tape remained still for the MRI and did not need sedation" (p.239). This study has clinical significance with obvious practical applications, however, in terms of investigating the therapeutic effect of guided imagery, it has a number of limitations. The researcher acknowledges that it is not known whether it was the calming music, the storyline, or a combination of both that distracted the children (p.239). It is interesting to note that the researcher uses the term 'distraction'. The assumption here is that guided imagery, at least this approach, is a form of distraction. This assumption is also evident in the method. After the procedure, the researcher asked the children the following questions:

> Did you enjoy or like listening to the music and the story on the tape?
> Did the music and the story help you to relax?
> Were you afraid or scared during the test?
> Would you like to use music and stories again if you ever need another test done?

These four closed questions seek a simple 'yes' or 'no' response. Each question could have been phrased in an open ended manner, even with children as young as four years. More important though, the researcher did not ask the children about their imagery. There is no indication that any of the children engaged in imagery during the procedure, although, from Smart's description of the content of the tape, one goal was clearly to encourage imagery:

> Slow, rhythmic, background instrumentation plays continuously during the story. The tape begins with five minutes of progressive relaxation…. The 20-minute storyline focuses on a ride in a hot-air balloon through white "cotton candy" clouds to a series of magical islands. … The narrator stimulates imagination by inviting listeners to "travel wherever they want to go." (p. 241)

In a study of adults, Kwekkeboom, Huseby-Moore and Ward (1998) investigated imaging ability with a group of 60 graduate students who were led to believe that participating in the study involved self-disclosure through a short speech – "What I dislike about my body and physical appearance" (p. 193). Subjects were told that the speech would be videotaped and analysed by the researchers. Only those participants whose anxiety scores increased with the knowledge of the speech were included in the study. Thirty participants listened to a pre-recorded imagery script. The use of a pre-recorded relaxation and imagery script is a restrictive approach to imagery. The tape was 12 minutes in duration and took the following format:

> The guide instructed a muscle relaxation exercise followed by imagery involving a walk along a river, sitting under a tree amid wildflowers, and viewing a sunset. (p. 193)

This sounds very pleasant and appealing but the degree of passivity is a problem and it is easy to see that some participants might find it hard to focus on this particular image. The findings reflect this issue. Successful imagery was established by a reduction in anxiety score of 5 points or more on the STAI anxiety questionnaire. Based on this criterion, imagery was only effective in reducing anxiety in 23 percent of the participants. Furthermore, the authors report that, for 3 participants, anxiety scores actually increased 5 points after listening to the imagery tape. It is possible that the low efficacy of 'imagery' in this study reflects a failure on the part of the participants to actually engage in imagery. Under these circumstances, the audiotape could be construed as an auditory distraction rather than a prompt for imagery. Moreover, for the participants whose anxiety increased, the tape may have been perceived as an irritation.

To conclude, pre-recorded tapes force a particular image, and pace, on the recipient and are likely to be met with greater resistance, and produce less involvement, than the techniques that allow open communication between the child and the guide.

### *Guided Imagery*

Pederson (1995) investigated the use of imagery on children's pain and anxiety during cardiac catheterisation. In describing the technique, Pederson does not appear to have deepened a trance nor given suggestions for analgesia or altered sensory perception of pain. The following excerpt from Pederson's brief description of an imagery experience of a 14-year-old girl playing soccer provides some insight into the technique. The child is in present tense as she describes her soccer game.

> "Now while your body is feeling loose and relaxed, you might choose to play a soccer game in your mind, just the way you would like it to go. You could look around you and notice how the soccer field looks … what the sky looks like, … the uniforms that you and your team-mates are wearing, … and where the soccer ball is now. [more comments about surroundings, the wind, team-mates, whistles blowing] What happens when the game starts?" The child responded, "The ball is kicked really high and it comes toward me… I'm going to kick it really hard." (Pederson, 1995, p. 369)

It is interesting to note Pederson's comment regarding difficulties in 'sustaining' imagery.

> The intervener used intervals of quiet relaxation between imagery experiences because of the difficulty in sustaining imagery for longer than 15 to 20 minutes. (Pederson, 1995, p. 369)

It is not clear whether the children had difficulty sustaining imagery, or whether it was the intervener's difficulty. The use of the word 'intervener' to describe someone who uses imagery 'on', rather than 'with' a child is an interesting point and perhaps illustrates subtle but important aspects of the imagery technique. If the intervener attempted to maintain control of the imagery as opposed to guiding and being guided by the child then the problems sustaining imagery for longer than 15 to 20 minutes are understandable. The technique described earlier in the current study has been employed with children to manage procedural pain for 45 minutes and longer with ease.

Pederson found that imagery did not reduce children's pain during cardiac catheterisation. Unfortunately, there is no reported level of response or way of gauging how involved the children were with their imagery – whether imagery was achieved by all, some or none of the children in the imagery group. Pederson does however comment on an effect on anxiety levels in the imagery group.

> The Imagery group had the highest State Anxiety Mean before catheterisation, yet this group had the lowest Mean of distress behaviours during the procedure. Therefore, imagery may have assisted these children in coping with their anxiety. (Pederson, 1995, p. 372)

A significant reduction in anxiety without a concomitant reduction in pain is sometimes seen in children using hypnosis or imagery to manage procedural pain. Kuttner (1988) comments on this finding:

> This split [between pain and anxiety] suggests a dissociation from the pain. As is sometimes the case during a hypnotic trance, pain sensations may not be entirely eradicated, they may simply become more distant, less relevant, and therefore less upsetting and painful. (294).

Underpinning the notion of distance from the pain is the idea that children can feel the pain sensations but it does not bother them. This concept is developed later.

In reviewing these studies, it is clear that there is much confusion on what imagery actually is and often it is not very clear precisely what form of interventions has been used. It is not surprising that the effects of interventions have varied although there has been enough success to warrant continued investigation into exactly which component of the interventions elicits which particular change in the pain and fear experienced during medical intervention. In this vein the next section, will consider what could be argued to be the minimal effect of any psychological intervention – distraction.

### *Effects of Distraction Techniques on Procedural Pain and Fear in Children*

Frequently health professionals and parents suggest behavioural strategies such as counting or looking the other way, as ways to distract the child, to facilitate coping, and hopefully to reduce the pain and distress of medical procedures. In a study that investigated the types of coping strategies used by children, parents and clinicians during venepuncture, Hodgins and Lander (1997) found:

> ... parents and the laboratory personnel were frequently observed advising children to use behavioural strategies such as "count to ten" or "look the other way." (Hodgins & Lander, 1997, p. 282)

Studies into the efficacy of distraction in reducing procedural pain, fear and distress produce mixed results. Vessey, Carlson and McGill (1994) found that children distracted with a kaleidoscope during venepuncture reported significantly less pain and scored less on indicators of behavioural distress. However, in a subsequent multi-site study Carlson, Broome and Vessey (2000) found no significant difference in pain, fear or distress scores between children distracted with the kaleidoscope and those receiving standard treatment during venepuncture. A study by Manne, Redd, Jacobsen, Gorfinkle, Schorr and Rapkin (1990) incorporating parent coaching and distraction with children undergoing venepuncture revealed significant reduction in parent distress but child self-report of pain and nurse ratings of child distress were not significantly affected. Fassler (1985) found that children who participated in medical play, injecting dolls with water and having a story read to them exhibited significant reductions in fear but not verbal expression of pain associated with injections. In reviewing literature on the effects of distraction on children's pain and distress for a meta-analysis, Kleiber and Harper (1999 p. 44) found "…33% of the studies on distraction and distress behaviour reported statistically insignificant results, and 75% of the studies on distraction and pain reported insignificant results." The authors acknowledge that it is not known if the failure to demonstrate a significant effect was related to method or variability in the efficacy of distraction.

Megel, Houser and Gleaves (1998) used audiotaped lullabies as distraction in children aged three to six years having immunization injections. No significant differences were found between experimental and control groups for heart rate, blood pressure or pain scores. Overall, however, distress scores were significantly less in the experimental group. The authors also considered gender effects and found no significant difference between boys and girls in heart rate, blood pressure (systolic and diastolic) or pain scores. Interestingly, boys showed significantly higher total distress scores than the girls. This is contrary to the widely held assumption that boys hide their feelings.

Audiotapes were used as distraction in an earlier study (Ryan, 1989) with older children, aged nine to twelve, undergoing venepuncture. The tapes were musical and selected by the child. In this small study of 14 participants, there was no significant difference in pain scores between the distraction group and the standard treatment group. The external validity of this study is compromised by the small sample size and lack of random allocation to groups. Furthermore, pain was the only dependent variable investigated. Given the sensory and affective nature of procedural pain in children, a measurement of fear for example, would have enhanced the value of the study.

Wells (1998) chose to investigate the effect of a live dog versus a stuffed dog and no dog on pain, fear and distress in children undergoing repeated port access procedures via an implanted venous access device. Despite the small sample size of eight, the within-subjects design led Wells to conclude that a live dog was more effective in reducing children's stress responses than either a stuffed dog or no dog during potentially painful medical procedures.

Sparks (2001) independently investigated the effect of two distraction techniques (touch and bubble-blowing) on immunization needle pain in children aged four to six years. Sparks used the Child Medical Fear Scale to obtain a measure of pre-procedural fear and used this as a covariate in the analysis. Sparks reported that both forms of distraction significantly reduced pain perception and that fear was a significant covariate, but distraction was effective even when fear was not held constant.

Investigations using cartoons as distraction are limited. Cohen, Blount and Panopoulos (1997) investigated carton distraction as an intervention to reduce distress and pain associated with immunization injection in children aged four to six years. Three groups were utilized: a cartoon with the nurse coaching, a cartoon with the nurse coaching and a previous 15 minute training session with the child, parent and nurse role playing desired behaviours, and a standard intervention group with no cartoon or distraction. The authors reported significantly higher pain and distress scores in the control condition and no significant difference between the nurse coach and parent coach conditions for distress or pain. Fear was not measured in this study.

Mason, Johnson and Woolley (1999) compared the effect of viewing a cartoon video, a short story and control condition on behavioural distress during medical procedures in eight children aged 2.4 – 4.5 years with cancer. They found that the short story procedure, which involved parent-child interaction, was more effective than either the control condition or the cartoon film. Pain was not measured. The children in this study were very young, perhaps too young to attend to the cartoon. It is possible that close interaction with the parent was more comforting and distracting than the television. In another study using parents to distract children, aged four to seven years, during intravenous cannulation, Kleiber, Craft-Rosenberg and Harper (2001) found no difference in behavioural distress or self-report of pain between the experimental and control conditions.

Distraction techniques have also been compared to topical anaesthesia (eutectic mixture of local anaesthetics – EMLA®) for efficacy in reducing procedural pain and distress in children. EMLA does not produce complete anaesthesia of the skin in all cases (Fanurik, Koh, & Schmitz, 2000; Lander, Fowler-Kerry, & Oberle, 1996). Cohen, Blount, Cohen, Schaen, and Zaff (1999) compared distraction, EMLA, and standard care during three immunizations on fourth graders over a 6-month period. "Distraction resulted in more nurse coaching and child coping and less child distress than did EMLA or typical care on an observational measure." (p. 851). Cohen et al. also reported that EMLA did not result in increased coping or decreased distress. In an earlier study, Arts et al. (1994) compared the effects of EMLA, a placebo cream and music distraction (described as 'contemporary, up-beat' and the same for all) on pain associated with intravenous cannulation pain in children aged four to sixteen years. The researchers found differential age-related effects of the interventions. Essentially, EMLA was most effective in the young (4 to 6-year-olds) but this decreased in the older children. The music distraction had no significant effect on pain scores.

Rather than comparing EMLA versus distraction, Fanurik, Koh and Schmitz (2000) investigated the effect of EMLA with and without distraction on pain and distress associated with intravenous cannulation prior to gastroscopy in children aged 2-16 years. Children were allocated to one of six groups and half had age appropriate distraction interventions (bubble blowing, musical story books and self choice of music via headset). All children had EMLA applied at lease 60 minutes prior to the procedure. Interestingly, only 17 percent of the sample with EMLA reported no pain at all, and overall, pain ratings were not influenced by the distraction intervention, or by age group. However, distress scores were significantly lower for older children, and for children in the distraction conditions.

As with the imagery studies, investigations of distraction have displayed a variety of techniques and elicited a range of effects. Nonetheless, the success of some provides even more incentive to establish the precise conditions under which imagery and distraction will work. One method of achieving this is to consider the psychological and neurophysiological mechanisms that accompany these interventions.

### *Distraction and Imagery Compared*

In this section, distraction will be compared and contrasted with imagery in terms of cognition, the brain areas involved, and the effects of each intervention on pain and fear. In the constructivist model, the essence of distraction is a shift in attention from the procedure and related pain to a secondary, sensory focus that is introduced. Globally, distraction techniques are essentially homogenous in that in all cases, the distraction stimulus competes with bottom-up procedure-related afferent input for representation in the central nervous system. Unlike the bottom-up appraisal of sensory (pain or distraction) input, in the proposed model of imagery, the child's sense of self or 'reality' is constructed within top-down neural pathways and mechanisms in the brain.

Conceptually, both at cognitive and neurophysiological levels, distraction and imagery are not the same. Cognitively, distraction tasks tend to involve a 'competing story' that the child has to make sense of in a largely 'passive' way. The child may be actively construing either the pain or the distraction task but the child's essential task is to attend to one or the other. Should the child attend to the 'pain story' there is little to 'call' her back to the distraction task other than a directive from a third party. If the distraction is constant or no longer novel, then it may fail as a 'competing story' as the child loses interest. If this happens, the 'competing story' may no longer grasp the child's attention. In contrast, to this is imagery where the constant interaction between the child and the guide affords every opportunity for full engagement. The child actively constructs and attends to her 'own story'. The child's imagery, her 'own story' becomes the central focus for the child and for the person guiding the imagery.

In imagery, a high degree of engagement with the child is maintained by a 'guide and be guided by the child' approach to the child's imagery. The person guiding the imagery has usually constructed his or her own, often detailed, version of the child's imagery. Even after the procedure, the child's imagery affords an opportunity for further engagement, unlike distraction techniques, which tend to cease at the end of the procedure. The child's description of her imagery often initiates discussion and interest from those present. The content of the child's imagery can be intriguing for the parents, nurses and doctors. Sometimes a nurse or a doctor will exclaim, "I was following what you were describing, and I was imagining …", or "That was amazing, while you (the child) were talking, I felt as if I was …" Such comments, particularly from a 'powerful' health professional, can be extremely uplifting for a child.

Distraction techniques do not tend to elicit the same level of post-procedural interest and interaction with the child. Worse still, is the biomedical procedure-oriented approach where the child is removed or the health professional bolts from the procedure room as soon as possible. The immediate post-procedure period is important because this is when the child will reflect on the procedure, and from a Personal Construct perspective, new constructs will be formulated and existing ones can be reconstrued. In the case of repeated procedures, the implications are clear. Post-procedural reinforcement of control and coping, together with encouragement and praise are extremely important. The child can choose to do imagery again or sometimes the child reaches a point where he or she says, "No, this time I might just …" and perhaps uses a distraction technique, which is an excellent outcome, because the child is in control.

A summary of the comparison between imagery and distraction is presented in Table 7.1

**Table 7.1**

*A Constructivist Comparison of the Characteristics of Imagery and Distraction*

| | **IMAGERY** | **DISTRACTION** |
|---|---|---|
| Neural Processing | Top-down | Bottom-up |
| Focus of attention | Intrinsic | Extrinsic |
| Role | Active | Passive |
| Attendant task | 'Own story' | 'Competing story' |
| Cognitive Process | Construing | Appraisal |
| Engagement | Participant, two-way | Observer, one-way |
| Reality / Sense of Self | Imagery related | Procedure related |
| Range of Choice | Individual, Open | Limited to distractor |

The obvious superordinate factor differentiating imagery and distraction in the above comparison is how consciousness is typically defined – Imagery in the constructivist model, and distraction in the traditional sensory-appraisal approach. The following section develops the concepts in the above comparison by considering imagery, distraction and consciousness within the constructivist position.

### *A Constructivist View of Distraction, Imagery and Consciousness*

A distractor, within the traditional bottom-up, sensory – appraisal model is a stimulus that competes with pain stimuli for attention and a place in consciousness. The ability to 'be distracted', in this model, depends upon the extent to which attention is diverted and how long the shift can be maintained. Conversely, within the constructivist perspective, the ability to be distracted is largely a function of how one constructs the 'distractor' rather than the specific qualities of the distractor. Certainly, what one person finds distracting, another might find irritating, annoying or frustrating. With this in mind, rather than attempting to find the 'best' distraction technique, a more fruitful point to consider is what aspects of the physical and social environment in which distraction occurs are most likely to encourage active construction of the distractor.

If a technique involves a health professional, for example, blowing bubbles, then, more than anything it is the approach of the health professional that matters. Consider the manner in which a magician performs tricks for a group of children, compared to an adult audience, and the extent to which it is the trick, or the magician, that is captivating. In Chapter 5 the notion of drawing on the ability to construe as a child construes was raised as an important factor in communicating with children. The point is, there is more to using bubbles as a distractor than simply blowing through the device. Undoubtedly, there is a marked difference between the health professional who blows bubbles at the child, and one who says, "Lets see if we can land a bubble on Mum's nose. Ah look! There is one, right on the end of Mum's nose! Lets see if Mum can land one on your nose."

This example illustrates that it is often not the features of the distracting stimuli that are critical, as one would expect in a bottom-up, sensory – appraisal model, but the manner in which the child construes the stimuli. More importantly, this example shows that often there is a 'joint' construction of the distraction in which the child and parent attend to, and make meaningful, features of the environment unrelated to the painful procedure. On other occasions, the child may have to work with others not actually present to jointly construct the alternative reality – the production team of a cartoon, for instance. On a few occasions, the child may devise all the necessary aspects of the reality him or her self.

Clearly, the constructivist perspective on distraction and imagery forces us to address the concepts of awareness, consciousness and reality directly because each implies a shift in awareness, being conscious of something at the expense of another, perhaps an 'altered consciousness' and in constructivist terms, a construed shift in reality. In the previous chapter, consciousness was defined in terms of a phenomenon that emerges from a range of brain activities and that consciousness is represented in the reality of the moment. In writing on consciousness, Cairns-Smith (1999, p. 38) proposed, "… to be conscious is to have feelings and sensations, and emotions and moods associated with them." Cairns-Smith coined the term 'Evanescent Self', "… a description of the conscious aspects of the brain's activities…" (p. 38) as a description of the sense of self that is conscious. 'Evanescent' is defined as, "That is on the point of vanishing…that quickly vanishes; fleeting…" (*Shorter Oxford English Dictionary*, Little, Fowler, Coulson, Onions, & Friedrichsen, 1991, p. 689).

For Cairns-Smith then, that which is conscious is not permanent, whatever is conscious, feelings, sensations and emotions, collectively referred to as qualia, is fleeting, on the edge of consciousness and can emerge and fade around consciousness. In this way, the Evanescent Self is in a constant state of flux, inextricably linked with feelings, sensations and emotions. Carins-Smith is quick to differentiate between 'conscious' and 'aware' by stating that 'aware' means to have current information on things going on within and around us. Awareness is not synonymous with consciousness because we can be 'unconsciously aware' and respond appropriately to that of which we are 'unconsciously aware'.

Greenfield (2000) cites, (as does Cairns-Smith), the phenomenon of 'blindsight' as an example of being unconsciously aware. Classically, in blindsight, the subject has lost half the visual field but when, for example, a letter is placed in the blind field and the subject is asked to 'guess' what the letter is, most times, they 'guess' correctly (Cairns-Smith, 1999; Greenfield, 2000). Awareness cannot be the same as consciousness if we can be 'unconsciously aware'. Greenfield gives a more familiar example of being unconsciously aware and effecting an appropriate response as in a professional tennis player who successfully returns a ball served at a speed of 120 mph (193 kph). Greenfield points out, "… it takes a full 500 milliseconds for 'you' to become aware [conscious] of what is going on." and, the tennis player who receives the serve, "… has under 400 milliseconds to work out where the ball is going to land." (p. 182).

For Cairns-Smith, 'thought' is no more of a determinant of consciousness than awareness because like awareness, we are continuously processing unconscious thoughts.

> Indeed most of the time, we operate intuitively, making judgements and arriving at conclusions without quite knowing why. … Most of us are also familiar with occasions in which the solution to some problem comes to us, fully formed, after a period when we have been consciously thinking about something else. (Cairns-Smith, 1996, p. 185)

The implication of this for distraction techniques is that we do not have to contend only with what the child is consciously thinking and aware of, we must also consider the impact of unconscious thought and what he or she is 'unconsciously aware of' during a procedure. In Cairns-Smith's terms, this is the domain of the 'Greater Self,' which is unlike the immediate and short-term Evanescent Self. The Greater Self, "is the more permanent self embodied in that great unconscious part of our inner model…" (p. 251), and, "… the computing aspects of the brain's activity…" (p. 38). The 'computing aspects of the brain's activity' encompasses the neurons, synapses and interrelated brain regions. As for the likelihood of a single seat of 'consciousness' or 'Evanescent Self', consciousness theorists (Baars, 1996, 1997, 1999; Cairns-Smith, 1996, 1999; Crick & Koch, 2000; Flohr, 2000; Greenfield, 2000; Hardcastle, 2000; Posner & Rothbart, 1998; Roth, 2000) hold that this is extremely unlikely to exist. The phenomenon of consciousness is generally accepted to be a something that emerges from, and involves, multiple brain regions, the closest approximation involves the ‘working memory’ structures and pathways outlined in Chapter 6. The ‘things’, of which we are consciously aware, are a multitude of qualia. What is important in terms of this thesis is the interplay and relatedness of brain regions involved in constructing and experiencing these qualia.

### *Neurophysiological Correlates of the Constructivist Model*

Considering the proposed neural basis of distraction in relation to pain, we can develop these ideas further. Brain scanning techniques have been applied to investigate distraction and well as imagery. Petrovic, Peterson, Ghatan, Stone-Elandar and Ingvar (2000) used the cold pressor test to experimentally induce pain in subjects while engaging in a cognitive distraction task, a maze test. At the same time, active brain areas were identified with PET scanning sensitive to increased regional cerebral blood flow (rCBF). Petrovic et al. reported that the cold pressor test evoked significant activity in the contralateral primary sensory cortex (S1), and bilaterally in the somatosensory association areas (including S2), the ACC (anterior cingulate cortex) and the mid-insula. These regions are classically activated during the conscious experience of pain (Derbyshire & Jones, 1998; Ploghaus, Tracey, Gati, Clare, Menon, Matthews, & Rawlins, 1999; Price 1999). They are also working memory structures (Baars, 1996; Baddeley, 1993; LeDoux, 1998; Phaf & Wolters, 1997; Schachter, 1991). If consciousness is taken to be related to the ‘working’ aspect of working memory then part of the conscious experience of pain is expressed, and represented, in increased activity in the working memory structures.

> The activity in the somatosensory association areas and periaqueductal gray/midbrain were significantly modified, i.e. relatively decreased, when the subjects were also performing the maze task. The altered activity was accompanied with significantly lower ratings of pain during the cognitive task. In contrast, lateral orbitofrontal regions showed a relative increase of activity during pain combined with the maze task as compared to only pain, which suggests the possibility of the involvement of the frontal cortex in modulation of regions processing pain. (p. 19). No significant activation was observed in left S1 [primary sensory cortex] for the hand (p. 23)

The pattern of brain activity associated with the pain stimulus observed by Petrovic et al., the contralateral primary sensory cortex (S1), to somatosensory association areas, and on to the ACC (anterior cingulate cortex) and mid-insula conforms to the classic bottom-up, sensory – appraisal model. Activity in the association areas, in this model is subject to what is coming 'up' from the primary sensory area and activity in the association areas then feeds the ACC and together this activity emerges as 'consciousness'.

However, not all their data fitted a simple bottom-up process. For instance, if activity in the PAG had increased, then this would suggest activation of the downstream inhibitory system and blockade of the bottom-up nociceptive afferents at the dorsal horn (closing the gate). However, this mechanism was not supported because Petrovic et al. found *decreased* activity in the PAG. This focuses discussion of the effects in the brain, rather than the dorsal horn.

Another interesting and complicating feature of this study with regard to the brain effects of distraction during pain, was the decrease in activity in the somatosensory association areas and no significant activation in the primary sensory cortex. Petrovic et al. point out that it was not possible to determine whether the noxious signals were modulated at the cortical or subcortical levels or a combination of the two. Certainly, the decrease in activity in the association areas coupled with increased activity in the lateral orbitofrontal cortex suggests top-down modulation of bottom-up signals. These areas are working memory structures. The cognitively complex task may have placed greater demands on working memory and higher regions in terms of completing the task. This in turn may have invoked the top-down modulation described by Mesulam (1998). Such a top-down modulation may explain the following, a recent review on the cognitive modulation of pain. Petrovic and Ingvar (2002) said:

> … the ACC may be divided into a caudal region, showing increased activity during pain per se, an adjacent part preferentially involved in general attention and a rostral region involved in emotional processing. When the activities induced by pain modulation are plotted on a map of the ACC, it is apparent that these increases reside in the emotional sub-region. (p. 2)

One factor that must be considered in interpreting the results of brain scans in relation to experimentally induced pain is that the pain is qualitatively very different to procedural pain in children. For example, the lack of activity in the association areas in the Petrovic et al. study could be related to the fact that the subjects were volunteers who had consented to participate in the study and the pain stimulus was induced using the cold pressor test. This is very different to a terrified resistant child undergoing a medical procedure. The implication is that further research on the activity of brain regions in distraction and in imagery, involving children who are undergoing medical procedures is needed to determine the functional areas within a clinical rather than experimental context.

This form of research, while still in its early stages, is beginning to map out the cortical and subcortical areas that might be involved in the top-down modulation of pain and associated emotions. The details are only beginning to emerge but this work nonetheless encourages us to examine further the nature of distracting stimuli and their observable effects. This research can be pursued alongside the study of the neurophysiological mechanisms that will mediate the effects of the distractors.

## *Summary*

This chapter began with an overview of the many interpretations of ‘imagery’ in the literature and their application in the management of procedural pain in children. The ‘imagery’ literature reflects a diverse range of techniques and a lack of clarity; some studies describe ‘imagery’ as a ‘distraction’ and others as ‘hypnosis’. The lack of specificity makes it difficult to draw conclusions on the efficacy of imagery described in these studies. The problem is compounded by combined (relaxation, music, behavioural, pharmacological) interventions where the effects of multiple independent variables are not isolated. Despite these concerns, some studies have demonstrated positive effects of these interventions with regard to reducing procedural pain in children.

The second section in this chapter reviewed studies that have investigated various distraction techniques in the management of procedural pain in children. It is generally held that if a child’s attention can be distracted during a painful procedure then pain, and subsequently distress, will be less. However, results regarding the effect of distraction on pain are mixed. Close examination of the reported research suggests that the positive effects may be more on fear (anxiety is the common measure) than on pain per se.

The aim of the final section in this chapter was to differentiate between the two approaches reviewed and investigated in this thesis, namely imagery and distraction. It was argued that differences exist at cognitive and neurophysiological levels. Essentially, distraction techniques compete with procedure-related sensory input for the child’s attention. Therapeutically, it is hoped that the child will attend more to the distraction than to the painful procedure. Conceptually, this presents the child with a ‘pain story’ and a ‘competing story’. In both stories, the child is a passive observer of bottom-up sensory input. In the case of an ‘enchanting’ distraction, or in imagery, however, the child actively constructs her ‘own story’ that is, her own reality and, unlike the bottom-up appraisal of sensory input consistent with passive distraction, an emotionally engaging distraction, or imagery is constructed within the top-down neural networks in the brain. A key issue regarding distraction techniques is how the child constructs the distraction. If the child becomes involved, or engages with, and is even amazed at whatever the distraction is, then, a qualitative shift occurs and the experience is more than simple bottom-up distraction. Under these circumstances, the child would be invoking the top-down processes, a 'story of her own'.

# CHAPTER 8

## STUDY ONE: CARTOON DISTRACTION

This chapter describes the first of two studies undertaken in this thesis. The aim of the first study was to investigate the effect of watching a cartoon as a form of distraction on fear and pain in children undergoing venepuncture. The method and results are presented and discussed in this chapter but the findings are further discussed in relation to the second, the imagery study, in Chapter 11 of the thesis, Discussion.

### *Background*

Much research into procedural pain and fear/anxiety has been concerned with the overall effects of psychological interventions (Arts, Abu-Saad, Champion, Crawford, Fisher, Juniper, & Ziegler, 1994; Broome, Lillis, McGahee, & Bates, 1992; Carlson, Broome, & Vessey, 2000; Cohen, Blount, Cohen, Sachen, & Zaff, 1999; Kildow, 2000; Kleiber, Craft-Rosenberg, & Harper, 2001; Kleiber & Harper, 1999; Kuttner, 1997; Manne et al., 1990; Powers, 1999; Ryan, 1989; Seers & Carroll, 1998; Sparks, 2001; Vessey, Carlson, & McGill, 1994). Less research (Chapman & Nakamura, 1989; Petrovic et al., 2000) has been concerned with the psychological processes by *means* of which children can experience less pain and fear during a medical procedure. The focus in this thesis is on the means by which distraction, relaxation and imagery alter the experience of procedural pain and fear in children. The first empirical study focussed on distraction using cartoons while the second examined relaxation and guided imagery in tandem. Both studies attempted to address the methodological failings that, regrettably, have plagued the area and which will be considered in depth in relation to the first study on distraction. However, before embarking on these issues, it is worth re-emphasising the manner in which 'distraction' is perceived in this thesis and how distraction relates to relaxation and imagery.

### *A Constructivist Perspective on Distraction*

Our consciousness, reality, or 'sense of self' in a sensorial world is viewed in this thesis within the constructivist paradigm as a phenomenon that is constructed and emerges in the brain at two levels: firstly, at a 'primitive' passive level, and secondly, at a more complex, active level. At the heart of Kelly's *Psychology of Personal Constructs* is the notion that we *actively* construct the realities to which we respond (Kelly, 1955). The constructive essence of Kelly's approach is a constant theme throughout this thesis, but the *always*-active notion of construing is arguably overemphasised in Kelly's theory. In the spirit of constructivist theory, if we actively construe, then, we can also shift to the opposite pole and 'passively' construe. One could argue that, at times, when we are not focussed on anything in particular, we are passively construing our world. In this 'passive mode' of construing, our sense of self in the world is 'as if' we are receivers of sensory input, as if, we are functioning in a bottom-up sensory appraisal manner. Clearly, the view, captured by Greenfield (2000) in the neuroscience literature, is that the brain is more than a sponge to the senses, but at times, the apparent passivity of our construing gives the impression that we are very much in a 'receiving' mode. Arguably, when we are tightly construed around the 'passive' pole and not actively construing much at all, it is unlikely that we will be distracted because by definition, to be distracted requires that we are distracted from 'something'. Where all of this comes into play is in considering *construing* as a bipolar *passive – active* construct, of which distraction is an element, and in considering how distraction techniques relate to the other two interventions under investigation – relaxation and imagery.

In this thesis, a distinction is drawn between 'passive' and 'active' construing. Where passive construing is a resting mode, requiring less effort and energy, active construing is demanding: it requires effort and considerable energy. An analogy exists with the traditional subconscious – conscious dichotomy in the sensory – appraisal paradigm, where the notion that we are not always aware of all sensory input is openly accepted (Greenfield, 2000). Similarly, within the sensory – appraisal paradigm, we can choose to attend to some things and not others. In daily life, we move back and forth between passive and active modes of construing our world. A prolonged period of intensely active construing, a mentally 'busy day' can be incredibly tiring. For arguments sake, suppose the manager's parting words were, "If I don't get this problem sorted, I will have to ring you at home tonight". After such a day, we might long for some time around the passive pole. For example, on calling into a video shop on the way home, we will choose the familiar, 'golden oldie' and avoid the new and intense thriller. As we watch, we notice (passively construct) the dog barking outside, and the children arguing upstairs but are content, in the passive mode, at least, until the telephone rings. Suddenly, we are actively construing the *sound* of the phone in an intensely negative manner.

This view of passive and active construing is akin to Fiske and Neuberg's model of social cognition (cited in Augoustinos & Walker, 1995). In their model Fiske and Neuberg posit a continuum from category based informal processing to individuating data based processing. The former is more likely, when, what the person is dealing with is uncomplicated and irrelevant, and the process is "automatic and sometimes unconscious" (Augoustinos & Walker, 1995, p. 46). Individuating based data processing occurs when the person is confronted by a novel situation that requires careful attention.

Similarly, in a medical procedure, the idea is not to have the child simply living the, often accepted, passive role, but actively construing, engaging in, identifying with, and ultimately, in Plutchik's terms, being amazed by the distraction. This raises the dimensions of balance and focus; balance between active and passive construing, and focus on the procedure, versus focus on the distraction.

The child who is about to have a medical procedure will be actively construing some aspects of her reality and passively construing other aspects. This is a crucial moment in terms of how the child might construct the procedure and it emphasises the importance (and effects) of pre-procedural play, familiarization with the environment and the approach of the health professionals. Most damaging, is an emphasis on compliance and, 'sit there and don't move', from the health professional, because it reinforces the child's sense of helplessness, powerlessness and fear. Under these circumstances, the child is virtually encouraged to actively construe the frightening aspects of the procedure and passively construing everything else, including the clinician's attempt to introduce a distractor. In cognitive psychology, this is referred to as *selective attentional bias*, whereby an anxious or fearful individual is likely to attend selectively to threat-related stimuli (Eysenck & Keane, 2001). In Fiske and Neuberg's terms, it is developing an individuating schema for the procedure. If this is the case, then in order for the child to actively construct the distractor, the fear must be reconstrued. This is where the approach of the health professional is all-important. The aim then, in employing a 'distraction technique', is to allow and encourage a switch in focus of the child's *active – passive* construing, whereby the child actively construes the distractor and passively construes the procedure.

When a frightened child is presented with a distractor in the procedure room, he or she is very much in the 'here and now', actively construing the fearful aspects and passively construing the distractor. If a degree of rapport and trust can be established with the child then the child may begin to construe the distraction in a more active manner, becoming involved in the distraction. Arguably, a distractor becomes a distraction when it is actively construed. When this happens, the process, including the interaction between the health professional or the parent, and the child becomes a 'distraction technique'. For example, in using a pop-up book to distract a child during a painful procedure, the child may begin by passively construing the distractor, the book, pages, colours, figures and so on, and actively construing some other aspect of the environment. The aim then, in employing a distraction as a 'distraction technique', is to reverse this, whereby the child actively construes the distractor and passively construes the procedure. We know, as discussed in the previous chapter, that in some instances, this is possible and that this type of distraction can be effective in reducing procedural pain (Kuttner, 1986, 1989).

### *Research on Cartoons as Distraction*

Comparatively few studies have used cartoons as forms of distraction during medical procedures but among those that have are Cohen, Blount and Panopoulos, (1997) and Mason, Johnson, and Wooley (1999). Cohen et al. investigated the effect of nurse and parent coaching of a child to watch a cartoon video compared to standard treatment of children undergoing routine immunizations. Reported measures of distress and self-report of pain were significantly higher in the control condition compared to the intervention conditions. In a small study of eight children, Mason et al. measured distress but not pain and found that a 'short story' was more effective than a cartoon in reducing procedural distress. There is some evidence then that cartoons can distract children though the effects are generally limited to emotional tone and only occasionally to the painful sensory component of the experience. In addition, a variety of methodological issues have emerged from these, and other studies in distraction (Broome et al., 1992; Kildow, 2000; Manne, Redd, Jacobsen, Gorfinkle, Schorr, & Rapkin, 1990; Mason et al., 1999; McCarthy, Cool, & Hanrahan, 1998; Powers, 1999; Schiff, Holtz, Peterson, & Rakusan, 2001) specifically the nature of the procedure, the purity of the distraction technique, sample sizes and assignment to conditions, and measures used. Each of these requires more consideration.

Examination of the procedures used in distraction studies suggest much of the research involves the use of combinations of interventions – 'cognitive behavioural therapies', distraction, relaxation and imagery – where it is not possible to identify the effects of the specific elements of an intervention (Broome et al., 1992; McCarthy et al., 1998; Powers, 1999; Schiff et al., 2001). This concern was overcome in this study by limiting the distraction task to a single intervention. The distraction was not only confined to a cartoon video, the same video was used in all cases. Also evident in a number of studies was the small sample size, ranging from 2 to 14 participants, but seldom was it evident whether randomisation of participants to experimental or control conditions occurred (Broom et al., 1992; Hoffmann, Doctor, Patterson, Carrougher, & Furness, 2000; Kildow, 2000, Manne et al., 1990; Mason et al., 1999; McCarthy et al., 1998). This study attempted to ensure some degree of methodological rigor with random allocation to experimental and control conditions from a sufficiently large sample to allow meaningful analysis of the measures. The final key methodological issue concerns measures. Distress and anxiety are common measures in distraction studies, some studies have incorporated a self-report of fear, but few have incorporated a comprehensive range of measures (Broome, Lillis, McGahee & Bates, 1992; Carlson, Broome & Vessey, 2000; Carpenter, 1990; Sparks, 2001; von Baeyer, Carlson, & Webb, 1997; Wells, 1998). Given the sensory and emotional nature of pain, a separate measurement of pain, with an emphasis on what was felt in the arm during the venepuncture, and a self-report of procedural fear were considered important dependent variables in this and the second study.

### *Measuring the Pain Experience*

As has been amply discussed, issues surrounding the quantification of phenomena such as pain and fear are complex. It is evident that the selection of appropriate measures is critical in examining the effectiveness of distraction and imagery. This discussion on measures begins with the notion of what is being measured in a 'pain measure' and when it is important to try to differentiate between the sensory and emotional components of pain. This is followed with a brief discussion of the issues relevant to the measures employed in this, and the second study

Although pain is defined as a sensory and emotional experience, there is a common tendency to focus on the 'sensory' component. If 'emotion' is considered, then it is usually couched in the term 'affect'. For example, the word 'fear' does not appear in the index to the IASP publication, *Measurement of pain in infants and children* (Finley & McGrath, 1998) and next to *Emotion* is 'S*ee Affect*'. When asked, "How much did it hurt? The person asking the question is usually asking about severity of the sensation and the respondent answers in terms of the intensity of the sensation. However, particularly with regard to procedural pain in children, the response is often emotionally laden, at least to some degree. Thus, it is possible that self-report measures are skewed towards the 'sensation'. Behavioural measures of pain, on the other hand, provide a pain score but because some of the observed 'pain' behaviours are also 'fear' behaviours, particularly in children, for example, crying, grimacing, verbal request for support, tension, shivering, restraint, and kicking, it is possible that the behavioural measures skew towards the emotion. Indeed, as McGrath (1998) points out, four of the behaviours in the Observational Scale of Behavioral Distress (OSBD) are common to the 'pain' scale, the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS). In sum, if the aim is a measure of 'pain,' and pain is a composite of sensation and emotion, whether a measure leans towards one or the other is not particularly relevant. If, however, one is wishing to differentiate between the 'sensory' and 'emotional' (fear in this case), components of pain then the sensitivity of the measure to one or the other component is relevant. This implies the need to measure fear and pain separately.

Other problematic features of the measurement process concern the age of the children and the nature of the procedure. Measurement of pain and fear becomes increasingly difficult with younger children (Champion, Goodenough, von Baeyer, & Thomas, 1998; Goodenough, Champion, Laubreaux, Tabah, & Kampel, 1998), however, visual analogue scales have been found to be valid and reliable tools in measuring pain in children over 5 to 6 years (Mathews, McGrath, & Pigeon, 1993). They are commonly used in research and clinical practice to measure pain in children. Champion, Goodenough, von Baeyer and Thomas (1998) provide an excellent review of self-report measurement of pain in children and conclude that "Most children 5 years of age and older can reliably use visual analogue and faces scales to rate their pain." (p. 153). In the light of this review, it seemed appropriate to incorporate self-report measures for both pain and fear in children but considerable care was taken about the age of children given each measure.

It appears that context and type of pain may be important factors influencing the validity of behavioural measures of pain. Beyer, McGrath and Berde (1990) compared self-report and CHEOPS scores in children post surgery and found discordance between the two measures. However, they concluded that the CHEOPS might be less sensitive to pain if the child has been in pain for several hours as the pain behaviours may habituate as pain persists, and that postoperative assessment of pain should not rely solely on behavioural tools such as CHEOPS. Similarly, with regard to behavioural measures of pain, Mathews, McGrath and Pigeon (1993, p. 100) state, "Reliability and validity are highest when measuring short, sharp pain (e.g., from injection or lumbar puncture)". Given the acute procedural nature of the pain under investigation in this study, the behavioural measure, the CHEOPS, was deemed appropriate for the younger children.

A final methodological issue that plagues research is the procedure that induces pain and fear. Venepuncture is a common procedure performed on children to obtain a sample of blood for analysis. Rather than using a variety of painful procedures, as in an emergency department, the procedure in this, and the second study, was standardized to a venepuncture so that all children underwent the same procedure. Human research ethics committees would not allow researchers to inflict pain on children merely for the purpose of research but inflicting some pain on children in the course of treatment is considered inevitable and therefore 'ethical'. Consequently, researchers use children who undergo venepuncture as part of treatment to investigate paediatric pain, evaluate measurement tools and investigate effects of pharmacologic and psychological interventions on pain (Bournaki, 1997; Caty, Ellerton, & Richie, 1997; Hodgins & Lander, 1997; Humphrey, Boon, van Linden van den Heuvell, & van de Wiel, 1992; Lander, Fowler-Kerry, & Oberle, 1992; Van Cleve, Johnson, & Pothier, 1996). In reviewing the research into pain and venepuncture, Lander et al. (1992), concluded that the technician, time taken to perform the procedure and volume of blood did not contribute to the prediction of children's pain. They did find that age and anxiety were significant predictors of pain and, not surprisingly, concluded that venepuncture pain can be recommended for the study of issues in children's pain.

In summary, there were two broad aims in the first study, to examine the effect of a single uncontaminated intervention, cartoon distraction, and to do so in a rigorous fashion, addressing a range of methodological concerns of previous studies.

Two hypotheses were formulated to address the stated aims. Firstly, it was predicted that audiovisual cartoon distraction would reduce the child's perception of the pain associated with venepuncture, and secondly, that audiovisual cartoon distraction during venepuncture would reduce the child's fear associated with the procedure. In was also expected that pain and fear would be strongly and positively correlated. This study also provided an opportunity to explore correlations between behavioural and self-report measures of pain in children.

## *Method*

### *Participants*

One hundred English-speaking children, 57 boys and 43 girls aged three to 16 years were drawn from a convenience sample of children who presented to a Pathology Out Patients department of a large metropolitan children's hospital for venepuncture. The hospital was chosen because of the accessibility to large numbers of children undergoing venepuncture as a standard painful procedure. Children requiring a venepuncture (some tests would require only a fingerprick) were invited to participate in this study unless excluded on the following criteria.

*Application of topical anaesthesia.* A small number of children were excluded because they presented with topical anaesthesia applied before the venepuncture. Topical anaesthesia will alter the sensory component of pain.

*Involvement in other research at the hospital.* Parents were asked if their child was involved in any research study at the hospital. Approximately two children were excluded on this criterion, as per the requirements of the hospital Human Research Ethics Committee.

*Ability to communicate in English – child and parent.* Surprisingly, given the diverse range of cultures represented in the city, only one child was excluded because the parent was not able to communicate in English. As translation services were not available in this study, informed consent could not be obtained in this case.

*Pre-existing pain, or a child unaccompanied by a parent or significant other (eg grandparent).* As it turned out, no children were excluded on these criteria but both were stringently applied. It would be unethical to involve a child in a research project without the consent of the parent or guardian, and, methodologically, inclusion of the parent or significant other would help negate any potential separation anxiety effects.

## Materials

### Cartoon Distractor

A single cartoon was selected rather than several, to ensure consistency of the intervention. Copyright was a limiting factor in selecting a cartoon. One major distributor would not allow their cartoons to be viewed in a hospital. The child, parent, nurse and researcher in a small blood collecting room were deemed a 'public viewing' and a breach of copyright. Further enquiries were made with another major distributor of very well known cartoons, who stated that children in hospitals watch their cartoons on video frequently. They allowed their product to be used in the research with the provision that the cartoon would not be named in any report. It is for this reason that the actual name of the cartoon used in the study is withheld.

## *Measures*

The two dependent variables investigated in this study in relation to distraction were pain and fear. Given the age range, both behavioural and self-report measures of pain were used; fear was not measured in the very young children (3 and 4 year-olds).

### *Pain*

Two measures of pain were used in this study depending on the child's age. The Children's Hospital of Eastern Ontario Pain Scale (CHEOPS), a behavioural pain tool (Gauvain-Piquard, Rodary, Rezvani, & Lemerle, 1987) was used over self-report in the children aged 3 to 4 years. The tool has established validity and reliability (Mathews, McGrath, & Pigeon, 1993) and its use in pain research in children continues (Galinkin et al., 2000; McCarty, Mencio, Walker, & Green, 2000).

In this study, VAS pain scores were obtained from children aged 5 years and older. A number of Visual Analogue Scales are available for use with children to measure pain. The one used in this, and the second study was the Astra® Pharmaceuticals plastic pain ruler with a sliding blue curser. This tool was chosen over a line drawn on a piece of paper because of its novelty and ease of use in the clinical setting. On one side are the two faces from the Wong-Baker Faces rating scale (Wong & Baker, 1988) the 'zero pain' face and the 'level 4' pain face. On the reverse side is a scale in millimetres from zero - 100. 'NO PAIN' is written under the smiling face at the left and on the reverse side corresponds to zero. 'WORST PAIN EVER' is written under the grimacing face on the right, which, on the reverse side, corresponds to the maximum score of 100. The 'Worst Pain Ever' face (face 5) on the Wong-Baker Faces Scale has tears falling. Astra® selected 'face 4' on their pain ruler in an attempt to improve the validity of the tool (tears could easily be interpreted as sadness not pain). The Astra® tool could however be interpreted by a young child as a measure of Happy versus Sad. If for example the researcher said, "I want you to move this blue thing along to tell me how bad it was", the child may rate on any number of constructs: Happy – sad, good – bad, pleasant – unpleasant. The validity of this tool is dependent upon good communication at the levels described above – transmission of information, reception and understanding.

***Fear***

Hester's Poker Chip tool was developed in the late 1970s to measure pain in young children (Hester, 1979; Hester, Foster, & Kristensen, 1990). The recommended age range is 4 to 8 years. This tool has well-established validity and reliability and is widely used to measure pain in children in research (Gharaibeh & Abu-Saad, 2002; Hester et al., 1998; Johnston, Stevens & Arbess, 1993; West et al., 1994). Cross-cultural validity is strong (Gharaibeh & Abu-Saad, 2002; Romsing, Hertel, Moller-Sonnergaard, & Rasmussen, 1996). There are two versions of the tool to measure pain. The first consists of four red poker chips where each poker chip represents a 'piece of hurt'. The second version has a white poker chip and four red ones. The red poker chips represent 'pieces of hurt,' as in the first version, but in the second version, the white poker chip represents 'no hurt'. When the second version is used, the poker chips are laid out in a horizontal line in front of the child with the white poker chip on the left. An explanation is given to the child that the white one means 'no hurt', the first poker chip next to the white one is one 'piece of hurt' the second one is more hurt, 'two pieces of hurt' and so on up to the most hurt, 'four pieces of hurt'. The child picks up or points to the appropriate poker chip to signify the level of pain or hurt experienced.

This tool was simply adapted to measure fear whereby the white chip was no fear or not scary. The first chip is one 'piece of fear' or 'scariness' or 'a little bit scared', the second, two 'pieces of fear' or 'scariness' and so on up to the fourth poker chip' which was the most amount of fear or 'really… really (sic) scary' or 'most afraid'. This idea was canvassed on the PEDIATRIC-PAIN discussion group (PEDIATRIC-PAIN@ac.dal.ca) and was supported by researchers familiar with the tool. When used to measure pain, the recommended upper age is set at 8 years; the suggestion being that older children may find the tool childish (Matthews, McGrath, & Pigeon, 1993). However, for older children who may feel awkward about verbalizing their level of fear, the instrument allows these children to communicate their level of fear in a non-verbal manner by simply picking up a corresponding poker chip and handing it to the researcher. Culturally, as casino gambling is a growth industry in Melbourne, the term 'poker chip' is likely to be construed as 'cool' rather than ‘childish’. Had the tool been introduced as four ‘little red discs and a white one’, older children may have construed it as ‘childish’.

Fear was measured in all children aged five and over. One white chip meaning ‘no fear’ or ‘not at all scary or frightening’ then four red chips each representing an increase in scariness or fear from one to four. The poker chips were laid out with the white one on the left in front of the child. Each child was asked to rate his or her level of fear experienced during the venepuncture by picking up the appropriate poker chip and handing it to the researcher. The respective age ranges of the participants in relation to the three measures is summarized in Table 8.1

**Table 8.1**

*Breakdown of Measures according to Age*

| Measure | Age Range (years) | N |
|---|---|---|
| CHEOPS – All | 3 – 7 | 54 |
| CHEOPS – Only | 3 – 4 | 30 |
| CHEOPS – VAS Pain – Poker Chip Fear | 5 – 7 | 23 [a] |
| VAS Pain – Poker Chip Fear Only | 8 – 16 | 46 |
| Poker Chip Fear – All | 5 – 16 | 69 |
| VAS Pain – All | 5 – 16 | 69 |

Note

[a] One five year-old child was extremely distressed after the procedure. The behavioural measure was applied but it was not possible to obtain a self-report (VAS) of pain or a Poker Chip fear score. Hence the sum of rows two and three is one less than the total CHEOPS in the first row.

### ***Procedure***

Children accompanied by a parent or significant other presented to the pathology Out Patients Department with a request form from a medical practitioner for a blood test. The majority of blood tests require a venous sample of blood; this is taken by venepuncture and then sent for analysis. The parent presented to the window, handed the nurse the request form, which showed the child’s age and the requested blood test. If a child fell within the age of three to 16 years requiring a venepuncture, the researcher was informed and the child and parent were directed to the room in which the study was conducted. At this point, a brief verbal explanation of the project was given to the parent and child. The parent was then given a plain language statement, which she or he read. The parent was asked if there were any queries and the assent of the child was sought. If the parent and child were happy to participate in the study, a consent form was reviewed and handed to the parent. The parent then read the consent form; the researcher invited questions. Any queries were addressed and when the parent and researcher were satisfied that a full and thorough understanding of the study had been reached, the parent was invited to consent to the participation of her or his child in the study by signing the consent form. The parent retained a copy of the plain language statement showing the contact details of the researcher, a Clinical Nurse Specialist, Pain Control Service at the Hospital, and the Human Research Ethics Committee of the University of Ballarat that granted ethical approval of the project. The parent was told that any later questions or concerns about any aspect of the project could be directed to any one of the three points of contact.

#### *Random Allocation to Groups*

Children were randomly allocated to either the control or experimental condition based on odd or even birth date. That is, the children with an odd birth date were allocated to the control group; children with an even birth date were allocated to the experimental group. This procedure would satisfy conventional definitions of randomness, "…that there is no known law capable of being expressed in language that correctly describes or explains events and their outcomes." (Kerlinger & Lee, 2000, p. 167).

#### *The Painful Procedure: Venepuncture*

All venepunctures were performed in the child's arm using a tourniquet and 23-gauge butterfly needle. Topical anaesthetic was not used in any case because at the time the study was conducted, that was standard practice in the department.

The children in the control group underwent the venepuncture in the usual manner with the nurse performing the procedure whilst chatting with the child. The television mounted to the wall was turned off. In the experimental group, the children underwent the same procedure in the same setting but their attention was directed towards a television mounted to the wall showing the cartoon. Each child in the experimental condition began watching the cartoon with the parent, nurse and researcher in the room. The nurse directed the child's attention to the cartoon on the television. At a particular point in the cartoon, the nurse placed the tourniquet on the child's arm and performed the venepuncture while directing the child's attention to the cartoon.

A number of parameters relating to the experimental condition were consistent between cases. These included the child occupying the same position in the room for each case, sitting at an identical distance from the television, the television volume and brightness were the same, and each venepuncture commenced at same point in the cartoon.

Immediately after the procedure the researcher said to the children aged five and over:

> "I am interested in how scary or frightening that was for you, while you were having the blood test. These Poker Chips tell me about scariness."

An explanation of the tool was given and each child's understanding of what each Poker Chip represented was confirmed. The Poker Chips were laid out on the bench in front of the child with the White Chip on the left. The child was then asked to pick up the Poker Chip that would tell the researcher how scary or frightening it was for the child during the blood test; the white one – not at all scary or frightening then from one to four indicating increasing scariness with the fourth chip meaning *really really* (sic) scary. A fear score was then written on the data sheet. The tool was easily understood even by the younger children. Only on a couple of occasions were repeated explanations required to confirm the child's comprehension of the tool.

Immediately after measuring fear, each child five and over, was shown the VAS and how it worked. The researcher showed the child how the blue plastic bit slid from one end, no pain at all, through gradually increasing amount of pain, up to the end which meant a 'really huge pain, the biggest pain ever'. The researcher then handed the VAS to the child and asked the child to show him how much it hurt in his or her arm by moving the blue bit along the groove. The child then handed the VAS back to the researcher and a score from zero – 100 was entered on the data sheet. The child and parent were then thanked for participating in the study before leaving the department. For children aged 3 to 7 years, as soon as the child and parent left the department, the researcher scored the child's behaviours during the venepuncture on the CHEOPS and the score was entered on the data sheet. In the case of the experimental condition, the video was then rewound to the same starting point.

## *Results: Cartoon Study*

To ensure that the random allocation of participants to the two experimental conditions had not inadvertently resulted in the unequal distribution of a number of potentially confounding factors, one *t* test and a series of chi-square analyses were performed. These analyses examined the extent to which the age, gender of participant, history of previous venepuncture, nurse taking the blood, time of day (morning or afternoon) and parents present were balanced between the two groups. The distributions are tabulated as Appendix B. The results established that randomisation had been effective and that none of the variables was distributed in a manner that could not have occurred by chance.

### *Descriptive Statistics and Data Transformations*

Table 8.2 shows the descriptive statistics for each dependent variable across the whole sample. During preliminary examination, the variables were inspected for significant departures from normality. Two dependent variables – Fear and Pain (VAS) were subject to transformation because of significant skew in each case. The distribution of the behavioural (CHEOPS) scores was satisfactory on preliminary inspection and thus not subjected to transformation. It must also be kept in mind that the samples used in the CHEOPS analyses were not discrete. The age range (3 to 16 years) of the sample meant that self-report measures could not be administered to all participants. This necessitated the use of a behavioural measurement of pain in the younger children.

**Table 8.2**

*Descriptive Statistics and Transformations – Whole Sample*

| | Transformation | N | Mean | SD | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| CHEOPS[a] | Nil | 54 | 9.60 | 2.28 | -.115 | -1.076 |
| VAS Pain[b] | Log (VAS + 10) | 69 | 1.55 | .243 | -.020 | -.355 |
| Fear[c] | Log (Poker + 1) | 69 | .29 | .219 | -.090 | -1.06 |

Notes

[a] The CHEOPS measure was applied to children aged 3 to 7 years.

[b] Children aged 5 to 16 years gave a self-report of pain on a VAS.

[c] Children aged 5 to 16 years gave a self-report of fear using the Poker Chip Tool

Table 8.3 shows the transformed means and standard deviations of the dependent variables for the control and cartoon conditions. The untransformed means and standard deviations are shown in Table C-1 (see Appendix C).

**Table 8.3**

*Transformed Descriptive Statistics – Control and Cartoon Conditions*

| | CONTROL | | | CARTOON | | |
|---|---|---|---|---|---|---|
| | *n* | Mean | SD | *n* | Mean | SD |
| Pain – CHEOPS | 29 | 10.66 | 2.00 | 25 | 8.44 | 2.04 |
| Pain – VAS | 36 | 1.61 | .22 | 33 | 1.50 | .25 |
| Fear – Poker Chip | 36 | .38 | .20 | 33 | .20 | .19 |

### *Dependent Variable Analyses*

Though checks had shown age, gender and previous experience of venepuncture were equally distributed in the two conditions, the fact that these variables had been shown to influence some of the dependent variables (Goodenough, Champion, Laubreaux, Tabah, & Kampel, 1998; Goodenough, Thomas, Champion, Perrott, Taplin, von Baeyer, & Ziegler, 1999; Manne, Jacobsen, & Redd, 1992) warranted their inclusion as covariates.

The effect of cartoon distraction on self reported pain (VAS), approached significance $F(1,64) = 3.13$, $p =. 08$, $\eta^2 = .05$. Behavioural scores were significantly lower in the cartoon distraction condition than in the control condition, $F(1,49) = 13.93$, $p < .001$, $\eta^2 = .22$. Fear scores were also significantly lower in the cartoon distraction compared to the control condition, $F(1,64) = 13.74$, $p < .001$, $\eta^2 = .18$.

### *Correlations*

The strongest correlation in this study was between Fear and Pain scores, $r(68) = .47$, $p < .001$. The observational measure of pain (CHEOPS) was used in 69 children aged three to seven years. Of the 69 children, a sub-sample, consisting of 23 five to seven year-olds rated VAS pain scores CHEOPS pain scores and Poker Chip fear scores. Self reported fear correlated significantly with the CHEOPS scores ($r = .45$, $p = .03$) but poorly with VAS pain scores, ($r = .27$, *ns*). The correlation between CHEOPS pain scores and VAS pain was weaker than with fear, and only approached significance, $r = .37$, $p =. 08$. None of the correlations involving this sub-sample differed significantly.

## *Discussion*

The first hypothesis, that audiovisual cartoon distraction reduces the child's perception of the pain associated with venepuncture, was partially supported by the self-report (VAS) measure of pain in children aged six to 16 years. The hypothesis was supported on the behavioural measure (CHEOPS) applied to children aged three to seven years. Support for the second hypothesis, that audiovisual cartoon distraction during venepuncture reduces the child's fear associated with the procedure, is more compelling. Fear scores, measured in children aged 5 to 16 years, were significantly less in the cartoon distraction compared to the control condition. Fear was not measured in the children aged three and four years so support for the second hypothesis is restricted to children aged 5 to 16 years.

In order to reconcile the apparently contradictory findings in relation to pain and distraction, it is necessary to explore more fully the measures employed. Amongst the 5 to 7 seven year-olds the three measures: behavioural pain (CHEOPS), self-reported fear and self-reported (VAS) pain were obtained. In this sub-sample, it was clear that despite its name, the CHEOPS correlated more strongly with self-reported fear than with self-reported pain. This trend in the data is similar to the findings of

Beyer, McGrath and Berde (1990), who found discordance between self-reported pain and CHEOPS scores and raised concerns about the validity of the CHEOPS in measuring postoperative pain. Despite the view held by Mathews, McGrath, and Pigeon (1993) that reliability and validity of the tool are highest in procedural pain, the data in this study suggest that in the procedural context, the CHEOPS may be more sensitive to fear or distress than it is to pain. Interestingly, Fradet, McGrath, Kay, Adams, and Luke (1990) used the CHEOPS as a measure of distress associated with venepuncture in children and then labelled the CHEOPS measure of 'distress' as 'anxiety'. In children aged three and four years, it is difficult to say whether the CHEOPS measures pain or fear, however, the data in this study, together with the concerns raised by Beyer et al. (1990) suggest at times, the CHEOPS may lean towards the fear.

In this, the cartoon study, the CHEOPS measure was recorded by the researcher immediately after the child and parent had left the department. The potential for bias in the sub-sample is acknowledged because the CHEOPS was recorded after the child had rated his or her pain, although it must be stressed that the CHEOPS consists of a number of clear and well-defined observations. Regarding the stronger correlation with fear compared to pain in the sub-sample, it is possible, although extremely unlikely, that the children confused fear for pain on the Poker Chip Tool while at the same time confusing pain on the VAS for something else. In administering the Poker Chip Tool, the word 'scary' was used in conjunction with fear. Although difficult to put into words, there is something unique about communicating with a child about his or her fear or how scary something is. There is a sense of emotional disclosure that in many ways seems even more personal than a self-report of pain.

In conclusion, this, the first of two studies, provides partial support regarding the efficacy of cartoon distraction as an intervention for procedural pain. The effect on fear is more convincing. If the CHEOPS is seen to be a measure of the affective component of procedural pain, then we can conclude, albeit cautiously, that cartoon distraction reduced fear, in the 3 and 4 year-olds, but we can be confident that it reduced the self-report measures in the older children. A failure to demonstrate a significant effect of distraction on pain has been noted in previous studies (Carlson et al., 2000; Fassler, 1985; Kleiber et al., 2001; Kleiber & Harper, 1999; Manne et al., 1990; Meagel et al., 1998; Ryan, 1989). However, in other cases (Cohen, Blount, & Panopoulos, 1997; Kuttner, 1986, 1989; Sparks, 2001) distraction is reported to have an effect on pain. A rationale, based on the notion of passive versus active construing of the distractor could account for the mixed effects of distraction on procedural pain. If a child actively construes the distractor, and begins to lay over his or her own constructed sense of self in relation to the distractor then this would invoke the kind of top-down neural processing that is consistent with imagery. Under these circumstances, the child may, to a degree, construct an altered reality and with it a sensory reality that is not consistent with the reality of the procedure room. In this study, observing the cartoon might be consistent with the notion of the child construing somewhere between the passive and active pole on a *passive construing – active construing* construct. If some children tended to lean towards the passive pole, then, they would construe the cartoon, as if, in a bottom-up sensory appraisal manner, as a 'competing story' while actively construing the 'pain story' that is unfolding in the procedure room. Under these circumstances, the opportunity for engagement is limited because the child is an observer of information on the television. The child is faced with a limited range of choice, essentially, to focus on the cartoon, or the procedure. Clearly though, for some children, the cartoon was an effective distractor for pain. The argument here is that what makes a distractor an effective distraction, is when it is actively construed by the child. Importantly, regarding fear though, the child has something to focus on that is inconsistent with the procedure. The mere presentation of a cartoon could be a surprising variation from the typical (and expected) 'clinical and serious' milieu of the procedure room, thus making it easier to construe the context in a non-fearful manner. It is possible that, even if not actively construing to the point of absorption and preoccupation, in loosening and shifting away from the passive pole, the child gains some sense of control, and participation, and that this, coupled with consciousness of the cartoon, is enough to have an inhibitory effect on the typical cascade of fear responses. These ideas will be developed further in the main discussion in Chapter 11.

The greater effect of distraction in this study on fear than pain associated with a medical procedure suggests that children as young as five and possibly younger are able to differentiate between the emotional and sensory components of procedural pain, that is, what hurts and what is scary. Interventions should therefore be targeted at both components. This view has gained momentum over the past 25 years in the paediatric pain literature (Anderson, Zeltzer, & Fanurik, 1993; Eland & Anderson, 1977; Kuttner, 1986, 1998; McGrath & Hillier, 1996) but in many settings still is not put into practice.

### *Summary*

This chapter described the first of two studies undertaken in this thesis. The aim of the first study was to investigate the effects distraction on fear and pain, which, together with the findings of the second study, addresses the main aim of the thesis, to compare, contrast, and account for the therapeutic effects of distraction, relaxation, and imagery on fear and pain in children undergoing painful medical procedures.

The results of this study suggest that distraction, in the form of watching a cartoon, has a significant effect on fear and a partial effect on pain associated with the procedure. It appears that of the two constructs, fear and pain, pain is the one that is more resistant to the positive effects of distraction, at least, the distraction employed in this study.

Conceptually, the notion of passively versus actively construing the distractor, taking a passive role, and being very much in the 'here and now' of the procedure room were raised as factors that might account for the lesser effect of this distraction intervention on procedural pain. These issues will be explored in detail in Chapter 11, Discussion, after describing the Method (Chapter 9) and Results (Chapter 10) of the second study into the therapeutic effects of relaxation and imagery on procedural fear and pain.

CHAPTER 9

# METHOD: STUDY TWO – RELAXATION THERAPY AND GUIDED IMAGERY

This chapter outlines the method undertaken in the second study, which investigated the effects of imagery and relaxation on the experience of procedural pain in children. Previous studies have identified failure to determine the level of involvement of a child in imagery as a methodological limitation. This was addressed in this study through the development and implementation of a new scale to measure involvement in imagery. A variety of additional measures were employed to capture the cognitive, emotional and imaging aspects of the child's experience. These are discussed after first giving the background to the study. The fundamental research question, subsidiary questions and hypotheses concerning the effects of imagery and relaxation are stated.

## *Background*

This, the larger of the two studies in this thesis, was designed to build on the distraction study with a view to investigating the effects of relaxation and imagery on pain and fear in children undergoing a medical procedure. As was discussed in Chapter 7, relaxation (RT) is often combined with guided imagery (GI), as a combined intervention. No studies have, to date, independently investigated these as distinct interventions. Furthermore, those studies that have used combined interventions have frequently failed to examine the full range of psychological dimensions related to pain and fear that could be altered by such interventions.

### *Relaxation*

Relaxation, as an intervention intended to reduce fear and pain within a medical context can be viewed from two perspectives: the physiological and the psychological. The physiological effects of relaxation, the so-called 'relaxation response' (Benson, 1976), tend to be aligned with a decrease in activity of the sympathetic nervous system, which is manifest in decrease in heart rate, blood pressure (if normally hypertensive), breathing rate, oxygen consumption, blood lactate levels, and, of course, a decrease in muscle tension (Hewitt, 1985). At first glance, it may appear that the relaxation response is mediated by a simple shift in the sympathetic – parasympathetic autonomic balance, towards an enhanced parasympathetic outflow. However, vagal (parasympathetic) bronchoconstriction, and a reduction in sympathetic bronchodilation are not consistent with the positive effects of relaxation in acute respiratory conditions such as asthma (Payne, 1995). While the physiological effects of relaxation appear to mimic many parasympathetic effects and contrast with many sympathetic effects, the relationships appear to be correlational, rather than causal. Nonetheless, it seems reasonable to conclude that the physiological concomitants of relaxation are antithetical to those accompanying the experiences of pain and fear, however, it is also conceivable that the physiological effects of a relaxation-based intervention are less important than the cognitive changes elicited by a relaxation intervention in reducing pain and fear.

As an intervention, relaxation is interesting because, in addition to the obvious physiological effects, there are changes in thinking associated with being in a relaxed state. In drawing on the notion of distraction as a function of passive versus active construing, relaxation could be viewed, in part, as a type of distraction from the sensations of the procedure, to sensations in other parts of the body; 'in part', because when coupled with focussed attention on breathing, the 'relaxation response' is enhanced. If relaxation is a form of distraction, one would expect the effects of relaxation on pain and fear to be similar to the effects of distraction. Yet, there is something qualitatively different about being in a relaxed state compared to being distracted. Quite simply, relaxation 'feels good'; it is this 'feeling' that qualitatively differentiates relaxation from distraction.

It is important to point out that ‘relaxation’ as used in this study was a simple progressive muscle relaxation exercise with occasional deep breaths. Conceptually, in this thesis, the cognitive aspect of relaxation (passive rather than active construing) is similar to distraction rather than active involvement in deep relaxation, coupled with suggestions, which would be more akin to a hypnotic technique. In comparing relaxation with imagery, the passive – active contrast in construing is the salient factor that distinguishes the two interventions. During a relaxation exercise, the child may be construing the relaxed state somewhere between the passive and active pole but his or her consciousness, reality, ‘sense of self’, tends to be in the ‘here and now’ of the procedural room. Engagement in imagery, on the other hand, implies a definite shift to the active pole and what the child constructs in imagery is an alternate reality, complete with unique qualia. Where relaxation, as used in this study, tends to operate around the passive end of a *passive construing – active construing* continuum, imagery invokes a shift to the opposite (active) pole.

There are many reported studies on relaxation and pain (Anbar, 2001; Brown, Douglas, & Flood, 2001; Good, Stanton-Hicks, Grass, Anderson, Lai, Roykulcharoen, & Adler, 2001; Houston & Jesurum, 1999; Kwekkeboom, 2001; Lang, Benotsch, Fick, Lutgendorf, Berbaum, Berbaum, Logan, & Spiegel, 2000; Murphy & Carr, 2000; Powers, 1999; Schiff, Holtz, Peterson, & Rakusan 2001; Schofield & Davis, 2000). Relaxation is generally considered useful in managing pain. However, the relevance of much of the research to procedural pain in children is limited because of the types of pain investigated and the age of participants. Typically, relaxation is investigated with regard to its effect on chronic pain (Corrado & Gottlieb, 1999; Schofield & Davis, 2000) or cancer pain (Grealish, Lomasney, & Whiteman, 2000; Kwekkeboom, 2001; Pan, Morrison, Ness, Fugh-Berman, & Leipzig, 2000; Wallace, 1997). Many studies are on adults (Cupal & Brewer, 2001; Good et al., 2001; Hattan, King, & Griffiths, 2002; Hewitt, 1985; Houston & Jesurum, 1999; Logan et al., 2001) rather than children (Bullock & Shaddy, 1993; Hobbie, 1989; Murphy & Carr, 2000).

Seers and Carroll (1998) conducted an extensive review of studies on relaxation techniques for the management of acute pain and concluded that there was only weak evidence to support the use of relaxation for acute pain. Many studies suffer from methodological weaknesses including lack of randomisation, small sample size, lack of adequate controls, combined interventions and lack of a detailed explanation of the relaxation technique. Wallace (1997) points out that relaxation and imagery are frequently combined as a single intervention (Bullock & Shaddy, 1993; Cupal & Brewer, 2001; Hobbie, 1989; Kwekkeboom, 2001; Skaggs, 1999). Krueger (1987) wrote, "Because most pain studies have paired imagery with other components, such as relaxation or distraction exercises, conclusions about the unique phenomenon of imagery cannot yet be drawn". Such designs do not allow the identification of individual or combined effects of each intervention. Although Krueger raised the methodological issue in 1987, 'non-pharmacologic' interventions are often investigated in combination. Clearly there is a continued need to address this issue through carefully controlled studies of the independent and combined effects of relaxation and guided imagery interventions.

### *Imagery*

Having considered the possible impact of relaxation on pain and fear and also acknowledged that frequently relaxation is combined with imagery in guided imagery (Bullock & Shaddy, 1993; Cupal & Brewer, 2001; Wallace, 1997; Whitaker, 1994; Zahourek, 1988) or in hypnosis (Anbar, 2001; Kuttner, 1997; LeBaron & Zeltzer, 1996; Murphy & Carr, 2000; Olness & Kohen, 1996), it is necessary to consider in more depth the effect of imagery as an independent intervention. In keeping with the main thrust of this thesis, this will be done from a constructivist perspective.

As the child engages in imagery, his or her construing becomes more active and focussed on whatever is imaged. As the imagery develops, there is a concomitant shift in the child's consciousness and 'sense of self'. In constructivist terms, the child 'actively construes the reality to which he or she responds'. This two-part constructivist tenet is particularly relevant to the effects of imagery on pain and fear: firstly, the notion that 'reality' is actively constructed in imagery; and, secondly, that the child *responds* to the reality that is constructed. If the constructed reality is pain-free and fun, then, in actively constructing this reality in imagery, one would expect self-reports of pain and fear associated with the 'procedural reality' to be significantly reduced in children who are able to 'get into' the imagery. Conceptually, successful engagement in imagery is marked by the degree of shift from the passive to active pole, and the attendant shift from the reality of the procedure room to the reality in imagery; this is, however, not a given. The designs of previous studies using imagery as an intervention have drawn criticism (Langley, 1999; Wallace, 1997) because the researchers have not commented on the child's ability or success in engaging in imagery during the procedure. Broome, Lillis, McGahee, and Bates (1992) also identified the failure to assess the actual ability of children to use imagery and relaxation techniques as a limitation in their own study on the use of these techniques to manage procedural pain in children with cancer. In anticipating the likelihood that not all children will engage deeply, that is 'get into' the imagery, it is vital that any investigation into the effects of imagery includes an assessment of the extent to which the child has successfully engaged in imagery.

Central to measuring the independent variable 'imagery' is the concept of 'absorption'. This concept is not new; it is widely discussed in the hypnosis literature as a predictor of 'hypnotisability' (Monteiro, MacDonald, & Hilgard, 1980; Tellegen & Atkinson, 1974; Yanchar & Johnson, 1981). However, given the specific context of procedural pain, that the intervention was imagery not hypnosis, and the lack of emphasis on suggestion, measures of hypnotisability (Tellegen & Atkinson, 1974; Weitzenhoffer & Hilgard, 1959) as an indicator of absorption in imagery are unlikely to be valid. Hence, there is a need to develop a measure of absorption that is specific to imagery and procedural pain in children.

### *Effects of Imagery*

As well as ensuring that the discrete effects of relaxation and imagery are examined, and that checks are made on the success of the imagery intervention, the current study sought to address the failure of past research to explore the full range of psychological effects that interventions of this type might produce. When considering this issue it is important to remember the age of the children experiencing the procedure and intervention. The validity of self-report is an important methodological consideration in research with children. Given that the participants in this study could be as young as six, the most important principle driving the validity of the self-report measures was simplicity. The validity of a child's self-report is dependant upon the child understanding the question and providing a true and accurate answer. On the use of self-report measures with children (within the context of pain), Mathews, McGrath, and Pigeon (1993) state:

> Self-report measures rely on children reporting their own subjective pain experiences. Because the child must have adequate cognitive and communicative skills, the lower age limit for use of these measures is approximately four. (p. 98)

Four-year-olds can identify and describe pain and fear. They can also tell us whether what they are thinking or feeling is good, bad, or just normal. Of more concern is the validity of a four-year-old child's self-report of relaxation and bother. Champion, Goodenough, von Baeyer, and Thomas (1998, p. 133) point out, "…young children especially 3 and 4 year olds, are more likely to select the endpoints of VAS or category scales with multiple options…" The commonly reported minimum age for the valid and reliable use of visual analogue scales to measure pain in children is five years (Finley & McGrath, 1998; Mathews, McGrath, & Pigeon, 1993). A significant factor here is that this is the age most children start school. School aged five-year-old children could probably report on a visual analogue scale how relaxed they felt and how much something bothered them. However, to allay concern regarding the self-report of 'feeling relaxed' and 'bothered', a conservative margin of one year was considered appropriate following discussion with health professionals experienced in working with children and several primary school teachers. Therefore, only children aged six years and older were asked to participate in this study.

As well as ensuring the general format of the measures was appropriate for the age of the sample, research in this area has to be mindful of the breadth of the child's experience during the procedure. The psychological dimensions that could constitute the experience were considered earlier in relation to the research on relaxation but can be extended to assess additional dimensions that might be affected by imagery and related interventions. For example, in a study exploring a child's favourite story as a hypnotic technique to reduce procedural pain, Kuttner (1988) noticed how much the pain 'bothered' a child whose self-report of pain was high, but whose self-reported anxiety and observed distress were low. "It [the discrepancy between pain and bother] suggests that although Samantha was aware of pain, it did not bother her" (p. 294).

Kuttner suggests this occurred through dissociation from the pain: that the pain sensations “may become more distant, less relevant, and therefore less upsetting and painful” (p. 294). However, in this child’s case, her self-report of pain was 5 out of 5, suggesting that the intensity was at a maximum level. In light of Kuttner’s comments, asking children about how much what they felt in their arm during the blood test bothered them was a worthwhile question.

Self-reports of ‘bothersomeness’ have also been incorporated in a number of adult pain studies including an investigation in to the effects of nitrous oxide (Zacny et al., 1999), and fentanyl (Zacny, Coalson, Klafta, & Klock, 1996) and on ‘bothersomeness’ of experimentally induced pain (cold pressor test) in healthy subjects. In both studies, the pharmacologic intervention significantly reduced measures of pain intensity and bothersomeness of pain. These studies strengthened the case for the incorporation of a measure of the extent to which procedural pain bothered the child.

A number of other dimensions have been thought relevant to the pain and fear experienced by children beyond the notion of how much the pain “bothered” them. The term ‘valency’ has been applied to emotion (Adolphs & Tranel, 2000; Fernandez & Turk, 1995; Wintre & Vallance, 1994) to categorize emotions as positive or negative. Children as young as 3 years can understand the link between situations and the emotions they provoke (Wintre & Vallance, 1994). A logical progression from the absence of positive or negative emotion is to ask about neutral or no emotion. Thoughts too can be classified according to valency as positive, negative or neutral. From the perspective of the child, this most easily and accurately equates to good, bad, or just normal thoughts. Measurement of both of these variables is dependent upon the child’s self-report of a subjective experience but children as young as 4 years have been found capable of accurate and reliable self-report subjective experiences (Champion, Goodenough, von Baeyer, & Thomas, 1998). This very simple classification of emotional and cognitive tone appeared a worthwhile adjunct to any comprehensive assessment of intervention effectiveness.

The term ‘uptight’ has been in common use in the English language since the 1960s. In the world of paediatric pain, the term ‘distress’ is favoured, however, laypersons could not be expected to have a similar understanding of the term ‘distress’ because its use is not common. The term 'uptight' however, is used in everyday conversation and in the media. 'Uptight' was therefore selected as a preferred descriptor over distress. Parent and nurse ratings of how uptight the child was were sought in this study to obtain another view of the psychological impact of procedural pain on children. Previous studies have drawn on parent and or nurse ratings of pain, anxiety and distress. Opinions vary regarding the validity of these measures. Manne, Jacobsen, and Redd (1992) and McCaffery and Wong (1993) considered parent ratings of child distress to be more accurate than the ratings of health professionals, although, Manne, Jacobsen, and Redd did suggest that parent ratings reflected parental anxiety and that the nurse ratings were associated with observations of the child's behaviour. Despite mixed opinion, parent and nurse ratings were included to obtain a diverse range of measures and views of the impact of the procedure on the child.

While self-report measures are typically seen to be the most important mode of learning about the child's experience the observations of parent and nurse can clearly add to the "picture" that is produced by the interventions. However, as has been suggested, both sets of observations might be confounded, by the observer's own emotional state, in the case of the parents, and by the concern for a quick and efficient procedure and the attendant focus on particular forms of behaviour, in the case of the nurses. One way of addressing these issues is to employ a more "objective" and comprehensive observational schedule. The Observational Scale of Behavioural Distress (Jay, Ozolins, Elliott, & Caldwell, 1983) is specifically designed to measure distress in children associated with painful medical procedures. The tool has been used in a number of settings on a range of painful procedures and has well-established validity (Broome, Rehwaldt, & Fogg, 1998; Foertsch, O'Hara, Stoddard, & Kealy, 1998; Jay, Elliott, Katz, & Siegel, 1987; Pederson, 1995), and reliability (Jay & Elliott, 1984, 1986; Jay, Ozolins, Elliott, & Caldwell, 1983). It seemed appropriate to incorporate this measure to round out the impressions of the child's behaviour during and after the procedure.

### *Research Questions*

Previous chapters have identified pain as a multifaceted construct with cognitive, emotional and sensory qualities. When imagery and relaxation are introduced in a painful procedure, they too can have cognitive, emotional and sensory qualities. The fundamental research question in this study focuses on how imagery and relaxation modulate a child's thoughts, feelings and reporting of fear and pain as well as their expressive behaviour during a medical procedure. Formally, the research question is: What are the effects of distraction, relaxation and imagery on procedural fear and pain in children?

In the light of the examination of previous research, several issues stem from this fundamental question. Firstly, there is a need, in a randomised controlled design, to identify the effects of imagery on a child's reaction to a painful procedure. Secondly, there is the issue of whether there are distinct effects of imagery on fear and pain beyond those produced by relaxation. Finally, the study should establish in what ways relaxation, imagery and distraction are similar in terms of their general psychological impact, and how they differ.

The two interventions under investigation in this study, relaxation and imagery were expected to have differential effects on pain, fear, distress and the related variables. The children in the imaging conditions were expected to actively construct an alternate reality, in imagery, and as such, the imaging conditions would produce significantly lower pain, fear, bother, distress and uptight scores than the non-imaging conditions. Similarly, reports of positive thoughts and feelings would be greatest in the imaging conditions.

Relaxation, like distraction, was expected to draw mainly on the notion of passive, rather than active construing, although it is acknowledged that in terms of how the child felt, relaxation would add a sense of actually feeling good, even in a fundamentally threatening situation. A difference was expected across the range of dependent variables between the non-relaxation, and the relaxation conditions. In terms of the 'distraction-like' effects of relaxation, coupled with an expected positive effect on feelings, it was anticipated that, the relaxation conditions would produce significantly lower pain, fear, bother, distress and uptight scores than the non-relaxation conditions.

Given that there was very little time between meeting the child and explaining the study and the onset of imagery for those in the imaging conditions, it was anticipated that the relaxation phase would allow the child to engage more fully in the imagery. As a consequence, children in the combined relaxation and imagery condition were expected to report significantly lower pain, fear, bother and distress scores, more positive thoughts and feelings, and would be rated by parents and nurses as less uptight than children in the imagery, or relaxation only conditions. Similarly, but more specifically, across both imaging conditions, it was predicted that children who were engaged more fully in imagery would report significantly lower pain, fear, bother and distress scores, more positive thoughts and feelings, and would be rated by parents and nurses as less uptight than children who were less engaged.

The relationships between the various dimensions of pain and fear were also anticipated to be affected by the more powerful imagery intervention. The correlations between fear, bother, pain, thoughts and feelings were expected to be weaker in the imaging conditions than the non-imaging conditions because in the imaging conditions the children would be construing a reality in which these variables would be less relevant. There should be no procedural pain focus in the imaging conditions around which these ratings could coalesce. An exploration of the extent to which pre-procedural ratings of fear and being uptight were correlated with procedural assessment was also anticipated.

## *Method*

### *Participants*

One hundred and twenty English-speaking children were drawn from a convenience sample of children who presented to a Pathology Out-Patient department for venepuncture. Children aged 6 to 16 years were invited to participate in this study unless excluded on the same criteria that were used in the Cartoon Distraction Study. In this study, only about four children were excluded because of involvement in other research, pre-existing pain or application of topical anaesthesia.

### *Setting*

This study was undertaken in the same Pathology Out Patients Department, as was the Cartoon Study. The same room was also used. Stability of the environment during the conduct of the study was achieved by maintaining the following conditions. *Lighting*: fluorescent lights brightly illuminated the room. These were on and fully functional. *Privacy*: the sliding door to the room was closed during the procedure. *Background noise*: the study was conducted in a busy pathology department. The staff undertook their work in the usual manner. Telephones would ring; staff would talk with each other, their patients and the parents. Often babies would scream and children could be heard crying. *Position in the room*: for each procedure, the child sat in a chair, the younger ones sat on the parent's lap as per standard procedure in the department. The nurse collecting the blood always sat to the left of the child. The researcher always sat to the right of the child. The small video camera mounted on the tripod was always in front of the child at a distance of approximately 1.5m. *Room temperature:* the ambient temperature was held constant by the air conditioning system in the hospital. *Room odour:* the somewhat 'clinical' odour of the department did not change throughout the study. At no stage were therapeutic oils burned or areas painted. *Parental presence:* no procedures were performed without a parent or significant other present. *Appearance of staff:* there were no changes in the attire worn by staff throughout the study. Equally, the researcher did not significantly change his casual attire. *Other distractions:* no other distractions, for example television, music, computer games or play, were introduced during the conduct of the study.

### *Measures*

To ensure the full range of psychological responses following the procedure and the interventions were examined a number of self-report measures, including level of relaxation, valence of thoughts and feelings, pain, fear and bother, were collected. Given that the participants in this study were as young as six, the most important principle driving the choice of these measures was their simplicity and ease of use. In an attempt to obtain a broader view of the psychological impact of the procedure on the child, measurement of the three remaining dependent variables involved the parents' and nurses' perceptions of the child and an observational measure of the child's distress applied by the researcher and an independent Clinical Nurse Specialist in paediatric pain. Detailed description of the manipulation checks, self-report dependent measures and observational measures follow.

### *Manipulation Checks*

#### *Relaxation*

The children were asked to rate how relaxed they felt on a verbal scale of zero to 10. The use of a verbal scale requires effective communication, which is dependent on not only effective transmission and reception of information but also understanding. The latter is often incorrectly assumed, particularly when communicating with children. To avoid errors in understanding the term ‘relaxed’, the researcher also used the word ‘floppy’ and demonstrated what ‘being relaxed or floppy’ meant. Having the child raise the researcher’s arm by picking up his wrist helped to achieve this. The arm was deliberately relaxed and heavy. The researcher asked the child, “What will happen to my arm if you let go?” Most children said that it would drop. A couple were not sure. The researcher said, “Okay let go”. The researchers arm would then drop onto the child’s knee. The researcher then demonstrated ‘not relaxed’; a tense weightless arm held by the child that did not drop when let go. This brief exercise confirmed the child’s understanding of the term ‘relaxed’. Each child was asked to rate how relaxed or floppy he or she felt during the blood test on a verbal scale where zero meant ‘not relaxed at all’ and 10 was ‘most relaxed’ (really floppy).

#### *Involvement in Imagery*

A new scale, the Imagery Absorption Scale (IAS), was developed in consultation with health professionals experienced in imagery and pain management in children. The following section describes the development, and implementation of this scale.

Clinically, there is certainly something different about being in imagery. This difference is experienced by the individual and can be observed in the person’s affect and behaviour. Typically, a child will describe herself in a scene in the present tense, often the description is detailed, it flows easily, if something amusing happens, the child will smile or laugh, and if the guide asks something that does not fit with the imagery, the child will simply correct the guide. Moreover, the person guiding the imagery shares many aspects of the individual’s imagery. There is often a concurrent construct of the individual's imagery in the mind of the person guiding the imagery. The task of developing an Imagery Absorption Scale specific to procedural pain in children was dependent upon identifying the behavioural differences between being in a normal conscious state and being in imagery and defining these within the context of a painful procedure. The criteria deemed important in developing the scale were identified in a previous study (Whitaker, 1994) that examined the types of images that help children through painful procedures. The mode of operationalizing these components as a reliable measure is described below. The purpose of the Imagery Absorption Scale was to assess the extent of engagement in imagery. The seven criteria, together with corresponding values in the are shown below in Figure 1. Each factor was defined and scored as follows:

*Eyes Closed*. More often than not, children will close their eyes when engaging in imagery. They may begin with eyes open but when they feel okay to go with the imagery, they will close their eyes. Scoring: 1 – eyes closed during the imagery, a brief opening of eyes then eyes closed again would also be scored as 1; 0 – eyes open throughout procedure.

*Did you feel as if you were here or there?* Children who deeply engage in imagery will say upon cessation of the imagery that they felt as if they were there – in the pool, on the swings, actually bouncing the basketball down the court – rather than here in the hospital or whatever setting the child is physically in. Three options are given to the child, "When we were doing the blood test (any procedure), did you feel as if you were here, there – in your imagery, or somewhere in between?" Sometimes children will say, "I felt as if I was in between, sometimes there, sometimes here". The child who tends not to engage in imagery will say, "I felt as if I was here". These three possibilities are scored as: 2 – there; 1 – in between; and 0 – here.

*Appears relaxed.* Children who engage in imagery appear relaxed even if the imagery is active as in playing sport. Scoring: 2 – appears relaxed for entire procedure; 1 – periods of being tense or fidgeting; 0 – appears tense throughout procedure.

*Speech – normal to calm with no sign of apprehension.* The tone of the child's speech is normal to calm in imagery. The child sounds as if he or she is in the place of imagery, not in a hospital about to have a painful procedure. There is no apprehension or sense of fear in the child's voice. Scoring: 2 – normal or calm speech throughout the procedure; 1 – an episode of apprehension; 0 – apprehensive, fearful or distressed speech throughout the procedure.

*Easy flowing description of Imagery.* In imagery, the child's description of the imagery flows easily and is in the present tense. Some children say a lot, some say less. The important characteristic here is the quality of the speech. It is not a case of "What does he or she want me to say next?" The description of the imagery flows and can easily be followed by the person guiding the imagery. If the guide asks an inappropriate question, the child will correct the guide. For example, on getting out of a swimming pool in imagery, the guide might ask, "Have you dried yourself off? The child responds with, "No, my towel is on the other side of the pool." Scoring: 1 – flows easily as described above in the present tense; 0 – does not flow or past tense is used or sounds 'made up' rather than a description of what is being experienced.

*Appropriateness of affect and imagery*. When in imagery, the child's affect matches the description of what is happening. For example, if something amusing happens, the child will smile or laugh. If the child describes winning a game or a race or simply is having fun, their affect is appropriate. Scoring: 1 – appropriate affect; 0 – inappropriate affect.

*Ability to sustain imagery throughout the procedure:* Possible scores are 3, 2 or 1. If the child sustains the imagery for the entire procedure, the score is 3. For part of the procedure (brief lapse), the score is 2. Sometimes a child will open his or her eyes, perhaps check out what is happening, ask a question about the procedure and then go straight back to describing the imagery; this would be scored as 2, a brief lapse in imagery. Sometimes a child will lose the focus of the imagery altogether. If there was total loss of imagery, the score is 1.

| Parameters | Possible Score | | |
|---|---|---|---|
| Eyes closed | 1 | 0 | |
| Did you feel as if you were here or there? | 2 | 1 | 0 |
| Appears relaxed | 2 | 1 | 0 |
| Speech: normal to calm with no sign of apprehension. | 2 | 1 | 0 |
| Easy flowing description of Imagery | 1 | 0 | |
| Appropriateness of affect and imagery | 1 | 0 | |
| For the entire procedure | 3 | | |
| or | | | |
| Part of the procedure (brief lapse) | | 2 | |
| or | | | |
| Total loss of Imagery | | | 1 |
| IAS SCORE (Out of 12) | | | |

***Figure 1.*** **Imagery Absorption Scale (IAS)**

The items were experientially defined, refined, and developed into a scale by the researcher. The development and implementation of the scale was then corroborated in discussion with an expert Clinical Nurse Specialist in the field of imagery and pain management in children. The score represents how absorbed a person is in imagery during a painful medical procedure. The maximum score is 12. The children who were highly absorbed in the imagery, compared to the rest were of particular interest in this study. High involvement in imagery was anticipated to lead to an IAS score of nine or greater. As a bipolar construct of high vs. low, any score less than 9 was considered low. The reliability of the measure and the extent to which this was a reasonable division into high/low imagery was an additional aspect of the study.

Given this was a new scale, interrater reliability of the tool and internal consistency of the seven items were examined. Two independent observers, in addition to the researcher, one an expert in the field of pain in children with more than five years clinical experience in using imagery with children, the other, a novice, who had never used imagery, rated a random selection of 20 cases from the imaging conditions. The extremes of experience in the independent observers were purposefully selected to determine if level of experience influenced the implementation of the scale.

Independently. Each observer sat with 20 copies of the Imagery Absorption Scale shown in Figure 1 together with the scoring criteria, viewed each video, marked each item accordingly and summed each item to give a total, which was the IAS score for each case. The observers completed this process independently.

Interrater reliability between the researcher and two independent observers, one experienced in using imagery, the other with no experience, was high. Correlation analyses established the following coefficients: Researcher and experienced observer, $r = .95$; researcher and inexperienced observer, $r = .94$; the two independent observers who never met each other, $r = .91$.

A high level of internal consistency of the 7-item IAS Cronbach's alpha of .86 was demonstrated. Table D-1 (Appendix D) shows the "corrected item-total correlation" for each of the seven items in the IAS, together with the "alpha value if item deleted". The item that stands out in the corrected Item-Total correlations in Table C-1, as being the weakest is Item 2, "Place". In relation to most instruments, however, this correlation is not low. The alpha value if the item was deleted would only move from .86 to .87. Clinically, the response to the question "Did you feel as if you were here, in the hospital, there, in your imagery, or somewhere in-between?" has much relevance for the child, and the person guiding the imagery. Therefore, on both clinical and statistical grounds, this item was not deleted from the scale. It is also interesting to note the item that best reflected the total score on the IAS is Item 4, "Speech – normal to calm with no sign of apprehension". Again, clinically, signs of apprehension in the child's speech quickly alert the person guiding the imagery that the child is beginning to lose focus.

### *Dependent Variable Measures*

#### *Pain*

The Astra® Pharmaceuticals plastic pain ruler was described in relation to its use in the Cartoon Distraction Study. The same tool was used in this study to measure pain. The researcher demonstrated the use of the ruler to measure pain by showing the child how the blue plastic curser moved along the scale from zero to 100. The researcher explained:

> This pain ruler tells me about how much it hurt in your arm when the nurse did the blood test, how much pain you felt in your arm. Down here, you can see is zero, no pain at all and then it goes up in tens, 10, 20, 30, 40, and so on, each division means more and more pain right up to 100 which is the most, the highest, that is the worst pain ever. Do you see what I mean? Here, take this and move this blue thing along to show me how much it hurt in your arm.

### *Fear*

Pre and post procedural fear scores were taken using Hester's Poker Chip Tool (Hester 1979; Hester, Foster, and Kristensen 1990) adapted for fear. This tool was also used in the Cartoon Study. The Poker Chips were laid out left to right on a bench in front of the child. The researcher explained:

> These Poker Chips tell me about fear, about how scary things are, you can tell me how scary, how frightening this is for you (Pre-procedural measure) right now, sitting here, about to have a blood test taken in your arm. There are five Poker Chips, the white one on the end here is zero, that means no fear at all, not at all scary, then it goes up, 1, 2, 3, 4, each one of these red Poker Chips is a piece of scariness. This first one means a little bit scary, a little bit of fear. This one is 2, it is like two bits of scariness or fear, then this one is 3, that means very scary or a lot of fear, and this one, number 4, is the most, this is a huge amount of fear. Can you point to the one that will tell me how much fear you are feeling, how scary this is for you right now?

The same tool was used immediately after the procedure. The child was asked to point to the Poker Chip that showed how much fear he or she felt during the blood test.

### *Bother*

A second Astra® Pharmaceuticals Pain Ruler was adapted by printing the words 'NOT BOTHERED' at the zero (left) end of the ruler and 'VERY BOTHERED' at the 100 millimetre (right) end. The researcher explained:

> You can tell me how much what you felt in your arm during the blood test bothered you on this ruler by moving the blue thing along between 0 ‘not at all bothered’, up in tens, 10, 20, 30, 40, and so on up to 100, which means that you were very, very, hugely bothered by what you felt in your arm.

As with the pain scale, the child moved the blue cursor between 0 ‘not bothered’ and 100 ‘very bothered’.

#### *Valency of Thoughts and Feelings*

In regard to thoughts and feelings during the procedure, all that was required in this study was to have the child determine if he or she was thinking good thoughts, bad thoughts or just normal thoughts, (not good or bad) during the venepuncture. The same applied for feelings. Immediately after the procedure, each child was asked about his or her thoughts during the procedure, and then about feelings.

#### *Uptight Ratings by Parents and Nurses*

A verbal scale of zero to ten was used. Each parent and nurse performing the procedure was asked to rate how uptight the child appeared before and during the procedure. These ratings were taken independently. The parent was asked when the nurse left the room, and the nurse was asked after the parent and child left the department.

#### *Distress*

Implementation of the Observational Scale of Behavioral Distress (OSBD) is relatively simple but the tool is cumbersome and demands attention to detail. In a research setting, the easiest way to apply the measure is to a videorecording of the procedure; this was the method adopted in this study. The 15-second time schedule for scoring the observed behaviours was set by recording onto a 30-minute audiocassette a single note on a piano at 15-second intervals. This played in the background as the videos were scored. Videorecording of the procedures also allowed scoring with the OSBD by a second independent observer. Data were then entered into Microsoft Excel® and distress scores computed according to the weightings stipulated in the design of the tool (Jay, Ozolins, Elliott, & Caldwell, 1983). The procedure can be divided into phases to give a distress score for each phase or these can be summed to give a total distress score. In this study, four phases were initially defined: Phase 1, Tourniquet placed on the child's arm. Phase 2, Needle penetrates the child's skin. Phase 3, Needle is removed. Phase 4, Bandaid® applied. The number of times each of the eight items is observed are summed and weighted to give distress score for each phase. These were subsequently combined to give a total distress score. Independent reliability checks on total OSBD scores have yielded Pearson correlation coefficients from .97 to .99 (Jay & Elliott, 1986, p. 4). In the current study, interrater reliability between two independent observers was high. The correlation coefficient between the two independent observers scoring a random sample of children (n = 60) was .97.

### ***Procedure***

The mode of presentation for venepuncture was the same as described in the Cartoon Study. Each child presented with a parent or guardian to the Pathology Outpatient department for a venepuncture as part of his or her medical management in the hospital. The main difference in this study was the lower age was set at six years. The nurses directed children aged six or older to the same room used in the Cartoon Study. Provided the child had not met any of the exclusion criteria, the child and parent were invited to participate in the study after the project had been explained. In each case, the child's assent and parent's consent were established and then the parent signed the consent form. The children had never met the researcher. There was about a five minute lead up time in which the project and involvement was explained, the Plain Language Statement read by the parent, the consent form was signed and the child was randomly allocated to one of the four conditions. In the imaging conditions, there was no practice run, that is, imagery occurred for the first time with the procedure. The children, either went straight into the imagery (GI condition) or began relaxing (about three minutes) and then into the imagery (RT/GI condition).

Each child was randomly allocated to one of the four conditions by having the child pull a coloured poker chip from an opaque white A4 postage pack. The child, parent and researcher were blind to the contents of the envelope. The postage pack contained four coloured poker chips identical in shape and size. Each poker chip corresponded to one of the four conditions. An explanation of this was on the Plain

Language Statement and was given verbally to the child. The child was invited to put his or her hand into the envelope, rummage around and take out one poker chip.

The colours and corresponding conditions were:

| | | |
|---|---|---|
| Gold Poker Chip | VP1: | Control |
| Blue Poker Chip | VP2: | Relaxation |
| Red Poker Chip | VP3: | Guided Imagery |
| White Poker Chip | VP4: | Relaxation Therapy with Guided Imagery |

Once the child was randomly allocated to one of the four conditions, the pre-procedural measures were taken and the venepuncture was performed according to the group to which the child was allocated.

***Pre-Venepuncture: Process and Measures.***

Seven highly experienced nurses worked in the area each identified by a number for the purposes of the research. The age and gender of the child were recorded. Parent present was recorded as Mother, Father, both parents or 'other'. Other could be a guardian, grandparent, aunt, uncle, etc. Previous experience of a venepuncture was noted. The child's pre-procedural fear level was measured using Hester's Poker Chip Tool adapted for Fear. This was done before the tourniquet was placed on the child's arm. A small Panasonic® video camera mounted on the tripod was then set to record mode by the researcher using a small infrared remote control. Up to this point, the sequencing and conduct of these preliminary steps was identical in every case. Starting the video camera heralded the onset of the particular condition. The condition to which the child was randomly allocated determined the next step in the procedure.

***Relaxation Technique***

The relaxation technique employed in this study in the relaxation condition and the first part of the relaxation and imagery condition was a simple breathing and progressive muscle relaxation technique from toes to fingers. The relaxation procedure began with the researcher explaining the difference between being tense and being relaxed and demonstrating this by making a fist and tensing the forearms and then relaxing, "going floppy". The researcher would then say to the child sitting in the chair, "Okay, the best way to start relaxing is to take a nice big deep breath in…. and out". This was repeated twice for a total of three deep breaths. "Now we might start with feet. Can you give your toes a little wiggle? Ah! That's good, I can see your toes moving." "We are going to start with feet, just notice the feeling in your feet and let your ankles relax". "Notice the sensation of your feet on the floor" (if the child's feet reached the floor). "Now, we are going to move gradually up your legs, and relax those muscles at the back of your legs below your knees, and another nice big deep breath in… and out, that's good." "Now, we will work our way up, through your knees, and legs to your bottom, on the chair, notice the weight of your bottom on the chair." "Okay, around to the bottom part of your back, and the feeling of your back against the chair." "Now, gradually moving up your back, relaxing those muscles, up to your shoulders". "The best thing to do with shoulders is to let them drop a little, Ah! That's good". "Now we will move gradually up the back of your neck, and if you like, you can turn your head one way like looking over your shoulder, like this, (researcher turns his head), and then over the other shoulder and finding a comfy position in the middle." "Again, noticing your breathing, as you breathe in… and out, and around your ears, then to your forehead and your eyes, letting those muscles relax." "Okay, now down the front part of your neck, and out to the tips of your shoulders… and now down both arms together, through your elbows, to your wrists and to your fingers, letting them go all floppy".

### *Guided Imagery Technique*

The Guided Imagery technique described in Chapter 6 was used with the children in the Imaging Conditions. An example of the imagery protocol is offered in Figure 2 as a reminder of the technique.

“Now I don’t know what it looks like, where your playground is, what does it look like, is it a sunny day, or a cloudy day? Is there a swing? What are you going to go on first?” The intention here is to give the child choices and to establish the present tense rather than describing a memory of a previous event. The ‘guided’ part of guided imagery involves asking the child simple questions about his or her imagery. For example, “Where are you now?” The child might say, “I’m going over to the slide.” “Okay, when you get there go up to the top but count how many steps there are to the top and tell me when you get there.” “I am at the top.” “How many steps up to the top?” “Eleven.” “Okay, have a look around and tell me what you can see from the top.” “I can see my brother.” What is he doing?” “He is on the swing” “Okay when you are ready, slide down the slide and we will do the blood test thing, tell me when you are sliding down the slide.” “Now I’m going down the slide.” “There goes the blood test, are you at the bottom? Where are you going now?” “Back up again.” “Okay, tell me when you get to the top...” The child may then have another go on the slide or the swing or engage in some other activity. Another couple of minutes in imagery and then he or she is informed that the procedure is over and we can finish the imagery. “When you are ready, you can finish your imagery and the way we do that is to count backwards in your mind from four to one and when you get to one, open your eyes, look at the floor and then look up, and we are all finished.”

***Figure 2.*** **Guided imagery description**

Generally the researcher would guide the child’s imagery for about 4-5 minutes then the nurse would come into the room and prepare the equipment, which would take only about another minute. By this time (about 6 minutes), the child would be ‘as engaged in his or her imagery’ as he or she was likely to be. As the study was undertaken in a busy clinical setting, sometimes a wait of a few more minutes occurred before the nurse to came. If this happened, the child would just continue describing his or her imagery. Sometimes the nurse would come into the room earlier and the researcher would hold the onset of the procedure until the child had been in imagery for about 4-5 minutes. The researcher would then say, “Okay while you are, ‘in the pool’, ‘on the slide’, ‘bouncing the ball’, we will pop the tourniquet thing on your arm, what is happening now?” The nurse would place the tourniquet on the child’s upper arm and locate a suitable vein. The researcher would then nod to the nurse who then performed the venepuncture. After the needle was withdrawn and a Bandaid® applied, the child would continue for another minute or two. If, for example, the child was in the middle of a game of basketball, the researcher would say, “Let’s imagine you have got a ‘fast forward’, fast forward, and there is 30 seconds left on the clock, tell me what happens in the last 30 seconds”.

If a child lost focus and became distressed, when the needle was inserted, the researcher would ask the child about a component of the imagery. For example, “You were telling me about riding your skateboard down your driveway, when you get to the end, what do you do next.” The child would either go back to the imagery or lose interest all together.

The combined Relaxation Therapy and Guided Imagery (RT/GI) began with the child taking several long slow deep breaths followed by exactly the same progressive muscle relaxation technique as in the relaxation condition, described above. In the RT/GI condition, this phase lasted only a couple of minutes, whereas in the RT condition, the exercise was repeated.

### *Procedure According to Condition*

#### *Control Condition*

Contact between the researcher, the child, and the parent was identical up to the child being randomly allocated to a condition. This took about five minutes. As in the other conditions, there was a wait of about three to five minutes for the nurse to come into the room. The children in the control condition had the venepuncture performed in the standard manner. This involved the nurse casually chatting with the child. Present in the room were the child, parent(s) usually the mother, the nurse and the researcher who stood near the closed sliding door. In the control condition, the researcher was present in the small room as an observer. When the procedure was over and the Bandaid® applied, as in the other three conditions, the researcher administered the post procedural measures and then thanked the child and parent for their participation in the study.

### *Relaxation Condition*

Children in the relaxation condition underwent the venepuncture using the relaxation technique described above. Once the child had relaxed from toes to fingers, the relaxation was repeated in a random manner, that is, switching from one side to the other and back again, and up or down the body. Again, after about 4-5 minutes of relaxing, the nurse would come in and prepare the equipment for the venepuncture. This would take another 1-2 minutes. During this time the relaxation technique continued. The venepuncture was performed as the researcher talked to the child about relaxing a particular area then focussing on another area.

### *Guided Imagery Condition*

In the GI condition, the researcher briefly spoke with the child about imagery. The child was asked to identify something that she or he liked to do, something that was 'good fun'. When the nature of the imagery was established, the researcher explained, "'Imagery' is imagining that you are actually doing that while we do the blood test". In every case with imagery, the researcher said, "I will tell you when we are doing the blood test. While you tell me about what is happening there, I will tell you what is happening here. There will be no surprises". One child asked not to be told when the blood test was happening.

Once the child had decided what he or she would like to imagine, the researcher said, "Okay, that sounds like fun, the way we start is to just take a couple of nice big deep breaths, and if you like, you can close your eyes and just imagine that you are … (wherever the child has chosen). What does it look like, where you are?" The opening questions were specific to the child's choice of imagery. The researcher ensured that the child had at least 4-5 minutes in imagery before the nurse commenced the procedure. Sometimes the nurse would have to wait a couple of minutes and sometimes the child had more time in imagery before the nurse entered the room. The venepuncture was then performed as the child described his or her imagery.

### *Relaxation Therapy and Guided Imagery (RT/GI) Condition*

The process of identifying a topic of interest to imagine in this condition was identical to the GI condition described above. The RT/GI began with the relaxation technique described above. This was brief, lasting only about 2 minutes compared with the relaxation alone condition. Unlike the relaxation alone condition, the researcher said to the children towards the end of the relaxation phase, “Okay, when you are ready, you can close your eyes if you like and just imagine that you are there, what does it look like, where you are? And so on. As stated above, the researcher ensured that the child had at least 4-5 minutes in imagery before the nurse commenced the procedure.

### *Post-Venepuncture Process and Data Collection*

For those children in the imaging conditions, the imagery was brought to a close after the Bandaid® was placed on the child’s arm. These children were asked if they felt as if they were here in the hospital, there, (wherever their imagery was) or in between, a bit there and a bit here. The response was recorded according to the numerical code on the data sheet. At this time the video recording was stopped. In the control and RT conditions, the video recording ceased after the Bandaid® was applied.

Each child was asked to rate how painful the blood test was using the Astra® Pharmaceuticals Pain ruler. Then each child was asked how scary or frightening he or she felt during the procedure. A score was taken, again using Hester’s Poker chip tool adapted for fear. The children also rated how relaxed they felt during the procedure and how much what they felt in their arm bothered them.

All children were then asked about their thoughts during the blood test. Responses were rated as good, bad, or just normal, neither good nor bad. All children were then asked about their feelings during the blood test. Similarly, responses were rated as good, bad or just normal.

By this time, the nurse had left the room to send the blood for analysis. The child’s parent was asked to rate how ‘uptight’ she or he felt the child was on entering the department and again during the blood test. Both of these ratings were on a verbal scale of zero, ‘not at all uptight’, to 10, ‘extremely uptight'. The nurse who performed the procedure also rated how uptight the child was on entering the department and during the blood test on the same verbal scale after the child and parent had left the department.

The videotapes were later analysed independently by the researcher and a Clinical Nurse Specialist in pain management employed by the hospital. Two measures were applied to the video, firstly, the level of involvement in imagery in the RT/GI and GI cases using the Imagery Absorption Scale (IAS) devised by the researcher and, secondly, a measure of distress using the Observational Scale of Behavioural Distress (OSBD) (Jay, Elliott and Caldwell 1983). The scoring of the videos on the IAS and OSBD was the final stage in data collection.

### *Summary*

This chapter outlined the method undertaken in the second study to investigate the effects of imagery, with and without relaxation, and relaxation alone, on the experience associated with venepuncture as a painful medical procedure. A number of measures were taken in this study including self-reports, specific observations of behaviour, and global assessments of the child by parents and nurses. The nature of the research question and the subsidiary questions leading to the hypotheses meant that the number of dependent variables was quite high compared to most other studies and the cartoon study described in Chapter 8. The videorecording of each case meant that the researcher and an independent observer could apply objective measures of distress and imagery absorption at a later time.

CHAPTER 10

# RESULTS: RELAXATION AND IMAGERY STUDY

The previous chapter outlined the hypotheses, measures and method undertaken in the second study. The purpose of this chapter is to present an overview of the sample and the checks for randomisation, to state and clarify the data transformations performed prior to the analyses, and to report the results of the statistical analyses.

## *Overview of the Sample*

One hundred and twenty children aged six to 16 years participated in this study, 52 boys and 68 girls. The mean age was 10 years and nine months (standard deviation, 2 years and 10 months). Of these, 77 percent had previous experience of a venepuncture.

### *Checks on Randomisation*

To confirm that the random allocation of participants to the four experimental conditions had not inadvertently resulted in the unequal distribution of a number of potentially confounding variables, a series of chi-square analyses were performed. These analyses examined the extent to which the gender of participant, the nurse involved in the procedure, the parent present, and previous experience of venepuncture were balanced across the four conditions. The distributions and analyses are tabulated and attached as Appendix E. None of the chi-square analyses was significant. This established that randomisation had been effective.

A one-way ANOVA with the four experimental conditions as the factor and age as the dependent variable did suggest a preponderance of older participants in the control condition, but the effect was insignificant, $F\ (3, 116) = 1.77$, *ns*. Tukey *post hoc* tests gave no indication that the mean age in the Control condition (11.77) differed from the other three conditions: RT (10.53), GI (10.37) and RT/GI (10.33). Nonetheless, given the recognised influence of age on perceptions of fear and pain, the presence of a slightly older control sub-sample was deemed important enough to use age as a covariate when examining the hypotheses. Gender and previous experience of venepuncture (*yes/no*) were also added as covariates despite their even spread across the conditions, given their suggested link with many of the dependent variables (Chambers, Giesbrecht, & Craig 1999; Carr, Lemanek & Armstrong, 1998; Crow, 1993; Dahlquist & Busby, 2002; O'Keeffe, 2001).

### *Preliminary Examination of the Dependent Variables*

During a preliminary examination, the variables were inspected for significant departures from normality. Following Tabachnick and Fidell (2000), variables were subject to transformation where there was any evidence of non-normal distribution, either in the form of significant skew or outliers in the sample as a whole, or within the four experimental conditions. Table 10.1 shows the means and standard deviations of the transformed variables across the whole sample as well as the manner in which they were transformed. The untransformed means and standard deviations for the whole sample are shown in Table F-1 attached in Appendix F. The untransformed (Tables F-2 to F-5) and transformed (Tables F-6 to F-9) means and standard deviations for each of the key dependent variables within the four conditions are also attached in Appendix F.

**Table 10.1**

*Transformed Descriptive Statistics – Whole Sample*

| | Transformation X = Score | N | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Pain | $X^{.4}$ | 118 | 3.32 | 1.58 | .04 | -.27 |
| Fear Pre | $X^{.7}$ | 120 | 1.46 | .78 | -.10 | -.63 |
| Fear Post | $X^{.7}$ | 120 | .94 | .84 | .39 | -.87 |
| Bother | $X^{.8}$ | 119 | 2.69 | 2.05 | .22 | -.99 |
| Valency of thoughts | $X^{.7}$ | 120 | 1.45 | .39 | .15 | -.99 |
| Valency of feelings | $X^{.7}$ | 120 | 1.53 | .37 | -.10 | -.69 |
| Uptight Parent Pre | $X^{.8}$ | 120 | 3.29 | 2.22 | -.19 | -1.34 |
| Uptight Parent Post | $X^{.8}$ | 120 | 2.67 | 1.87 | .25 | -.88 |
| Uptight Nurse Pre | $X^{.8}$ | 120 | 3.15 | 1.59 | -.25 | -.53 |
| Uptight Nurse Post | $X^{.8}$ | 120 | 2.81 | 1.70 | .20 | -.85 |
| Distress - OSBD | $X^{.1}$ | 117 | .46 | .54 | .35 | -1.84 |

Tables 10.2 and 10.3 show the means and standard deviations for the pre-procedural and post-procedural measures across the four conditions. These statistics were calculated using the same transformations listed in Table 10.1

**Table 10.2**

*Descriptive Statistics on Pre-Procedural Transformed Measures According to Condition (n = 30)*

| | **Non-Imaging** | | | | **Imaging** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Non-relaxed (Control)** | | **Relaxed (Relaxation)** | | **Non-relaxed (Imagery)** | | **Relaxed (Relaxation and Imagery)** | |
| | Mean | *(SD)* | Mean | *(SD)* | Mean | *(SD)* | Mean | *(SD)* |
| Fear Pre | 1.33 | (.67) | 1.40 | (.95) | 1.53 | (.86) | 1.57 | (.63) |
| Uptight Parent Pre | 2.81 | (2.25) | 3.17 | (2.21) | 3.29 | (2.38) | 3.88 | (1.98) |
| Uptight Nurse Pre | 2.70 | (1.65) | 3.12 | (1.54) | 3.32 | (1.59) | 3.46 | (1.57) |

**Table 10.3**

*Descriptive Statistics on Post-Procedural Transformed Measures According to Condition (n = 30)*

| | **Non-Imaging** | | | | **Imaging** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Non-relaxed (Control)** | | **Relaxed (Relaxation)** | | **Non-relaxed (Imagery)** | | **Relaxed (Relaxation and Imagery)** | |
| | Mean | *(SD)* | Mean | *(SD)* | Mean | *(SD)* | Mean | *(SD)* |
| Pain | 3.44 | (1.12) | 3.33 | (1.52) | 3.40[a] | (1.66) | 3.10[a] | (1.90) |
| Fear Post | 1.17 | (.84) | .95 | (.97) | 1.00 | (.86) | .65 | (.61) |
| Bother | 3.04 | (1.82) | 2.77 | (1.91) | 2.41[a] | (2.14) | 2.54 | (2.33) |
| Thoughts | 1.70 | (.40) | 1.70 | (.37) | 1.83 | (.35) | 1.78 | (.37) |
| Feelings | 1.59 | (.36) | 1.71 | (.44) | 1.71 | (.30) | 1.72 | (.34) |
| Uptight Parent Post | 2.90 | (1.93) | 2.53 | (1.74) | 2.66 | (1.98) | 2.59 | (1.91) |
| Uptight Nurse Post | 2.81 | (1.78) | 2.71 | (1.45) | 2.90 | (1.85) | 2.82 | (1.74) |
| Distress | .50 | (.54) | .36 | (.52) | .55[b] | (.57) | .44[a] | (.54) |

Notes:

[a]n = 29

[b]n = 28

### ***Preliminary Examination of the Independent Variables***

#### ***Effect of the Manipulations on Relaxation***

To confirm the relaxation manipulation was having the intended effects, a 2 (Relaxation) X 2 (Imaging) ANCOVA was performed on the relaxation scores following transformation to eliminate skew. Age, gender, and previous venepuncture were entered as covariates. The transformed data are shown in Table 10.4. Untransformed means and standard deviations for the relaxation scores on the whole sample and by condition are attached shown in Table G-1 (see Appendix G).

**Table 10.4**

*Descriptive Statistics: Transformed Relaxation Scores across the Four Conditions*

| Condition | n | Mean | *(SD)* |
|---|---|---|---|
| Control | 30 | 2.39 | (.59) |
| Relaxation | 29 | 1.77 | (.62) |
| Imagery | 29 | 2.13 | (.74) |
| Relaxation and Imagery | 30 | 1.87 | (.72) |

As one would expect, children in the two Relaxation conditions (Relaxation and combined Relaxation and Guided Imagery) reported significantly higher relaxation scores than the non-relaxation conditions, $F(1,111) = 15.311$, $p < .001$. There was no significant effect of imagery on relaxation scores, $F(1,111) = .609$, *ns*. There was no interaction between the imagery and relaxation conditions, $F(1,111) = 2.122$, $p = .148$.

#### ***Involvement in Imagery***

The untransformed means and standard deviations for the IAS scores on the combined, and individual imaging conditions are shown in Table H-1 (see Appendix H). To establish if relaxation had any effect on imagery absorption, a comparison of the two imaging conditions, with and without relaxation, with respect to involvement in imagery (IAS score) was performed. There was no significant difference in mean IAS scores between the Imagery (GI) and combined Relaxation and Imagery (RT/GI) conditions. ($M_{GI} = .60$, $M_{RT/GI} = .50$; $t = 1.002$, $df = 52.6$, *ns*).

### *Consideration of Covariates*

In light of previous research and the existence of marginal, although not significantly distorted distribution, age, gender and previous experience of venepuncture were identified for their potentially confounding effects in the main analyses to follow. Prior to these analyses, it was considered useful to determine if any of these potentially confounding variables did affect the key dependent variables. Consequently, the effects of gender and previous venepuncture (yes/no) were examined with a series of ANCOVAs. In each case, the variables not under investigation were entered as covariates in the analyses and all means were adjusted for the covariates. Hierarchical multivariate regression was used to determine any effects of age, as described below.

#### ***Effect of Gender, Previous Venepuncture and Age***

The effect of gender on pre-procedural fear and self-reported pain, approached significance: pre-procedural fear, $F(1, 116) = 3.29$, $p = .07$, $\eta^2 = .03$; pain, $F(1, 114) = 2.72$, $p = .10$, $\eta^2 = .05$. The trends were towards boys reporting less pre-procedural fear ($M_{boys} = 1.32$) and pain ($M_{boys} = 3.06$) than the girls, fear ($M_{\text{girls}} = 1.57$) and pain ($M_{\text{girls}} = 3.52$). Despite the tendency for boys to rate their pre-procedural fear lower than the girls, there was no effect of gender on procedural fear, $F(1, 115) = .63$, *ns.*

The effect of previous venepuncture on pre-procedural fear also approached significance, $F(1, 116) = 2.85$, $p = .09$, $\eta^2 = .02$, with children who had previous venepuncture reporting less pre-procedural fear ($M_{yes} = .40$) than those who had not had a previous venepuncture ($M_{no} = 1.67$). The effect of previous venepuncture on self-reported pain was also significant, ($M_{yes} = 3.15$, $M_{no} = 3.86$), $F(1, 114) = 4.65$, $p = .03$, $\eta^2 = .04$. There was a trend towards an effect of previous venepuncture on procedural fear, ($M_{yes} = .88$, $M_{no} = 1.13$), $F(1, 115) = 2.56$, $p = .11$, $\eta^2 = .02$. These results suggest that previous experience of venepuncture tends to reduce self-reported pain, and fear, before and after the procedure.

The effect of age was examined using a series of hierarchical multivariate regression analyses of pain, pre-procedural fear and procedural fear. In the analyses of pain and pre-procedural fear, gender and previous venepuncture were entered at step one and age was entered at step two. Age added significant predictive capacity in the analysis of both pain, $R^2$ Change = .04, $F(1,114) = 5.44$, $p = .02$, and pre-procedural fear, $R^2$ Change = .08, F(1,116) = 10.50, $p = .002$. In the analysis of procedural fear, age, gender and pre-procedural fear were all entered at stage one, and age added at step two. Age added no predictive capacity when examining procedural fear, $R^2$ Change = .003, $F(1,115) = .47$, *ns*.

In summary, gender, previous experience of venepuncture, and age, were all shown to have some effect on the dependent variables and confirmed their importance as covariates.

### *Relationships between the Dependent Variables*

A series of correlation analyses examined the association between the variables across the entire sample (Table 10.5). The strongest correlation across the entire sample was between pain and bother ($r = .75$). Pain also correlated strongly with procedural fear ($r = .66$), the parents' ($r = .51$), and the nurses' ($r = .50$) rating of how uptight the child was during the procedure. Pain also correlated strongly with valency of feelings ($r = .50$).

Apart from the strong correlation between bother and pain, bother also correlated strongly with procedural fear ($r = .54$), parent ($r = .52$), and nurse ($r = .50$) uptight ratings. Bother also correlated strongly with valency of feelings ($r = .50$), thoughts ($r = .50$), and observed distress ($r = .45$).

The strongest correlations with thoughts were fear ($r = .54$), and bother ($r = .50$), followed by parents' uptight rating ($r = .48$), valency of feelings ($r = .46$), and pain ($r = .45$). Pain ($r = .50$), fear ($r = .50$) and bother ($r = .50$) all correlated strongly with feelings.

The correlations represented in Table 10.5 were examined for themes using factor analysis. The 11 variables were entered into a principal components analysis. Suitability of this data set for factor analysis involved a number of standard considerations. Firstly, regarding sample size, opinions and recommendations vary. Tabachnick and Fidell (2000) favour 300 cases for factor analysis. However, as Pallant

(2001) points out, Tabachnick and Fidell concede that a smaller sample size is likely to be adequate if the correlations are strong and reliable and the analysis reveals only a small number of factors. Certainly, this was the case in the factor analyses described here. The majority of the correlation coefficients are above .3 and significant at the .01 level. Nunnally (cited by Pallant, 2001) points out that the ratio of subjects to items is an alternative way of approaching the issue of sample size. The recommendation is 10 cases for every item to be factor analysed. Applying this criterion to the present study would suggest a minimum sample size of 110, although 5 cases for each item (55 in this study) is also suggested as adequate in most cases (Pallant, 2001). The issue of sample size is acknowledged as a potential limitation in the analyses, however, given the strength of the correlations, the small number of factors computed, and the acceptable ratio of items to cases, factor analysis was deemed a reasonable way of analysing the relationships between the variables.

**Table 10.5**

*Correlations: Whole Sample*

| | | Pain | Fear Pre | Fear Post | Bother | Valency of Thoughts | Valency of Feelings | Parent Pre | Parent Post | Nurse Pre | Nurse Post | Distress |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pain | *r* | 1.000 | .418[a] | .655[a] | .751[a] | .454[a] | .502[a] | .171 | .509[a] | .314[a] | .498[a] | .447[a] |
| | N | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 118 | 115 |
| Fear Pre | *r* | | 1.000 | .549[a] | .337[a] | .262[a] | .285[a] | .361[a] | .387[a] | .518[a] | .320[a] | .432[a] |
| | N | | 120 | 120 | 119 | 120 | 120 | 120 | 120 | 120 | 120 | 117 |
| Fear Post | *r* | | | 1.000 | .540[a] | .538[a] | .501[a] | .159 | .549[a] | .302[a] | .440[a] | .335[a] |
| | N | | | 120 | 119 | 120 | 120 | 120 | 120 | 120 | 120 | 117 |
| Bother | *r* | | | | 1.000 | .495[a] | .500[a] | .264[a] | .522[a] | .411[a] | .498[a] | .452[a] |
| | N | | | | 119 | 119 | 119 | 119 | 119 | 119 | 119 | 116 |
| Thoughts | *r* | | | | | 1.000 | .463[a] | .193 | .482[a] | .208 | .256[a] | .261[a] |
| | N | | | | | 120 | 120 | 120 | 120 | 120 | 120 | 117 |
| Feelings | *r* | | | | | | 1.000 | .205 | .387[a] | .273[a] | .261[a] | .314[a] |
| | N | | | | | | 120 | 120 | 120 | 120 | 120 | 117 |
| Parent Pre | *r* | | | | | | | 1.000 | .423[a] | .472[a] | .197 | .225 |
| | N | | | | | | | 120 | 120 | 120 | 120 | 117 |
| Parent Post | *r* | | | | | | | | 1.000 | .424[a] | .615[a] | .360[a] |
| | N | | | | | | | | 120 | 120 | 120 | 117 |
| Nurse Pre | *r* | | | | | | | | | 1.000 | .611[a] | .379[a] |
| | N | | | | | | | | | 120 | 120 | 117 |
| Nurse Post | *r* | | | | | | | | | | 1.000 | .405[a] |
| | N | | | | | | | | | | 120 | 117 |
| Distress | *r* | | | | | | | | | | | 1.000 |
| | N | | | | | | | | | | | 117 |

Note:
[a]Correlation is significant at the 0.01 level (2-tailed).

Principal components analysis revealed two factors with eigenvalues greater than 1. Varimax rotation produced the two factor solutions presented in Table 10.6. The two factor solution accounted for a total of 50.37 per cent of the variance, with Factor 1 contributing 29.39 per cent and Factor 2 contributing 20.98 per cent.

**Table 10.6**

*Varimax Rotation of Two Factor Solution for Whole Sample Correlations*

| Dependent Variable | Factor 1<br>Procedural Pain Experience | Factor 2<br>Pre-procedural Emotional State |
|---|---|---|
| Pain | .81 | .24 |
| Fear Post | .75 | .25 |
| Bother | .72 | .33 |
| Thoughts | .61 | |
| Feelings | .58 | |
| Parent Post | .55 | .48 |
| Nurse Pre | | .91 |
| Nurse Post | .40 | .56 |
| Fear Pre | .36 | .51 |
| Parent Pre | | .45 |
| Distress | .39 | .40 |
| % of variance explained | 29.39 | 20.98 |

Both factors contain a number of strong loadings of the dependent variables. Of the seven variables loading on the Procedural Pain Experience Factor, the first five are self-reports, and the last two are parent, and nurse ratings of how uptight the child was during the procedure. The variables in the second factor load on the nurses' assessment of how uptight the child was before the procedure. Clustered around this are the other two pre-procedural ratings – the child's pre-procedural fear and the parents' rating of how uptight the child was before the procedure. The nurses' post-procedural rating also appears here. Overall, the second factor represents the child's Pre-procedural Emotional State. Together, the two factors present a logical summary of the relationships between the measures across the whole sample. The main factor is the experience of procedural pain for the child and the second factor, a construct of the child's emotional state immediately before the procedure.

Subject scores on each of the two factors were saved and subsequently both sets of scores were examined with a MANCOVA using a 2 x (Imaging – Non-imaging), 2 x (Relaxation – Non-relaxation) design. Table 10.7 shows the means and standard deviations of the two factor scores across the conditions.

**Table 10.7**

*Two Factor Scores: Means and Standard Deviations According to Condition*

| | Condition Non-imaging – Imaging | Condition Non-relaxation – Relaxation | Mean | *(SD)* | n |
|---|---|---|---|---|---|
| Procedural Pain Experience Score | Non-Imaging | Non-Relaxed | .35 | (.83) | 30 |
| | | Relaxed | .03 | (1.11) | 30 |
| | | Total | .19 | (.98) | 60 |
| | Imaging | Non-Relaxed | -.21 | (.81) | 27 |
| | | Relaxed | -.23 | (1.05) | 28 |
| | | Total | -.22 | (.93) | 55 |
| | Total | Non-Relaxed | .08 | (.86) | 57 |
| | | Relaxed | -.10 | (1.08) | 58 |
| | | Total | -.01 | (.98) | 115 |
| Pre-procedural Emotional State Score | Non-Imaging | Non-Relaxed | -.30 | (1.06) | 30 |
| | | Relaxed | -.11 | (.87) | 30 |
| | | Total | -.21 | (.96) | 60 |
| | Imaging | Non-Relaxed | .17 | (1.01) | 27 |
| | | Relaxed | .31 | (.96) | 28 |
| | | Total | .24 | (.98) | 55 |
| | Total | Non-Relaxed | -.08 | (1.06) | 57 |
| | | Relaxed | .10 | (.93) | 58 |
| | | Total | .01 | (.99) | 115 |

The MANCOVA, with age, gender and previous experience of venepuncture as the covariates, revealed a significant multivariate effect of imagery in reducing the Pain Experience Score (Factor 1.), $F(1,115) = 6.80$, $p = .01$, $\eta^2 = .06$, and conversely, an increase in the Pre-procedural Emotional State score (Factor 2), $F(1,115) = 5.51$, $p = .02$, $\eta^2 = .05$. Relaxation had no effect, Pain Experience Score, $F(1,115) = 1.57$, *ns,* Pre-procedural Emotional State Score, $F(1,115) = .32$, ns. There was no interaction between imagery and relaxation on the Pain Experience Score, $F(1,115) = .65$, *ns*, nor on the Pre-procedural Emotional State Score, $F(1,115) = .03$, *ns.*

In summary, the Pain Experience Factor Score was significantly lower in the imaging, compared to the non-imaging conditions. Curiously, the Pre-procedural Emotional State Score was higher in the imaging conditions – possible explanations for this finding will be discussed in the next chapter. The relaxation conditions had no effect on the pain experience factor score or the pre-procedural emotional state score.

### ***Dependent Variable Analyses: Effects of Imaging and Relaxation Conditions on the Dependent Variables***

In light of the significant positive effect of the manipulations on the second factor score, pre-procedural fear, and the pre-procedural uptight ratings were added to age, gender and previous venepuncture as the covariates in the follow-up univariate ANCOVAs to investigate the effects of the manipulations on each of the dependent variables.

The follow-up univariate ANCOVAs revealed a slight trend towards an effect of imagery on pain, $F(1,105) = 2.01$, $p = .16$, $\eta^2 = .02$, no effect of relaxation, $F(1,105) = 1.31$, *ns,* nor any interaction between imagery and relaxation, $F(1,105) = .01$, *ns*.

Self-reported procedural fear was significantly lower in the imaging conditions, $F(1,105) = 8.41$, $p = .005$, $\eta^2 = .07$, similarly, the relaxation conditions showed a significant reduction in procedural fear, $F(1,105) = 6.05$, $p = .02$, $\eta^2 = .05$,. There was no interaction between imagery and relaxation, $F(1,105) = .29$, *ns*. Planned comparisons showed that the combined intervention (relaxation and imagery) elicited significantly less procedural fear than either relaxation alone (contrast estimate, .412, $p = .02$) or imagery alone (contrast estimate, .413, $p = .02$).

Each child was asked immediately after the procedure to rate how much the procedure bothered him or her. The imaging conditions had an effect on bother, $F(1,105) = 4.81$, $p = .03$, $\eta^2 = .04$, but the relaxation conditions had no effect, $F(1,105) = .32$, *ns*, nor was there any interaction, $F(1,105) = .96$, *ns*.

The imaging conditions had a positive effect on the valency of thoughts, $F(1,105) = 7.56$, $p = .007$, $\eta^2 = .07$, and a positive effect on feelings, $F(1,105) = 3.80$, $p = .05$, $\eta^2 = .04$. Relaxation did not affect thoughts, $F(1,105) = .37$, *ns*, but there was a slight trend towards an effect on feelings, $F(1,105) = 2.07$, $p = .15$, $\eta^2 = .02$. There was no interaction between imagery and relaxation with regard to thoughts, $F(1,105) = .91$, *ns,* or feelings, $F(1,105) = 1.62$, *ns*.

There was no effect of imagery on distress, $F(1,105) = .16$, *ns*, but there was an effect of relaxation, $F(1,105) = 3.62$, $p = .06$, $\eta^2 = .03$. There was no interaction between imagery and relaxation: $F(1,105) = .59$, *ns*.

After the procedure, parents and nurses were each asked to rate how 'uptight' the child was. Imagery had an effect on parent ratings, $F(1,105) = 4.19$, $p = .04$, $\eta^2 = .04$, but not on nurse ratings, $F(1,105) = .73$, *ns*. Relaxation had no effect on parent ratings, $F(1,105) = 1.60$, *ns*, nor on nurse ratings, $F(1,105) = .59$, *ns* $\eta^2 = .02$. There was no interaction between imagery and relaxation; parent ratings, $F(1,105) = 1.30$, *ns*; nurse ratings $F(1,105) = .89$, *ns*.

In summary, the follow-up ANCOVAs on the post-procedural dependent variables demonstrated only a slight trend towards a reduction in self-reported pain but significant effects on most of the related variables including fear, bother, valency of thoughts and feelings and the parent post-procedural uptight rating. Relaxation reduced procedural fear and showed a tendency towards a positive effect on valency of feelings.

### *Correlations in the Non-imaging and Imaging Conditions*

It was anticipated that the imaging conditions would alter the extent to which pain and the other dependent variables, fear, bother, thoughts, feelings, parent and nurse uptight ratings and distress were related to each other. The correlations between the dependent variables in the non-imaging and imaging conditions are shown in Tables I-1 and I-2 (see Appendix I). The correlation between pain and procedural fear in the imaging ($r = .54$) conditions was less than the same correlation ($r = .81$) in the non-imaging conditions. The correlation between fear and bother was also weaker in the imaging ($r = .42$) compared to the non-imaging ($r = .66$) conditions, as were the correlations between pain and thoughts (imaging, $r = .38$, non-imaging, $r = .41$) and pain and feelings (imaging, $r = .53$, non-imaging, $r = .62$). A strong and significant correlation between pain and bother was common to the imaging ($r = .77$) and non-imaging ($r = .73$) conditions.

In order to focus on the effect of imagery, repeated factor analyses were performed on the relationships between the dependent variables in the non-imaging and in the imaging conditions. It was recognized that the small sample sizes render the factor loadings unstable but given the continued high values of the correlations (Tables H-1 and H-2) and the foregoing discussion of sample size, it was seen to be worth exploring. In these analyses, only the eight post-procedural measures were entered as only these were subject to the effects of the imagery manipulation. Tables 10.8 and 10.9 show the factor solutions for the non-imaging and imaging conditions.

**Table 10.8**

*Varimax Rotation of Single Factor Solution for Non-imaging Conditions*

| | Factor 1 |
|---|---|
| Dependent Variable | Procedural Pain Experience |
| Pain | .88 |
| Fear Post | .86 |
| Bother | .79 |
| Feelings | .70 |
| Thoughts | .69 |
| Parent Post | .68 |
| Nurse Post | .51 |
| Distress | .46 |
| % of variance explained | 50.31 |

**Table 10.9**

*Varimax Rotation of Single Factor Solution for the Imaging Conditions*

| | Factor 1 |
|---|---|
| Dependent Variable | Impact of Painful Procedure |
| Bother | .88 |
| Pain | .86 |
| Parent Post | .79 |
| Nurse post | .70 |
| Fear Post | .69 |
| Distress | .68 |
| Thoughts | .51 |
| Feelings | .46 |
| % of variance explained | 46.29 |

Principal components analysis on the variables in the non-imaging conditions revealed one factor with an eigenvalue greater than 1. Varimax rotation produced the single factor solution presented in Table 10.8 The single factor solution accounted for 50.31 per cent of the variance.

As was the case in the whole sample factor analysis, this factor is best described as the Procedural Pain Experience. The variable with the highest loading is pain, closely followed by the post procedural measure of fear during the procedure and then bother. A cluster of feelings and thoughts with the parent's rating of how uptight the child was during the procedure follows the top three.

Principal components analysis of the dependent variables in the imaging conditions also revealed one factor with an eigenvalue greater than 1. Varimax rotation produced the single factor solution presented in Table 10.9. The single factor solution accounted for 46.29 per cent of the variance.

The factor analysis in the imaging conditions produced a shift in the top-loading variable from pain to bother, and fear dropped to the fifth position. At the same time, parent and nurse ratings of how uptight the child was during the procedure escalated into the cluster of top-loading variables. This pattern represents a number of subtle changes in the relationships between the variables in the imaging conditions. The emphasis on bother, coupled with inclusion of the parent and nurse uptight ratings suggests that this factor might relate to the impact of the painful procedure on the child.

### ***Post Hoc Analyses: Effects of High versus Low Involvement in Imagery on the Dependent Variables***

The Imagery Absorption Scale (IAS) outlined in Chapter 9 was developed to facilitate a *post hoc* analysis of the effect of high versus low involvement in imagery on the dependent variables. The scale was applied to the videorecorded cases of children in the imagery conditions; the maximum possible score was 12. The median (IAS = 9) split created two roughly equal groups who varied in their observed involvement in imagery. High involvement in imagery was defined as an IAS score of 9 to 12 ($n$ =

33). The remainder (IAS score 1-8) constituted intermittent to low involvement in imagery ($n$ = 27). Using this classification as a quasi-experimental independent variable, the effects of high versus low involvement in imagery and the relaxation – non-relaxation manipulations on the dependent variables were analysed. In these analyses, age, gender and previous experience of venepuncture were always entered as covariates. Where the dependent variable had a pre-procedural measure (fear and uptight ratings), these were also entered in the analyses as covariates. The results of the analyses according to high-low involvement in imagery are presented in the same order as before: pain, fear, bother, valency of thoughts and feelings, distress, and parent and nurse ratings of how uptight the child was during the procedure

The means and standard deviations of the dependent variables in Table 10.10 relate to the imaging conditions only. The imaging conditions are first divided into imagery without relaxation (non-relaxed) and imagery with relaxation (relaxed). Each of these groupings is then divided into low and high involvement in imagery as measured by the Imagery Absorption Scale (IAS). Again, the means and standard deviations are based on the same transformations listed earlier in Table 10.1.

**Table 10.10**

*Descriptive Statistics on Transformed Measures according to Low and High Involvement in Imagery in non-relaxed and relaxed imaging conditions.*

| | **Non-Relaxed** | | | | **Relaxed** | | | |
|---|---|---|---|---|---|---|---|---|
| | Low IAS | | High IAS | | Low IAS | | High IAS | |
| | Mean (n = 14) | *(SD)* | Mean (n = 16) | *(SD)* | Mean (n = 13) | *(SD)* | Mean (n = 17) | *(SD)* |
| Pain | 4.09 [b] | (1.85) | 2.84 | (1.28) | 4.21 | (1.58) | 2.19[c] | (1.68) |
| Fear Post | 1.10 | (.97) | .91 | (.76) | 1.04 | (.54) | .35 | (.49) |
| Bother | 3.45[b] | (2.32) | 1.55 | (1.57) | 4.28 | (2.12) | 1.21 | (1.46) |
| Thoughts | 1.44 | (.37) | 1.31 | (.38) | 1.65 | (.37) | 1.26 | (.32) |
| Feelings | 1.57 | (.28) | 1.46 | (.35) | 1.61 | (.33) | 1.40 | (.37) |
| Uptight Parent Post | 3.77 | (2.00) | 1.69 | (1.41) | 4.08 | (1.52) | 1.46 | (1.31) |
| Uptight Nurse Post | 4.16 | (1.59) | 1.80 | (1.31) | 4.01 | (1.34) | 1.93 | (1.48) |
| Distress | .85[a] | (.52) | .32 | (.49) | .91 | (.41) | .06[c] | (.26) |

Notes:

[a]n = 12

[b]n = 13

[c]n = 16

High involvement in imagery had a significant effect on pain, $F(1,51) = 10.53$, $p = .002$, $\eta^2 = .17$, but not relaxation, $F(1,51) = 1.40$, *ns*. There was no interaction between imagery and relaxation, $F(1,51) = .31$, *ns*. Self-reported procedural fear was not influenced by high – low involvement in imagery, $F(1,52) = .83$, *ns*. Relaxation produced a reduction in procedural fear, $F(1,52) = 8.46$, $p = .005$, $\eta^2 = .14$. In the analysis there was no interaction between imagery and relaxation, $F(1,52) = .96$, *ns*. High involvement in imagery had an effect on self-report of bother, $F(1,52) = 20.10$, $p < .001$, $\eta^2 = ..29$. Relaxation showed no effect on bother, $F(1,52) = .03$, *ns*, and there was no interaction between high-low involvement in imagery and relaxation, $F(1,52) = 1.01$, *ns*.

The effect of high involvement in imagery on valency of thoughts was significant, $F(1,53) = 9.01$, $p = .004$, $\eta^2 = .15$, and there was a trend towards an effect of imagery on valency of feelings, $F(1,53) = 2.71$, $p = .11$, $\eta^2 = .05$. There was no effect of relaxation on valency of thoughts, $F(1,53) = .91$, nor valency of feelings, $F(1,53) = .08$, *ns*. There was trend towards an interaction between high-low involvement in imagery and relaxation for thoughts, $F(1,53) = 2.54$, $p = .12$, $\eta^2 = .05$; but not for feelings, $F(1,53) = .24$, *ns*.

High involvement in imagery had an effect on distress, $F(1,50) = 30.86$, $p < .001$, $\eta^2 = .38$, but there was no effect of relaxation, $F(1,50) = .61$, *ns*,. There was no interaction between high – low involvement in imagery and relaxation: $F(1,50) = 1.45$, *ns*.

There was an effect of high involvement in imagery on both parent, and nurse ratings of how uptight the child was during the procedure: parent ratings, $F(1,52) = 29.38$, $p < .001$, $\eta^2 = .36$; nurse ratings, $F(1,52) = 15.00$, $p < .001$, $\eta^2 = .22$. No significant effect of relaxation on parent or nurse ratings was found: parent, $F(1,52) = .50$, *ns*; nurse, $F(1,52) = .44$, *ns*, nor any interaction between imagery and relaxation; parent ratings, $F(1,52) = .06$, *ns*; nurse ratings $F(1,52) = .82$, *ns*.

In summary, within the two imaging conditions, the children who had high involvement in their imagery reported significantly lower pain and scored lower on all related dependent variables except fear. High involvement in imagery also had a positive effect on thoughts and a tendency towards positive feelings.

### *Summary*

The results of the inferential analyses were presented in this chapter. Prior to the analyses, three general issues were considered. These were checks for randomisation, departures from normality, and consideration of covariates. Randomisation was effective, although, children in the control conditions were slightly, but not significantly, older than the children in the other conditions. Consideration of covariates was undertaken in two stages. The first set, gender, previous venepuncture and age showed some effects and were subsequently employed as covariates in all analyses. The second set of covariates emerged from the factor analysis on the relationships between the dependent variables. The two factor solution clearly delineated the Pre-procedural Emotional State as a factor distinct from the Procedural

Pain Experience. The imaging conditions reduced the composite ‘Procedural Pain Experience Score’ but oddly, the ‘Pre-procedural Emotional State Score’ was higher in the imaging compared to non-imaging conditions, which is why the pre-procedural variables were then entered together with age, gender and previous venepuncture in the follow-up analyses. The subsequent analyses of the effects of the imaging and relaxation conditions on the dependent variables showed a slight effect of the imaging conditions on pain and significant effects on most of the related variables including bother, fear, valency of thoughts and feelings and uptight ratings. Relaxation reduced procedural fear and tended to show a positive effect on the valency of feelings.

The trend observed in the correlations was for weaker relationships in the imaging compared to non-imaging conditions. Factor analysis on the non-imaging conditions produced only the Procedural Pain Experience factor while factor analysis on the imaging conditions produced a shift to, ‘Impact of the Painful Procedure on the Child’. The effects on the dependent variables within the imaging conditions were further explored in a *post hoc* analysis of the effect of high versus low involvement in imagery. In this analysis, pain and all of the dependent variables except fear were significantly lower in the children who engaged in imagery as depicted by the high IAS score. The significance and implications of the results presented in Chapter 8 from the cartoon study together with the results in this chapter will now be discussed in detail in the next chapter.

# CHAPTER 11

## DISCUSSION

> The results of the second study are discussed in this chapter in relation to the findings of the first study, the literature reviewed, and the theoretical framework that emerged in the preliminary chapters. The aim of this chapter is to propose an empirically and theoretically based model that will account for the effects of distraction, relaxation and imagery on procedural pain and fear in children.

Two studies of moderate sample sizes were undertaken in this thesis to investigate the effects of distraction, relaxation and imagery on procedural pain and fear in children undergoing a standard medical procedure. A number of environmental parameters were controlled and the participants, although necessarily a convenience sample, were randomly allocated to the experimental conditions. The first study investigated the effects of a single distraction intervention in the form of a cartoon video rather than a range of distractors. In this way, the manipulation was easily standardised. The second study was more complex in that the manipulations under investigation were relaxation and imagery as combined and independent interventions. The manipulation checks confirmed that the interventions, relaxation and imagery, were successful and this facilitated a deep level of investigation into their effects on a broad range of self-report and observational measures that involved the parents, the nurses who performed the procedures, an independent observer, and lastly, the researcher. In each study, the painful procedure was venepuncture, and both studies were undertaken in the same acute clinical setting. This meant that the study populations, technical aspects of the procedure, and environmental conditions were similar in both studies, which in terms of this discussion, is important because the findings can be compared with confidence.

The first part of this chapter is divided into two sections. The first section focuses on the overall effects of distraction, imagery and relaxation and the *post hoc* analyses of the effects of high versus low involvement in imagery on the dependent variables. The second section reverses the perspective and focuses on the dependent variables and how their interrelationships were affected by the interventions. The remainder of the chapter is devoted to the development of a model that accounts for the effects of distraction, relaxation and imagery, on procedural fear and pain.

### *Overview of the Success and Failure of the Distraction, Imaging, and Relaxation Conditions*

The three interventions under investigation, distraction, relaxation and imagery, showed similarities and some differences in terms of their effects on procedural pain and fear. This overview will compare and contrast the effects of the interventions on fear and pain, and will be followed by a close examination of the effects of distraction relaxation and imagery on the range of dependent variables in the second study.

#### *Effects of Distraction, Relaxation and Imagery on Fear and Pain*

The distraction intervention in the first study had a clear and obvious effect of reducing procedural fear in children aged 5 to 16 years. In the second study, both relaxation and imagery reduced procedural fear, and when the two interventions were combined, the effect was even greater. Pain however proved to be more resistant to the effects of the interventions. In the first study, distraction had an effect on pain that approached significance. In the second study, relaxation did not reduce pain, and imagery only had an effect when children who had a high level of involvement were compared to those who had a low level of involvement. There was, however, a significant effect of the imaging conditions on the composite Procedural Pain Experience factor score. This score was generated from a factor analysis of the dependent variables.

Immediately it appears that of the two main constructs under investigation, fear and pain, pain is more resistant to the effects of relaxation, distraction and imagery. At first glance, each of these interventions is different to the others, however, there are points of similarity and contrast in terms of their social and psychological characteristics, capacity to involve, and impact on the child in the procedural setting. These characteristics are worth exploring in the light of the differential effects of these interventions on fear and pain.

The distraction intervention in this study was a cartoon playing on television. This presented the child with two options, to focus attention on the cartoon, or to focus attention on the elements of the procedure. The degree of social involvement and interaction with the child was low compared to say blowing bubbles, or engaging the child in a story that unfolds in a pop-up book. In this sense, the child is more of a recipient than a participant, in relation to the intervention. As a recipient, the child may feel a sense of isolation in an environment that is unfamiliar and threatening. However, a cartoon is something that is likely to be familiar and in a way, ‘a bit out of place’, given the typical clinical reality of a procedure room. The sight and sound of a cartoon in this setting could be unexpected and even surprising. The efficacy of a distraction is dependent upon how it is construed. If the child passively construes the cartoon playing: *it is there, I know it is on the television*; and actively construes the procedure: *right now, what they are doing to my arm is more important than that stupid cartoon playing*, then as a distraction, the cartoon will fail. The nurse might try to direct the child’s attention to the cartoon, and for some children, that might help, but for others, the cartoon is a story that cannot compete with what is unfolding in the procedure room. The results show however that the cartoon condition reduced fear and produced a trend towards lower self-report of pain. This would suggest that many children chose to actively construe the cartoon and in so doing, passively construed the procedural reality, and let it fade.

The relaxation intervention has some similarities with distraction but differs particularly at the level of social interaction. In common with distraction, the relaxation exercise presented the child with two options: to focus on relaxing, or to focus on the elements of the procedure. However, unlike the cartoon distractor, where the child’s attention is directed to something ‘out there’, the relaxation exercise directed the child’s attention within. There is an element of distraction in this because the child’s attention is directed away from the physical aspects of the procedure to a focussed sense of self in a relaxing manner. The striking differences between relaxation and distraction as interventions include the participatory nature of the child’s involvement, and the communication between the person conducting the relaxation, and the child. When a child engages in a relaxation exercise, she is an active participant, rather than being an observer, for example, when watching a cartoon on a television. As a participant, the child engages with the person who is directing the relaxation exercise. The flow of communication tends to be one way, that is, from the clinician to the child, but it is not as unidirectional as watching a cartoon. Furthermore, in using relaxation with a child, the person interacting with the child is supportive and calm, and could be construed as a 'good guy', while the nurse or the doctor performing the procedure is the 'bad guy'. In this study, the relaxation intervention had a significant effect on fear but not pain, which suggests that although the sensation of pain was not affected, having something to do, to focus on, perhaps the feeling of being relaxed, and being with a supportive person, made the experience less frightening.

The guided imagery intervention combines the attention shift in distraction with the supportive and communicative elements of the relaxation intervention. When engaging in imagery, the child's attention is directed firstly inward, similar to relaxation, but then the child constructs her own story, and furthermore, communicates her story to a guide who, demonstrably, is very interested in what is unfolding. The level of interaction with the guide is much greater in imagery than relaxation. In fact, the flow of communication is more from the child to the guide. In this way, the child is not only a participant; the child is in control and is the centre of her constructed reality. The child, in a distraction or relaxation intervention, is, at a most basic level, a listener, in imagery, the child is a speaker, and everyone present, is the audience. This is a complete turn around in the typical communication dynamics in a procedure room, where the child is usually told what to, and what not to do, by everyone present. Even in distraction and relaxation techniques, people tell the child what to, and what not, to do. In imagery, there is an element of instruction from the guide but a 'guide and be guided approach' ensures that the locus of control is with the child. An important difference between imagery and distraction and relaxation is the extent to which the child can construct her own story, a reality that is inconsistent with the procedural reality. Certainly, children will actively construct some distraction techniques in a personal and meaningful manner rather simply being a passive observer, but in imagery, there is full opportunity for the child to actively construct her own reality, and in so doing, to let the procedural reality slip away.

In the second study, the whole sample factor analysis of dependent measures produced two distinct factors, which represented the Procedural Pain Experience and Pre-procedural Emotional State. Imagery significantly reduced the Procedural Pain

Experience Score. It is worth pausing for a moment to reflect on what the first factor, the child's Procedural Pain Experience, actually means: it represents a holistic view of the pain experience for the child. The three top loading variables (all self-report), which could be thought of, as 'the big three' of procedural pain, were *pain*, *procedural fear* and *bother*, in that order. The 'big three' were closely followed by valency of thoughts and feelings (also self-report). This cluster of variables aptly represents the experience of procedural pain for a child, 'It hurts, I'm afraid, and I am bothered, my thoughts are negative, as are my feelings'. In terms of procedural pain, as suggested earlier, the word 'unpleasant' in the IASP definition of pain is inadequate. The 'big three', pain, fear and bother, together with negative thoughts and feelings, are consistent with the affective descriptors that children use to describe severe pain – terrifying, torturing, killing, deadly, as identified by Tesler et al. (1989).

It is interesting to note that this 'children's pain experience measure' is not only a composite of distinct variables, the variables were measured using a variety of tools, and yet, they converge on a single factor. It is not as if the children just repeatedly reported much the same thing on one measure. Separate visual analogue scales were used to measure pain and bother; fear was measured with a completely different tool; the Poker Chip Tool, and valency of thoughts and feelings was obtained with a verbal rating scale. This 'Procedural Pain Experience' factor emerged as a factor quite distinct from the second factor, the child's Pre-procedural Emotional State.

The *post hoc* analysis concentrated on the effects of on high versus low involvement in imagery. Comparison of high and low involvement in imagery groups reproduced the whole sample imaging versus non-imaging findings but in this analysis, pain was significantly lower in the children who scored high on the IAS, but fear was not affected. It is possible that during the procedure it was the pain that the children experienced that determined their level of imagery absorption rather than the reverse. Such is the nature of *post hoc* analyses. While it is argued that the reason that children who had high involvement in imagery would score low on pain and the related variables was their involvement in imagery, the assumptive nature of the argument is acknowledged.

Overall, the imaging conditions had a significant of fear, and pain was significantly lower in the children who had high involvement in imagery. It appears safe to conclude, therefore, that imagery as opposed to relaxation and probably distraction, will lead to a reduction in the pain experienced by children when that pain is defined in terms of both its sensory and emotional components.

### *Relationships between Pain, Fear, Bother, Thoughts, Feelings, Parent and Nurse Uptight Ratings and Observed Distress and the Effects of Relaxation and Imagery.*

As discussed in the previous section, the factor analysis of the dependent variables across the whole sample revealed two factors: the Procedural Pain Experience, and the child's Pre-procedural Emotional State. However, separate factor analyses of the non-imaging and imaging conditions revealed slightly different single factor solutions. In the case of the non-imaging conditions, the single factor was similar to the first factor revealed in the analysis of the whole sample. The most important variable was self reported pain. The factor analysis measures in the imaging conditions also produced a single factor solution, but in this analysis, the top-loading variable was bother. Concern about the possible effect of sample size on the stability of these analyses is acknowledged but the shift from pain to bother in the imaging conditions is interesting. The single factor solution in the imaging conditions is more related to the 'Impact of the Procedure on the Child' with 'bother' and parent and nurse ratings of how 'uptight' the child was during the procedure featuring amongst the top-loading variables. Pain is there of course because pain, or lack of it, is part of the impact on the child. Clearly, the parents and nurses could relate to whether the procedure bothered, or did not bother the child in the imaging conditions but less so in the non-imaging conditions. Parent and nurse uptight ratings, and the observational measure of distress all correlated strongly with bother in the imaging conditions but intriguingly, the same correlations were weaker in the non-imaging conditions. Apart from the shift from pain (non-imaging factor analysis), to bother (imaging factor analysis), fear featured amongst the top-loading variables in the non-imaging conditions but dropped considerably in the imaging factor analysis. There is no simple explanation for these findings. The child's *overt* reaction to the procedure could be a component of the degree to which the pain *bothered* the child. Certainly, the distress score is simply based on the number of times particular behaviours are observed, and nothing else, whereas pain and fear are more subjective and less easily identified by an observer. The emphasis on ‘bother’ coupled with pain, as components of the ‘Impact on the Child’ factor also suggests that in the imaging conditions, the two variables change together rather than the dissociative notion that the child can still feel the pain but is not bothered by it. The suggestion here is that in imagery, the child is less bothered, and appears less uptight but what the child feels, is not the same as the usual ‘pain experience’ (the factor identified in the non-imaging and whole sample analyses). The ultimate goal of this discussion is to propose how this can happen in imagery and in certain types of distraction.

Turning from the factor analyses to the individual dependent variables, the strongest correlation across the entire sample was between pain and bother. Pain also correlated strongly, as one would expect, with procedural fear, procedural uptight ratings, distress, negative feelings and thoughts. In this study, the emphasis in the pain measure was on the ‘hurty bit’ – how much it hurt in the child’s arm during the blood test. This was an attempt to focus the measure on the sensory aspect of the pain, using simple language. The other measures related to emotion (fear and feelings), affect (uptight), cognition (thoughts) and behaviour (Observational Scale of Behavioral Distress - OSBD). The significant positive correlation between pain and the other measures reflect the complexity of procedural pain, the strong association between sensation and emotion, and highlights these as possible targets for psychological interventions. However, it remains that out of the ‘ouch’ and the fear, the ouch is the more difficult to modulate.

Fear is an enormously important aspect of procedural pain, for the child, and the health professional. Interestingly, the highest correlation with pre-procedural fear across all participants was procedural fear. While some children may not be particularly frightened before the procedure, then frightened during the procedure, generally, those children who are frightened before will be frightened during the procedure, and if not frightened before, they tend not be frightened during the procedure – these represent the strong correlation between pre-procedural and procedural fear. Other significant correlations with pre-fear were pain, distress and the uptight ratings of the nurses and parents. All of these relationships reflect the link between pre-procedural fear and the intensity of the pain experience. Likewise, procedural fear correlated strongly with pain, bother, nurse and parent procedural uptight ratings and the valency of the child's thoughts and feelings.

Fear was measured before randomly allocating a child to a condition, and again immediately following the procedure. The post-procedural fear score related to how scary or frightening it was for the child during the procedure. Although the timing of the measure was after the procedure, the score relates to fear during the procedure.

Both relaxation and imagery had a significant effect on fear, as did distraction in the first study. Fear is certainly a factor that impacts heavily on the child's procedural pain experience. Fear, or its biomedical approximation, anxiety, has long been considered an important factor in procedural pain (Jay et al., 1987, 1991; Kuttner, 1989; Pederson, 1995; Zeltzer & LeBaron, 1982). As was outlined in Chapter 5, fear is preferred over anxiety for a range of reasons, not the least of which was that identifying fear in a child demands attention, whereas 'anxiety' tends to project the 'problem' onto the child. Fear is not only an obvious target of psychological intervention, in both studies, as reported elsewhere (Broome et al., 1988; Carlson, Broome & Vessy, 2000; Kuttner, 1986, 1998), it is a target that is susceptible to psychological intervention.

Despite the relative ease with which fear can be reduced, within the biomedical paradigm the focus is still on anxiety, and as a medical diagnosis, anxiety is 'treated' pharmacologically. For example, Ljungman, Kreuger, Andréasson, Gordh, and Sörensen (2000) reported reduced anxiety but not pain, with intranasal midazolam (a short acting central nervous system depressant) prior to subcutaneous central venous port access in children. They also reported nasal discomfort (elsewhere described as 'burning', Anderson, Zeltzer, & Fanurik, 1993) as the most common side effect, occurring in 45 per cent of the sample and that 19 percent of the sample dropped out of the study because of this side effect. Midazolam causes discomfort, has a disgusting taste, and can cause outright agitation or delirium in children (Anderson, Zeltzer, & Fanurik, 1993; Massanari & Novitsky, 1997; Young & Kendall, 2001). Within the 'emotion' context of this discussion, even if the child does not become agitated, the construction of 'disgust' in relation to taste is worth commenting on. Disgust is commonly included among the five principal emotions (fear, anger, sadness, joy, and disgust) as a negative emotion. Introducing something that the fearful child may very well construe as disgusting is likely to add to the child's negative construction of the experience. The co-construction of fear and disgust, coupled with a sense of helplessness, and hopelessness is akin to the trauma experience that survivors of disaster or combat zones face. For many children, the trauma is exacerbated because it is repeated with every procedure. Furthermore, as outlined in Chapter 2, it is quite feasible that the stress of repeated procedures could impact negatively on a child's immune status. Administering midazolam, up the nose of a child to reduce 'anxiety' associated with a medical procedure, seems a problematic and complex way of achieving an effect that can be achieved by engaging the child in a simple relaxation exercise or by using distraction.

The important issues to consider in combining pharmacological and psychological interventions are the aims of each intervention and the possible interactions. For example, the use of benzodiazepines (diazepam) to reduce anxiety in conjunction with psychological approaches has been found to be unnecessary (Bullock & Shaddy, 1993) and undesirable (Jay et al., 1991) because of impacting negatively on the child's ability to learn a cognitive behavioural intervention. Regarding midazolam, if the aim was to induce a state of anterograde amnesia of the pain, fear and terror of procedural pain, then this drug is an excellent choice. If, however, the aims were to reduce the experience of pain and fear, to give some control to the child, to facilitate coping and a sense of achievement, and to involve the child and family in treatment, then a psychological approach, with or without an analgesic or local anaesthetic would be appropriate.

One of the less expected findings to emerge from an examination of the relationships between the dependent variables was the emergence of the second factor in the factor analysis of the whole sample. This factor was described as the child's Pre-procedural Emotional State and the five top loading variables were the nurse pre-procedural and procedural uptight ratings, the child's pre-procedural fear, and the parent procedural and pre-procedural uptight ratings. Furthermore, these factor scores derived from this factor were higher in the imaging conditions than the non-imaging conditions.

Given that the pre-procedural ratings were actually taken after the procedure, it is possible that for some reason the parents and the nurses rated the children in the imaging conditions as more uptight before the procedure and the children in the non-imaging conditions as less uptight. It is of course possible that by chance the children in the imaging conditions were more uptight before the procedure. A point worth stressing here is that the child's self report of fear was also higher in the imaging conditions. This measure was taken before the procedure, and perhaps even more telling, before random allocation to a condition. It tends to suggest that the timing of the parent and nurse pre-procedural measures was not ideal. Had the parent's pre-procedural rating been taken before the procedure, it was felt that this should be done in isolation from the child. Removing the parent from the child before the procedure for the sake of a measure was deemed unethical. It was also felt that secretly conversing with the parent in front of the child might compromise the child's level of trust. With hindsight, the parent's pre-procedural measure could have been attached to the bottom of the consent form as a visual analogue scale, read and completed by the parent after signing consent.

The foregoing discussion has attempted to demonstrate that psychological interventions may have distinct effects on different aspects of the pain experience and thus alter the manner in which these aspects are related to one another. It has also shown the care that is required in measuring these various aspects. While the discussion has often been speculative, it is important to remember the unquestionable findings of the two studies. Both studies suggest that procedural fear is susceptible to distraction, relaxation, and imagery. The distraction and relaxation effects suggest that a shift in attention is sufficient to reduce fear. However, shifting attention, the bottom-up, sensory – appraisal model, does not appear to be sufficient to significantly reduce the sensation of pain but being involved in imagery, or actively construing the distractor does. The ability to demonstrate similar effects of distraction and imagery on fear (a complex body-mind experience) and pain, – also a complex body-mind experience, suggests that the modulation of each is subject to similar mechanisms. A more detailed psychological and neurophysiological model of the relationships between distraction, imagery, fear and pain, will be developed.

## ***A Model to Explain the Effects of Imagery and Distraction on Procedural Fear and Pain in Children.***

The proposed mechanisms underlying the effects of imagery and distraction on pain and fear in this study are based on the following premises: that the brain constructs our sense of self in the world; and that consciousness is experiencing qualia. These qualia are the qualities of our thoughts, feelings and sensations, associated with neural activity that emerges from working memory involving both bottom-up and top-down processes.

In discussing the effects of imagery on fear and pain, the phenomena of imagery fear and pain are construed as qualia (Cairns-Smith, 1999). The quale of fear carries the added complexities of the emotions. The bodily perturbations are what stand out immediately in feeling fearful but the cognitive and social factors are equally significant. The quale that is the raw sensation, the 'ouch' of pain as the needle pierces the skin is arguably simpler; it hurts. "Where does it hurt?" "In my arm". The suggestion here is not that pain can simply be reduced to a sensation but in an attempt to explain the effects of distraction, relaxation and imagery, the discussion accepts that among the qualia, the 'ouch' is a 'simpler' experience involving a largely sensory component and fewer cognitive and social elements.

The reason that the quale of fear is easier to modulate than the quale of pain (the ouch component) might lie in how each is constructed. As an emotion, fear is comprised of bodily feelings and cognitions within a social and cultural context. Pain (again, the emphasis here is on the sensation), on the other hand, is considerably more primitive, involving, initially, fewer cognitive and social components. In terms of modulation, in the case of fear, there are more avenues open to intervention. The avenues of intervention are the various components of the emotions such as, the bodily perturbations, emphasised in the early physiological theories of James and Lange, the cognitive aspects of Lazarus, and the social aspects raised by Kemper, and Oatley and Johnson-Laird. To expand this argument, let us consider the impact of relaxation.

For the children in this study, relaxation tended to be associated with positive feelings, which would compete with the usual fear quale. While children in the relaxation conditions did not report 'positive thoughts', a shift towards positive feelings and actively engaging in, rather than 'having to comply with', treatment marks a significant reconstruction of self in the procedural environment. For the child, such a shift also accompanies a social relationship that is participatory, carries a certain amount of status, and negates (to a degree) the typical power differential that exists when a child is the passive recipient of a medical procedure. Usually when the child challenges that role, she is denigrated to the point of being labelled 'difficult' and may be forcibly restrained. A similar participatory relationship exists in imagery, which might also partly explain the significant reduction in fear between the imaging, and the non-imaging conditions. The children in the imaging conditions showed a positive shift in valency of thoughts and feelings, which is likely to impart an enhanced sense of control, and in so doing, also have a positive effect on fear.

In terms of pain quale, best approximated as the 'ouch', apart from pharmacologic intervention, the principal avenue open to intervention appears to be cognition, which might explain why pain is harder to modulate than fear. For the purpose of this discussion, pain is temporarily reduced to the 'ouch' component for two reasons: firstly, to consider why this aspect is harder to modulate; and secondly, to consider the extreme cases where the modulation is remarkably successful. In a practical sense, however, the qualia of the procedural pain experience are so intertwined that an attempt to reduce the whole to the component parts is nothing more than a fragmentalist folly. In this study, the closest approximation to the whole experience was the composite Self-reported Pain Experience Factor Score, which was significantly reduced in the imaging conditions. The model, presented later describes the detail of the relationships between fear and pain, and distraction, relaxation and imagery. Although pain and fear are discussed as separate entities, procedural pain is a composite of many qualia that are constructed, and as such, can be reconstrued, as the case may be.

The proposed model for the effects of distraction, relaxation and imagery has features that are not dissimilar to those proposed by Chapman and Nakamura (1998). Chapman and Nakamura took a constructivist view of the role of suggestion in hypnoanalgesia. They conceptualised consciousness as an area in the brain for competing schema; schema related to pain, and schema related to the hypnotic suggestion. However, the model presented in Figures 3 and 4 differs from Chapman and Nakamura's view in a number of ways. Firstly, consciousness in the proposed model is viewed as a phenomenon that emerges from working memory activity rather than an area that can 'hold' a finite number of schemata. Secondly, the proposed model moves beyond the cognitive schemas that underpin Chapman and Nakamura's view of consciousness to consider the social psychological elements of the interventions that apply even in the absence of direct suggestions – as in imagery and distraction. Finally, the model attempts to embrace the way these interventions may alter both the sensory and emotional qualia of fear and pain.

The proposed model in terms of the psychological mechanisms and neurophysiological correlates as they relate to procedural pain and fear in children is presented in Figures 3 and 4. Reality 1 ($R_1$) relates to the construed reality of self in the procedure room, and Reality 2 ($R_2$) relates to the construed reality of self in imagery. Each of these can be construed actively or passively, in a reciprocal manner. That is, if the child actively construes the procedural reality ($R_1$), and passively construes the distractor or imagery then the procedural reality ($R_1$) will take precedence over the alternate reality ($R_2$). Conversely, if the child actively and in particular, 'imaginatively', construes the distractor, for example a pop-up book, or actively construes the imagery, then the reality consistent with what is actively constructed ($R_2$) will take precedence over the procedural reality ($R_1$). The success or failure of distraction or imagery is a function of the mode of construing the procedural reality versus the alternate reality of the distractor or the imagery. It is important to emphasise that while the terms *success*, and *failure* are meaningful in terms of statistical significance, the boundaries in the clinical domain are less clear-cut. In some cases, children will actively construct and engage in imagery or a distraction technique and shift to a reality that has little in common with the procedural reality, where pain and fear simply do not feature. Statistically, and clinically, this would constitute a success. However, during a painful procedure, a child might have periods where he or she is absorbed in, and actively construing the alternate reality, then swings back to the procedural reality, and then is able to reset, or reconstrue the *active – passive* construing balance back to the alternate reality. In terms of clinical significance, this would not constitute a failure; there are many levels of success. Depending on the balance of *active vs. passive* construction, the qualia of fear and pain will vary with regard to the alternate reality in their intensity, personal and social significance.

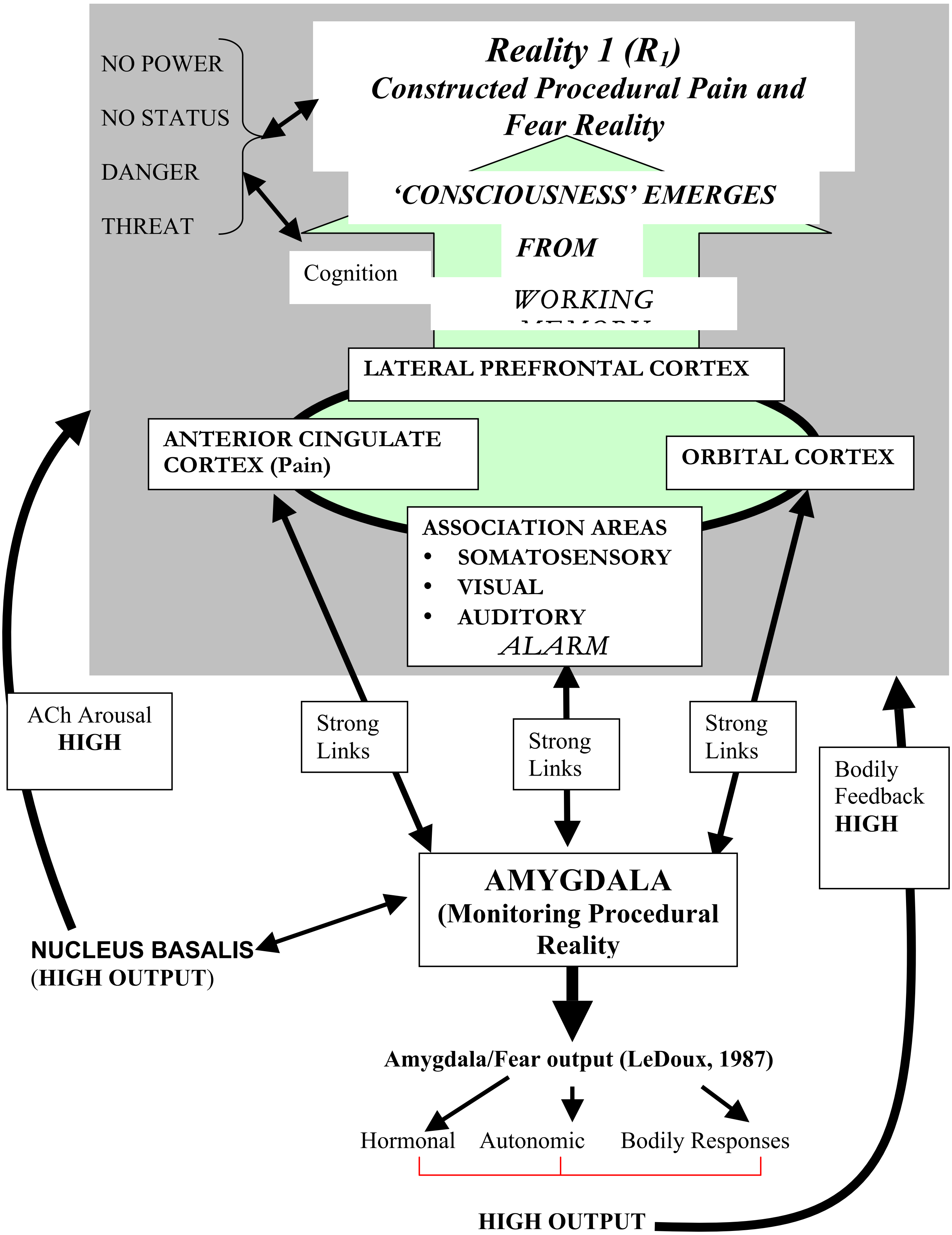


*Figure 3.* **'Limbic forebrain – Consciousness – Reality' relationships in a Procedural Pain Reality. (Adapted from LeDoux, 1987, 1998, 2002) The broad arrow rising in the shaded area represents the emerging Evanescent Self. Activity below the Evanescent Self is in the domain of the Greater Self (Cairns-Smith, 1999).**

Figure 3 outlines the proposed interactions between limbic forebrain regions, consciousness, and the related effects in the procedural pain reality – Reality 1. In terms of the *passive construing – active construing* construct, the child actively construes the painful and frightening aspects of the procedural reality and passively construes the distractor or does not engage in imagery. Awareness of what emerges around working memory (Baars, 1996; Baddeley, 1993; LeDoux, 1998; Phaf & Wolters, 1997; Schachter, 1991), or the qualia of Cairns-Smith's 'Evanescent Self', is what is central to the child's sense of consciousness. The key structures are likely to include the lateral prefrontal cortex, the anterior cingulate cortex, the orbital cortex and the association areas (LeDoux 1998). The cognitions and aspects of consciousness that emerge from working memory are negative and centre on powerlessness, lack of status, danger, no control, and extreme threat. The association areas abound with the alarming sensory input of the procedure room and the people present. Somatosensory, visual, and auditory associations are representations of self in an environment that is harmful, threatening and dangerous. Some of this activity, particularly in the association areas and the anterior cingulate (LeDoux 1998; Roth 2000), emerges as conscious awareness, with the Evanescent Self (shaded area), however, much is beyond consciousness, in Cairn-Smith's terms, the 'Greater Self'. The Greater Self encompasses all brain activity, of which one is not consciously aware. The projections from working memory and the association areas to the amygdala are well defined (LeDoux 1987), and even stronger are the reciprocal projections back to these and other cortical areas, which focuses attention on the alarming incoming sensory information. Working memory draws upon experiences and knowledge in long-term memory. New memories are laid down (LeDoux, 1987) via the hippocampus (factual) and the amygdala (fear related). Activation of the amygdala mediates the fear response via output connections; these set the hormonal, autonomic, and fear behaviours into action (LeDoux, 1987). At the same time, the activated amygdala innervates the nucleus basalis, which heightens acetylcholine arousal of the cortex (Amaral et al., cited in LeDoux, 1998). The flurry of bodily responses from amygdala mediated hormonal, autonomic and fear behaviours feeds back (LeDoux, 1998) to the constructed reality and sense of self that emerges from working memory. The qualia of the child's Evanescent Self, the fearfulness of fear, the painfulness of pain and the terror of being terrified emerge as consciousness, within the child. Some might hope to 'save face' to try to bare it, others will scream in pain and fear.

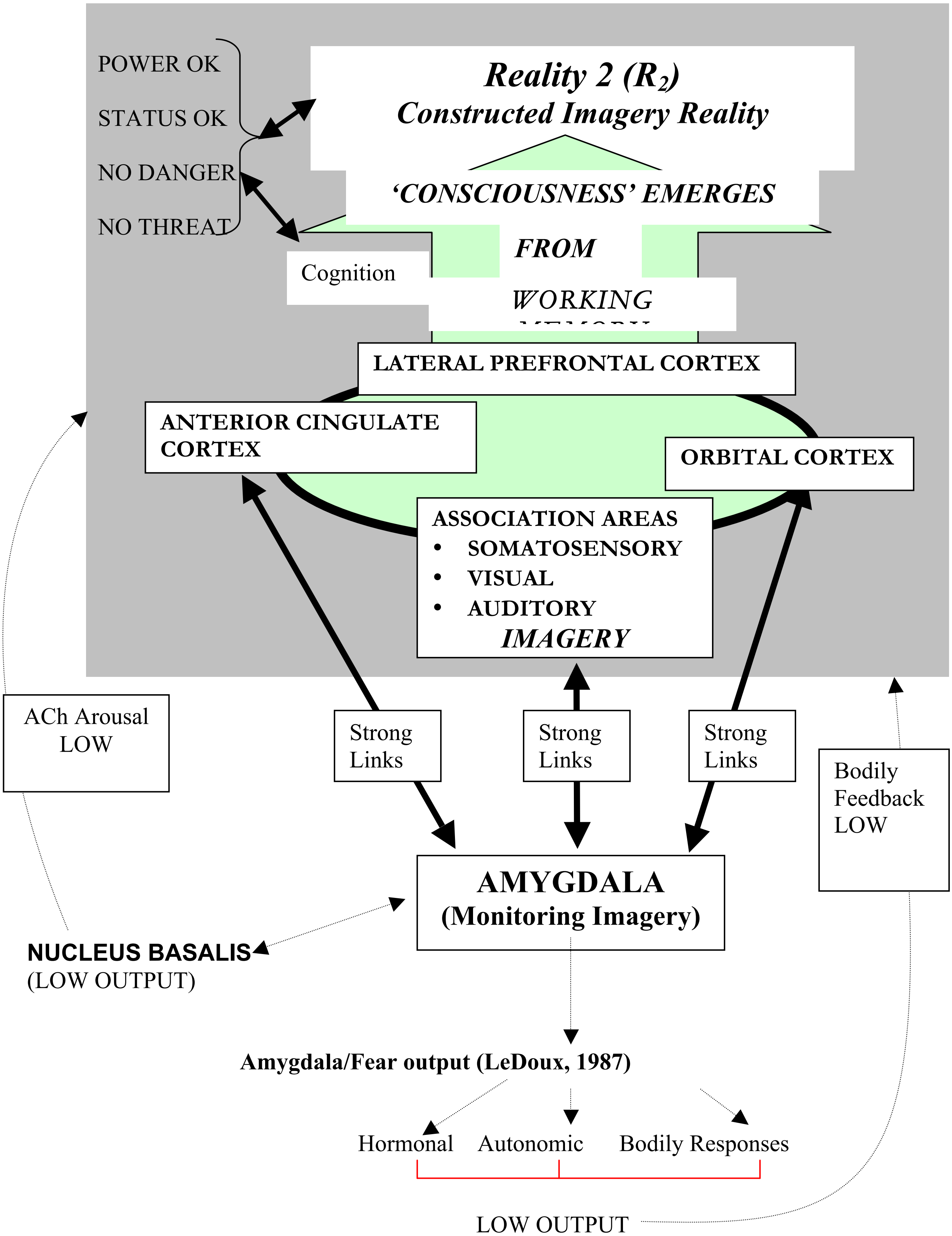


**_Figure 4_. 'Limbic forebrain – Consciousness – Reality' relationships in an Imagery Reality (Adapted from LeDoux, 1987, 1998, 2002). The broad arrow rising in the shaded area represents the emerging Evanescent Self. Activity below the Evanescent Self is in the domain of the Greater Self (Cairns-Smith, 1999).**

Figure 4 outlines the proposed interactions between limbic forebrain regions, consciousness, and the related effects in the imagery reality – Reality 2 – the Evanescent Self constructed in imagery, or in relation to actively construing and being involved in, a distraction. As a child engages in imagery or the distraction, his or her mode of construing of the procedural reality ($R_1$) becomes passive and the imagery or distraction shifts from the passive to the active pole. As the child becomes increasingly engaged in the imagery or the distraction, his or her construed consciousness and reality shifts from $R_1$ to $R_2$, that is, Figure 3 to Figure 4. Visual imaging is constructed in the visual associations areas in the temporal lobe (D'Esposito et al., 1997; Logothetis 1999; Mellet et al., 2000; Mesulam, 1998), which feed into working memory. It is likely that other sensory aspects of imagery are also constructed in the appropriate association areas. For example, the child who was in the swimming pool in imagery during a lumbar puncture when asked what she could feel during the procedure said, "I could feel the water, lifting me and drifting me." – the quality of the feelings and sensations are qualia and in Cairn-Smith's terms, the 'Me' is the fleeting 'Evanescent Self' constructed in imagery. Children frequently report bodily sensations that are congruent with their imagery. In imagery, the somatosensory reality is consistent with the constructed reality in imagery, not the reality of the procedure room. Even if there is bottom-up somatosensory input, the view is we are conscious of activity in the association areas not the primary sensory areas (Crick & Koch, 1995; Mesulam, 1998; Roth, 2000). Coghill et al. (1999) concluded that pain intensity, affect, feature extraction (cognitive evaluation of a painful stimulus), motor control and attention are all subject to significant modulation by top-down factors. It is possible that the bottom-up afferent nociceptive input is modulated by top-down neural activity associated with the process of imaging. Mesulam (1998, p. 1034) said, "Mental imagery provides one of at least three settings where the activation of sensory areas can transcend the constraints imposed by external reality". Top-down modulation would explain the apparent decrease in pain sensitivity, 'the decreased ouch', seen in children who are highly involved in distraction, imagery, hypnosis and indeed any psychological state that has an effect on pain. Furthermore, this is consistent with the failure of opioid antagonists to reverse the analgesia in hypnosis (Spiegel & Albert, 1983) because the top-down modulation represents an alternate mechanism to the opioid-based downstream inhibitory pathways to the dorsal horn as outlined in Chapter 2.

If the child's construed reality is somewhere on a continuum between $R_1$ and $R_2$, then as the child shifts from one reality to the other, the features of the prevailing reality take precedence. In practice, children in imagery are aware of some aspects of $R_1$ (they engage in conversation with the person guiding their imagery) but it is in the background and the sensations are not the same. One 15 year-old in this study, on opening her eyes as she came out of her imagery and looking at the Bandaid® on her arm exclaimed in a puzzled manner, "Oh! It's done, is it?" She appeared not to have realized that the venepuncture was over and the blood collected. When asked what she could feel in her arm during the procedure she said, "I felt something, I don't know, I thought it was her [the nurse's] hair or something." It is important to note that the $R_1$ to $R_2$ shift is a dynamic continuum and a child in imagery may at any stage, move one way or the other, which explains the variability in effect.

The cognitive and emotive aspects of the imagery in $R_2$ reflect a safe place. The children in the imaging conditions reported positive thoughts and feelings, not necessarily relaxing, but engaging. For example, a child could be playing a game of basketball, or running a race. At a conscious level, good thoughts and feelings are consistent with $R_2$ but what is also important is the brain activity that is not accessible, or in Cairn-Smith's terms, is within the Greater Self. In $R_2$, what emerges from working memory is a consciousness, an Evanescent Self that is constructed in the process of imaging. The Evanescent Self draws upon long-term memories and experiences associated with the imagery. While this is happening, the amygdala, through its vast connections (Aggleton, 1992; LeDoux, 1987) monitors activity within the Evanescent Self and the Greater Self. Activation of the amygdala is central to the experience of fear. The amygdala is not activated because the imagery-related activity is not threatening or alarming. This is not to say that it is not possible to experience a fear response while consciously imaging a non-threatening reality. Neuronal activity in the Greater Self could certainly activate the amygdala and in so doing initiate a fear response. If, however, the focus on the imagery is dominant, that is, the top-down construction of imagery qualia predominates, then amygdala activation via bottom-up processes is less likely to occur. LeDoux, (1998) said, "It now seems undeniable that the emotional meaning of stimuli can be processed unconsciously" (p.64), which is consistent with the bottom-up, sensory – appraisal view. The argument here is that in imagery, the brain constructs, and responds to, the experience rather than, as Greenfield (2000) said, merely being a sponge to the senses.

### *Implications of the Model for the Effects of Imagery versus Distraction on Fear and Pain*

The results from these studies suggest that both distraction and relaxation significantly reduce the fear experienced by a child during venepuncture. In the cartoon study, distraction had a significant effect on fear and a definite trend towards a reduction in pain. In the imagery study, relaxation reduced fear and high involvement in imagery effected a significant reduction in pain and related dependent variables. Two related concepts are important here, firstly, the notion of the *active construing – passive construing* construct and, secondly, the notion of an $R_1 – R_2$ construct. Regarding the mode of construing, the suggestion is that distraction and relaxation tend to be construed passively, but the mode of construing in distraction can shift towards the active pole. High involvement in imagery is consistent with a shift to the active mode of construing, and importantly for both distraction and imagery, what is actively construed is not the procedural reality, but the reality and involvement in either the distraction or the imagery. In terms of an $R_1 – R_2$ shift, distraction, relaxation and imagery begin in $R_1$ but meaningful, engaging, and ideally, imaginative distraction and involvement in imagery shift the child's reality construct to $R_2$.

In terms of Personal Construct Theory, the $R_1 – R_2$ construct is a useful way of considering the practical application of the model. If the child were tightly construed around $R_1$, the aim would be to loosen the child's construing to entertain the notion that there is an alternative, which is R2. This is, in essence, Kelly's philosophy of constructive alternativism; the pain and fear of the procedural reality are not 'givens', because the child's procedural reality is constructed, and as such, it can be reconstrued.

The proposed relationship between fear and pain in reconstruing from $R_1$ to $R_2$ is depicted in Figure 5 where the x-axis represents the $R_1 – R_2$ construct. The process underpinning the loosening and transition from $R_1$ to $R_2$ is a shift to the active pole in construing the distraction or the imagery, and a concomitant shift from actively, to passively construing the procedure. The y-axis represents the intensity of fear and pain.

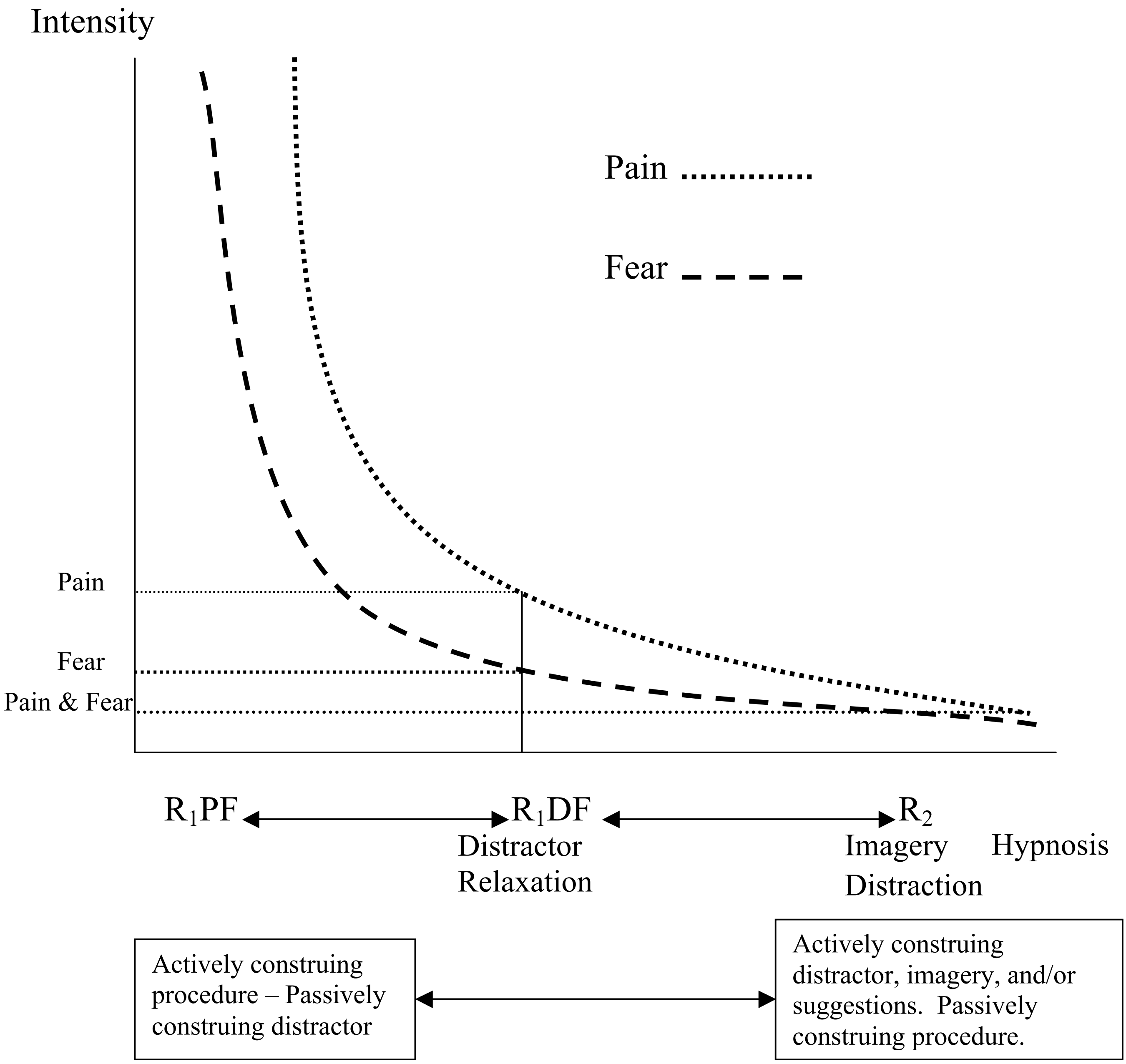


***Figure 5*** **Reality 1 ($R_1$) – Reality 2 ($R_2$) relationship between pain and fear in distraction, relaxation, imagery and hypnosis. $R_1$PF, Reality 1 – Procedure Focused, $R_1$DF, Reality 1 – Distractor Focused, while $R_2$, represents a shift to an actively constructed alternate reality.**

At Reality 1 – Procedure Focussed ($R_1$PF), fear and pain are actively construed and their intensity is high. As the child loosens his or her construing around the $R_1$PF pole, towards Reality 1 – Distractor Focussed ($R_1$DF), the intensity of fear and pain start to decrease. Note the pain curve is above the fear curve. The two measures are strongly correlated so the shapes are similar. A simple distractor, relaxation or low involvement in imagery, moves the child along the $R_1 – R_2$ construct to a point at $R_1$DF where fear is significantly reduced but pain is perceived. The reason the child feels pain is that he or she is still actively constructing the sensorial reality of $R_1$ but the emotional reality has many more avenues for change – power relationships, status, control – which are being reconstrued. The association areas participate in what emerges as consciousness. The activity in the association areas in $R_1$ is based on input from the primary sensory areas. In less effective distraction techniques or low involvement in imagery, unlike effective distraction, high involvement in imagery, or hypnosis, the child's sensorial consciousness is constructed around $R_1$. When a child begins to actively construe the distractor and it becomes a 'distraction', or the child actively constructs his or her imagery, as measured in this study by the high IAS, he or she constructs a sensorial consciousness that is not consistent with the procedural reality, $R_1$. Imagery is not just distraction from one reality, and effective distraction is arguably something more than paying attention to a distractor. The 'something more' is the shift from passive to active construing, the laying over of personal meaning, and identifying with, rather than being a passive observer.

In imagery, or when something (a distractor) other than the immediate procedural reality is actively construed, the child's Evanescent Self takes a qualitative shift, complete with unique qualia. When this happens, conscious awareness, the Evanescent Self, shifts from $R_1$ to $R_2$. $R_2$ could then shift to R3, R4, and so on. When this happens, awareness of the pain in $R_1$ is reduced. Top-down displacement of bottom-up nociceptive input is an accepted phenomenon in brain neurophysiology (Coghill et al., 1999; Mesulam, 1998) but even this is suggestive of a competitive paradigm. The preferred model here is a shift to a completely different sensorial experience, constructed in a top-down manner, rather than a fixed 'reality consciousness' admitting some-but-not-other aspects of experience.

### *Links with Emotion Theories and Personal Construct Psychology*

The theory represented in Figures 3, 4 and 5 discussed above draws upon top-down processes rather than the bottom-up, sensory – appraisal view. This approach is consistent with the constructivist view that the brain is actively involved in creating our sense of the world. As expressed by Greenfield (2000), the brain is more than a mere sponge to the senses. This does not render the emotion theories redundant. The relevance of the emotion theories discussed in Chapter 3 resides in the cognitive aspects of the proposed model. However, within the constructivist view, construing is not the same as appraising. Appraisal implies the attachment of meaning to bottom-up sensory input, whereas the act of construing is a synthesis of cognition including top-down processing into the constructed view of self in the world.

Power, status and control from Kemper (1993) are obvious factors in construing procedural fear. In $R_1$ the child construes no power: 'there is nothing I can do, they are going to make me have this procedure'; no status 'you don't care what I think, you don't listen to me, you don't respect my view'; or control: 'everything is happening to me and there is nothing I can do to stop it'. The negative power differential and lack of control in Kemper's view predispose a child to fear. If the child perceives no status, and the agents are the health professionals and perhaps the mother then the resultant emotion would be anger (Kemper, 1993; 2000). The social realm also includes issues related to solidarity. If the child construes loss of solidarity with the mother, stemming from the mother's powerlessness, this will exacerbate a sense of abandonment and fear. If the child construes that the erosion in solidarity stems from betrayal by the mother then the emotion might be anger. The social interactions and emotions in a procedure room are complex and dynamic. Through the course of a procedure, a child can experience fear anger and sadness in a multitude of sequences and combinations depending on how the child construes his or her reality. Within the constructivist view, these emotions are not givens but they are possible constructs if the child is not given a tangible opportunity to reconstrue coupled with nothing to focus on other than the procedure.

In contrast is the child who actively constructs an alternate reality ($R_2$) in imagery. The health professional is listening to, and engaging with, the child in imagery, not telling the child what to do and how to behave. Everyone present is listening to the child. It is common to build one's own image of the child's reality as the child speaks. The child is an active participant rather than a resistant recipient of treatment. The child's constructs are manifestations of his or her perceived status, empowerment and control, which, according to Kemper, are not consistent with anger and fear. These factors are important with regard to establishing trust and rapport with the child and therefore the likelihood of the child participating in the imagery, particularly when the child is already afraid – as evident in this study by the high pre-procedural fear scores.

Plutchik viewed fear as an emotion that primes the individual for escape to ensure protection. Fear in Plutchik's terms will diminish if the individual can escape and escalate in the face of danger if there is no escape. This is very much a stimulus – response view located firmly in the sensory – appraisal paradigm. Danger, within the PCP view, is only danger because it is, in this case, actively construed that way. If 'danger' was taken as the negative pole on a *danger – safe* construct, and the child was able to reconstrue towards the safe pole, then the fear would subside. Using imagery to reconstrue to the safe pole is not what Plutchik considered as escaping from a 'given' threat but from the child's perspective, it works. Furthermore, the Plutchik model does not readily handle the social factors that facilitate, or inhibit the likelihood of the child being able to reconstrue to the safe pole. The sociology of procedural pain must be considered. For example, ignoring, deceiving, forcibly restraining, and exercising power-over a child during a procedure, are factors that are unlikely to loosen the child's tight construing around the 'danger' pole. Distraction, relaxation techniques and entering an imagined world are ways of imparting positive attention and giving the child something to focus on other than the procedure. These factors could help the child to loosen and reconstrue to the positive 'safe' pole. Relaxation, simple distraction and low involvement in imagery reduced fear but not pain, which suggests that even though the participants could feel the pain, their fear was reduced by having something other than the procedure to focus on. 'Having something other than the procedure to focus on' could be a way of imparting some sense of control and loosening around the danger pole.

If the child's consciousness, that is, awareness of what emerges from working memory is focussed on the distraction then the emergence of a fear response would be less likely to occur provided the focus of the distraction is not negatively construed. Clinically, the challenge is to present distractors that will not only catch the attention of the child, but distractors that the child will actively construe and become involved in. Kuttner (1986) has championed a number of distraction techniques ranging from simply blowing bubbles, to engaging the child in a 'pop-up' storey book. Other approaches reviewed in Chapter 5 include a kaleidoscope (Carlson et al., 2000; Vessey et al., 1994) cartoons (Cohen et al., 1997), audio taped lullabies (Meagel et al., 1998) and medical play techniques (Fassler, 1985). The key to catching the child's attention may lie in what Plutchik referred to as intensity of surprise on a *distraction – amazement* construct. However, the social and cultural dimensions must also be considered to ensure that the surprise is construed in a positive manner. Intuitively, anyone who has used distraction techniques with children would welcome a positive shift in the child's attention to the amazement pole. Within the model, the amygdala is unlikely to precipitate a fear response if what emerges from working memory is positively construed as amazing.

Throughout this thesis, the constructivist view that the brain takes an active role in constructing our sense of self in the world is derived from Kelly's *Psychology of Personal Constructs*. Before closing this discussion, it is worth relating Kelly's views on fear to the procedural pain context, which of course includes the health professional. As a starting point, the following analysis is offered bearing in mind that one's constructs are individually construed within the PCP framework but the suggested constructs could be used as a point of embarkation on a PCP investigation of the model.

Fear, in Kelly's terms, results when a new incidental construct seems about to take over the core structure. An incidental construct is focussed, it could be as straightforward as earlier suggested, *danger*, on a *danger – safe* core construct, when the nurse calls the child's name or, I don't know how to get through this, on a core construct, *I don't know how to get through this – I know how to get through this*.

In the case of fear, specific knowledge may be low. In Kelly's words, "We are threatened by hauntingly familiar things and frightened by unexpectedly strange things (Kelly, 1955, p. 494). It is possible in some cases that the unknown exacerbates the child's fear. For the child who has never had the procedure, the unknown is frightening because the more that is unknown, the less confident the child is about being able to get through the procedure – hence, the possibility of gravitation to the: *I don't know how to get through this,* pole. Emergency departments are full of people who are frightened because of the unknown – What is wrong with me? What will they find? What are they going to do to me? Moreover, How am I going to get through what they are going to do? For the child who has previous experience of painful procedures and who is terrified, the unknown does not relate to the technical aspects of the procedure. In this case, the child's incidental construal could be more related to not knowing how she or he is going to cope, bear, get through what they are going to do to him or her especially given what happened last time. On face value, to a 'grown-up' this could be construed as having little significance, particularly if the procedure is considered 'minor'. However, the complexity of a given procedure, or for that matter, the diagnosis, may have little to do with how the child construes the procedural reality. As one young adult said when reflecting on what it was like to be a young child, experiencing repeated procedures, "I wasn't afraid of sickness, I was afraid of pain; I was afraid of strange people coming in to give me this pain" (Kuttner, 1998). We, the health professionals are the strangers. If we are to understand procedural pain and fear in children, we must, at least consider the child's reality. Granted, not all 'grown-up' health professionals are interested in the child's reality, or find this easy but for those who are concerned, a starting point, as discussed earlier, is to construe as the child construes. It is not always easy to shelve one's 'grown up' view of the world and think as the child thinks. A starting point could be to consider the language (Tesler et al., 1989) children use to describe the affective component of severe pain – killing, dying, deadly, suffocating, terrifying and torturing, and then consider the opposite poles. In the spirit of Kelly's constructive alternativism, an approach with a health professional who says, 'I am an adult, I just can't relate to children' might be 'If you were a child, how might you and your best friend relate to each other? On the other hand, more pertinently, 'If you were a child, how might you relate to your worst enemy? Issues of trust, being heard, fairness, hate and hurt, spring to the 'child mind'. Each of these are possible core constructs with likeness pole, and a contrast pole, and each construct could have a place in the model in Figures 3 and 4 next to the examples given: power, status, danger, threat.

### *Generalizability*

It was stated at the outset that this thesis is about the psychology of fear and pain in children undergoing medical procedures. However, the constructive tenor of the model represented in Figures 3 and 4 allows for generalization to any situation where the qualia of pain and fear are altered by psychological means; for example, altered pain and fear associated with religious ceremonies, and in hypnosis. It is well known that in some cultures people undergo initiation ceremonies that involve extensive tissue damage while at the same time they seem oblivious to pain. Not all so-called cultural examples are pain free – some subjects writhe and scream in pain during ceremonial procedures. Anderson and Anderson (1994) provide a balanced critical review of pertinent examples from Brazil, Sri Lanka and East Africa and state, "Nevertheless, it is abundantly clear that religious ecstasy alone is capable of masking enormous pain" (p. 125).

Beecher's (1946) patients in the forward army hospital with extensive tissue damage but not requesting pain relief could also be included here. Beecher concluded that what was important regarding the refusal of analgesia was the context and meaning of the pain for the soldier. Both the soldier and the religious participant are probably somewhere between $R_1DF$ and $R_2$ but the cognitive factors, which could be thought of as 'self-suggestions' in a self-hypnotic sense, are overwhelming. With regard to 'fear or religious ecstasy inhibiting pain', the argument here is not one of endogenous opioid modulation of bottom-up input. The explanation is the same as for imagery and hypnosis, that is, the experience of pain, as every other conscious experience is constructed by the brain and emerges at what at this stage, is best approximated as a 'working memory' view of consciousness. If an individual's consciousness has shifted, for whatever reason, from the actively constructed physical here and now to an actively constructed alternate reality then what is 'real', including the presence or absence of pain is a function of what exists in that reality. For the child in a swimming pool in imagery, the Evanescent Self is in the pool and experiencing all the associated qualia. For Beecher's soldiers, their construed reality, their Evanescent Self, may have centred on a sense of tremendous relief experienced in the realization "I am not going to die, I am going to get through this". For the participant in the religious ceremony "I am at one with the Greater Being". Under these circumstances, pain is simply not part of the artist's picture – the individual's sense of self in the world. However, for the soldier, a fumbling medic, probing a needle around, trying to find a vein would be a focussed psychological trigger on the here and now of procedural pain, which presumably could have been avoided if the soldier was given an opportunity to develop an image of being at home. Similarly, the religious participant who loses focus or, worse still, is subjected to, rather than participates in, the ceremony, may feel the full terror and pain of the experience.

The findings of the two studies have been discussed in some detail. It remains to consider briefly the implications of the findings and the model for clinical practice and for further research. These are addressed in the final chapter, Conclusions to the thesis after first providing a summary of the key issues identified in this discussion

CHAPTER 12

# CONCLUSIONS

Anecdotally, when using imagery with children during a painful procedure something appears to be happening to the normal experience of pain because some children seem to get through the procedure with no complaint of pain and on coming out of their imagery they are surprised that the procedure is over. Distraction and relaxation techniques also seem to help children to cope with procedural pain and fear. Anecdotal reports based on clinical experience are, however, unlikely to advance our knowledge and understanding of the relationships between these interventions and fear and pain in children. The aim of this thesis, therefore, was to investigate the effects of relaxation, distraction and imagery on procedural pain and fear in children and to propose a model that could account for the success and failure of these psychological interventions.

This thesis has provided clear support for the view that psychological interventions such as distraction, relaxation and imagery are effective in reducing fear during medical procedures. Furthermore, these interventions have been shown to work rapidly, with no preliminary training and to be successful where the fear is associated with acute pain.

The research has also provided evidence that the total pain experience, when assessed primarily in terms of pain, fear, distress and related self-report measures, can also be reduced during imagery, may be reduced during distraction, but is not affected by relaxation alone. The failure of relaxation to affect pain does not exclude it as a viable adjuvant because it had an effect on fear.

The research has offered suggestive evidence that during imagery those children who were absorbed in their imagery were significantly lower in their reports of pain and all other aspects of pain except fear than those children who were less absorbed in imagery.

In comparing the three interventions of distraction, relaxation and imagery, a model was proposed that recognised the complex interplay between cognitive, social and emotional factors that determine the extent to which each intervention would alter different aspects of the pain experience. It was suggested that changes in the pain experience were not only a matter of altered cognitions but were subject to the child's perceived status within the medical procedure. The role of the other in sustaining an alternative reality was thus recognised as a key practical feature in psychological interventions as was Kelly's personal construct theory at an abstract level.

Finally, the proposed model attempted to demonstrate that a top-down process of pain modulation that would be entailed by the success of psychological interventions, such as imagery, is in keeping with recent findings in neurophysiology. It was argued consistently that the 'experience of pain' cannot be explained in terms of a bottom-up, sensory – appraisal process in which the higher cortical centres simply weigh up incoming information form the various senses. Rather the 'consciousness' of the higher cortical senses, the working memory areas in particular, reflects a 'mindful' search for relevant sensory information that is in keeping with the prevailing constructions. Among the qualia that emerge from this mindful search, quale such as pain cannot 'mean' as much to the child who is in some imagined place, as they will to the child who is engaged in the medical procedure.

### *Implications for Further Research*

The empirical findings can be extended in a variety of ways. The need to deploy a range of measures when investigating the pain experience was clearly suggested. Both self-report and observational methods were used, and the research revealed some inconsistencies between the two types of measures. Within the self-report measures, the research suggested that we should be quite sensitive to the aspects of the pain experience that are granted prominence. Clearly different forms of intervention may have different effects on the various aspects and are worthy of closer examination. Furthermore, the implications of stressing, ignoring or reclassifying the various aspects of the pain experience can be profound as was indicated in the discussion of labelling fear as anxiety. Among the observational measures, differences between parent and nurse ratings of the child, and the extent to which observational measures actually assessed pain, as opposed to distress or fear, deserve further scrutiny.

During the research, a scale to measure involvement in imagery was devised. This scale needs further assessment of its reliability and validity. In particular, the scale's capacity to predict which child engages in imagery should be examined. As it was used in the current research, there was a danger that imagery absorption was a reflection of how painful the procedure was rather than the reverse. It would be comparatively straightforward to investigate children who had shown a capacity to be absorbed, or not, and discover whether these children do respond maximally to an imagery intervention. Complications that should be carefully considered in such a study would be the circumstances under which imagery absorption was tested initially, and how the intervention was subsequently carried out. The model proposed to explain imagery stressed that engagement in imagery is a complex function of how the child construes the medical procedure and the social setting in which imagery occurs. The imagery scale could also be assessed in relation to the neurophysiological mechanisms that underpin the imagery process to be considered below.

The precise nature of the psychological interventions needs to be examined further. Much evidence was presented that showed the manner in which interventions have been described and tested, has often been the source of confusion. While the current research was careful in the manner in which it presented the interventions, either in isolation or in combination, it still did not disentangle all the factors that are inherent in the interventions. In particular, the proposed model suggests more attention must be paid to the social dynamics within the intervention. The relative status and power of the child during the intervention is important in its own right, especially with regard to fear, but it may also be critical in determining whether the child engages in imagery. Further research might usefully compare relaxation, cartoon distraction and even imagery presented in an accommodating or didactic fashion, thus trying to tease out the engagement process from the social position of the child during the particular intervention. In addition, the relative importance of being flexible, being able to modify and adjust the intervention during interaction has been raised (Kuttner, 1988). In its extreme, this aspect of the process could be investigated by contrasting the flexibility of interactional interventions, such as imagery or hypnosis, with the imposed pace of a video or audiotape.

This social psychological perspective could be useful in comparing the relative effectiveness of hypnosis and imagery. The two approaches have much in common but the former attaches considerably more importance on suggestion. On the one hand, this has been acknowledged to offer greater scope for direction of the child but for some children it may do so at the expense of the child's social position. It would be interesting to see if research could establish the relative advantage of each approach, though the child's previous experience and personality will be critical mediating factors.

The importance of the social factors was inherent in the proposed model. This was not just an added feature of the model, and an attempt to reflect the undoubted complexity of the process, it was a key aspect. The critical nature of the social factors was recognised at various times in the thesis as it was suggested to explain the current, though weakening, ascendency of the bottom-up process. As much debate in psychology has recognised, neural mechanisms may well largely reflect the social processes in which the person is engaged. Thus, a child who is placed in a subservient position will largely act in a passive manner, which, in turn will be reflected in their neural mechanisms. These mechanisms will appear to be a 'sponge to the sensations'. If the child is accorded an active role then it is probable that the initiative and capacity for intended action will be obvious in the child's manner and will ultimately be reflected in neural processes. Unquestionably, our capacity to test out these models is currently constrained by our limited understanding of the so-called 'neural correlates of consciousness' but this will undoubtedly unfold in the future. As the technology for investigating the phenomenon of consciousness develops, we might see that the extent to which afferent stimuli determine the neural mechanism is much less than the capacity of the brain to construct what are meaningful stimuli.

Finally, the developing field of psychoneuroimmunology is becoming increasingly relevant to psychology and medicine. The potential for immunosuppressive effects associated with the fear and stress of repeated procedures warrants investigation, particularly in light of the positive effects of psychological interventions of pain and fear. It would not be difficult to investigate immune function in children in relation to procedural pain and fear, with and without interventions such as distraction, imagery or hypnosis.

### *Implications for Practice*

Imagery is a therapeutic technique that allows a child to transcend a painful and frightening existence to a place that feels normal and sometimes is even fun. The researcher said to one child after playing a game of cricket in imagery during the procedure, "You have had blood tests before, haven't you." He replied, "Yeah but never this exciting!" It is likely that every person can construct images. Whether or not a child can engage in guided imagery, or a distraction technique, probably has more to do with how the child construes the reality of the procedure room, including the health professional, than the child's intrinsic 'imaging' or 'distracting' ability. This is where the emotion theories are perhaps most relevant, in drawing attention to a therapeutic relationship that must be based on trust and rapport rather than power-over, control and compliance. With this in mind, the successful implementation of a psychological approach to managing fear and pain with a child is likely to be advanced if we have a deeper understanding of how a particular child constructs his or her immediate reality, especially the relationships the child has with the health professionals. It is easy to label a frightened child as anxious, difficult and manipulative. As one nurse said, "Perhaps we have been hiding behind the needle for too long" (personal communication: Jennie Cross). The health professional *is* an integral part of the child's reality, particularly in a procedure room. As the child's emotional state before the procedure is such a strong predictor of how the child will construe the total pain experience, it makes sense pay particular attention to how the child construes the notion of a medical procedure well before he or she enters the physical reality. Moreover, the onus is on us to consider how we might impact on how the child construes us, and what we leave behind when we walk away. The notion of transcending our obvious 'grown up' assumptions about what is important, and what is peripheral and construing as a child construes, is a skill that, in the heat of the moment, might provide valuable insight into the child's experience.

For many clinicians and researchers who work with children, managing pain is not a problem; it is a challenge that is immensely rewarding. For many, meeting this challenge is what is quintessential in their practice. However, the word 'quintessential' could, fall short of the mark for some. The Swedish translation of 'quintessential' is *Kärnan* (pronounced Shār-Nun, 'Shār' as cār). More than 'quintessential', kärnan embraces 'the core', 'the seed', and 'the heart' of the matter. Indeed, meeting the challenge of helping children to control their fear and pain could be construed as the "kärnan of practice" in paediatric pain.

# APPENDIX A

## STATEMENTS OF APPROVAL AND CONSENT FORMS TO CONDUCT THE TWO STUDIES FROM THE HOSPITAL AND UNIVERSITY INSTITUTIONAL ETHICS COMMITTEES

Royal Children's Hospital
Melbourne, Victoria

Department

Flemington Road,
Parkville, Victoria, 3052,
Australia.
Telephone: (03) 345 5522
Facsimile: (03) 345 5789
Telex: AA37281

# ROYAL CHILDREN'S HOSPITAL ETHICS IN HUMAN RESEARCH COMMITTEE

**DATE:** 11th April, 1995

**PROJECT NO:** 95023

**PROJECT TITLE:** Audiovisual cartoon distraction of children undergoing venipuncture: An adjuvant nursing intervention

**INVESTIGATOR(S):** B Whitaker, K Brereton

**APPROVAL:**
- **ORIGINAL:** 24th March, 1995
- 1 Year
- **RENEWAL:**

**COMMENT:**

**SIGNED:** Jan Watson
...................................................................
**COMMITTEE REPRESENTATIVE**

The Principal Investigator is requested to notify the Secretary of the Ethics in Human Research Committee, of:

1. Actual starting date of project
2. Any change in protocol and the reasons for that change together with an indication of ethical implcations (if any).
3. Adverse effects of project on subjects and steps taken to deal with them.
4. Any unforeseen events.
5. For sponsored drug trials, the investigators must report to the Sponsor and Ethics Committee within 24 hours of his or her becoming aware of any adverse drug effect experienced during the trial by any patient.
6. For drug trials, the investigators must maintain all records relating to the study for a period of 23 years.

At the conclusion of the project or every twelve months if the project continues, the Principal Investigator is requested to supply a concise report of the project with special emphasis on ethical matters.

Annual Report forms are available from the Royal Children's Hospital Research Foundation, ext. 5044.

***Please quote Project No. and Title for all correspondence***

Document4 11/04/95

14 February, 1995

Mr. B. Whitaker,
School of Nursing,
University of Ballarat,
MT. CLEAR 3353

Dear Bernie,

re: **PROJECT 211: AUDIOVISUAL CARTOON DISTRACTION OF CHILDREN UNDERGOING VENIPUNCTURE: AN ADJUVANT NURSING INTERVENTION**

I write to advise that the HREC approved the above ethical clearance subject to ethics clearance being obtained from the Royal Childrens' Hospital.

Could you please advise me if ethical clearance has been obtained from the RCH.

Yours sincerely,

Gail Harman

**GAIL HARMAN**
**Executive Officer**
**HREC**

Gear Avenue, Mount Helen
P.O. Box 663, Ballarat
Victoria, 3353 Australia
Telephone 053 279 000
Facsimile 053 279 545

Royal Children's Hospital
Melbourne, Victoria

Department

Flemington Road,
Parkville, Victoria, 3052
Australia.
Telephone: (03) 9345 5522
Facsimile: (03) 9345 5789

# ETHICS IN HUMAN RESEARCH COMMITTEE

**EHRC REF. No:** **96082 A**

**PROJECT TITLE:** Transforming the Experience of procedural pain and distress in children through the adjuvant use of relaxation therapy and guided imagery

**INVESTIGATOR(S):** B Whitaker, K Brereton

**DATE OF ORIGINAL APPROVAL:** **20 August 1996**

**DURATION:** 12 months

**SIGNED:** ........................................ COMMITTEE REPRESENTATIVE    21/8/96 DATE

## CONDITIONS

**ALL PROJECTS**

1. Any proposed change in protocol and the reasons for that change, together with an indication of ethical implications (if any), must be submitted to the Ethics in Human Research Committee for approval.
2. The Principal Investigator must notify the Secretary of the Ethics in Human Research Committee of:
   - Actual starting date of project.
   - Any adverse effects of the study on participants and steps taken to deal with them.
   - Any unforeseen events.
3. A progress report must be submitted annually and at the conclusion of the project, with special emphasis on ethical matters.

**DRUG TRIALS**

4. The investigators must maintain all records relating to the study for a period of 23 years.
5. The investigator(s) must report to the Sponsor and the Ethics in Human Research Committee within 24 hours of becoming aware of any serious adverse event experienced by any subject during the trial.

10 December 1996

Mr Bernie Whitaker
School of Behavioural & Social Sciences & Humanities
University of Ballarat

Dear Bernie

**re: A011 : Transforming the experience of procedural pain and distress in children with the adjuvant use of relaxation therapy and guided imagery (McLachlan/Whitaker/Brereton)**

At the HREC Meeting held on Thursday 05 December 1996, ethics clearance for the above project was approved.

A project report form is enclosed for your use at the completion of the project.

Yours sincerely,

Gail Harman

**GAIL HARMAN**
**Executive Officer**
**Human Research & Ethics Committee**

cc: Dr Angus McLachlan, B&SS&H
Ms Katrina Brereton

enc.

J:\SALLY\ETHICS96\LETTERS\APFM07LT.DOC

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Victoria, 3353 Australia
Telephone: 053 279 000
Facsimile: 053 279 545

# THE ROYAL CHILDREN'S HOSPITAL

# CHILD/PARENT INFORMATION & CONSENT FORM

PROJECT TITLE: ***AUDIOVISUAL CARTOON DISTRACTION OF CHILDREN UNDERGOING VENIPUNCTURE: AN ADJUVANT NURSING INTERVENTION.***

INVESTIGATORS: ***BERNIE WHITAKER***
***KATE BRERETON***

The aim of this research project is to enable the investigators to better understand the experience of pain in children from the child's point of view; and to investigate the effects of distraction on the pain experience.

When children go into a hospital, a nurse or doctor might have to take a sample of blood from the child to do any one of a number of blood tests as part of the child's treatment. Children hate having needles but unfortunately, a blood test may be required. This involves placing a small needle into a vein in the child's arm and withdrawing the blood using a syringe.

Distraction is recognised as a useful way of helping children through painful procedures and there are several different methods that can be used to distract children. This research study will use cartoons on a television in the room as a form of distraction while the blood test is done on the child. The investigators are particularly interested in the relationship between fear and pain in children undergoing painful procedures and whether or not watching a cartoon helps to allay the child's fear and reduce the sensation of pain. There will be two groups of children in this study: if your child's birthday is on an even date then he/she will have their blood test in the room with the television and cartoon. If your child's birthday is on an odd date then he/she will have the blood test in the usual manner that is without a television and cartoon. During the blood test, in the cartoon group, the child's attention will be directed towards the cartoon on the television; in the other group the blood test will be done without distraction. Following the procedure the investigator will ask the child to describe how painful the procedure was and how frightening it was.

Some children might be totally distracted and not feel much pain or be frightened whilst for others watching cartoons might not help at all. As a result, some children might benefit in that the procedure will be less traumatic, but for some the procedure will still be upsetting.

There will be no health risks associated with participation in this research project. Nor will non-participation in any way affect the care your child receives during the current, or any future admissions to the Royal Children's Hospital. Children are free to choose not to answer any question(s) about how painful or frightening the procedure was and may terminate their involvement at any stage. Furthermore, children and parents who volunteer to participate in this project will be able to withdraw their involvement at any point without prejudice. Any questions regarding the project titled ***"Audiovisual cartoon distraction of children undergoing venipuncture: an adjuvant nursing intervention."*** may be directed to the Senior Investigator - Mr Bernie Whitaker on **(053) 279674**. Alternatively, any questions may be directed to the Co-investigator Ms Kate Brereton on telephone number **3456356**.

I/We ........................................................ have read (or have had read to me - where appropriate) and understood the information above, and any questions I have asked have been answered to my satisfaction.

I/WE AGREE TO ALLOW OUR CHILD TO PARTICIPATE IN THIS ACTIVITY, AND UNDERSTAND THAT I AM FREE TO WITHDRAW HIM/HER FROM THE STUDY AT ANY TIME WITHOUT EXPLANATION AND THAT NON-PARTICIPATION IN THIS STUDY WILL NOT IN ANY WAY AFFECT ACCESS TO THE BEST AVAILABLE TREATMENT AND CARE AT THE ROYAL CHILDREN'S HOSPITAL.

I/We agree that research data collected during the study may be published or provided to other researchers, on condition that my name or the name of my child is not used.

NAME OF PARTICIPANT (in block letters)

**CHILD: ..........................................  PARENT/GUARDIAN: ..........................................**

**SIGNATURE OF PARENT/GUARDIAN ...................................................................**

**WITNESS: ...................................................................**

**DATE: ...................................................................**

Royal Children's Hospital
Melbourne, Victoria

Department

Flemington Road,
Parkville, Victoria, 3052
Australia.
Telephone: (03) 9345 55:
Facsimile: (03) 9345 578

# CONSENT FORM FOR PARENT/GUARDIAN TO GIVE CONSENT FOR THEIR CHILD TO PARTICIPATE IN A RESEARCH PROJECT

I/We ..............................................................................

parent / guardian of ..............................................................

consent to him / her taking part in the research study: *Transforming The Experience Of Procedural Pain And Distress In Children Through The Adjuvant Use Of Relaxation Therapy And Guided Imagery* which has been explained to me in writing (letter attached) by Mr Bernie Whitaker. I understand that this includes videorecording of my child during the procedure.

I/WE UNDERSTAND THAT I AM FREE TO WITHDRAW HIM/HER FROM THE STUDY AT ANY TIME WITHOUT EXPLANATION AND THAT NON-PARTICIPATION IN THIS STUDY WILL NOT IN ANY WAY AFFECT ACCESS TO THE BEST AVAILABLE TREATMENT AND CARE AT THE ROYAL CHILDREN'S HOSPITAL.

I **DO / DO NOT** consent to the use of the videorecording for educational purposes (delete whichever is applicable).

SIGNED .............................................................. ......../......../........
Date

WITNESS .............................................................. ......... ......... .........
Name Relationship

.............................................................. ......../......../........
Signature Date

## APPENDIX B

### *Checks on Randomisation of Participants in the Cartoon Study*

**Table B-1**

*Age by Condition*

| | Group | N | Mean | *SD* | Std. Error Mean |
|---|---|---|---|---|---|
| Age | Cartoon | 48 | 7.85 [a] | 3.97 | .57 |
| | Control | 52 | 7.50 [a] | 3.97 | .55 |

Note

[a] $t$ (98) = .446, $p$ =. 657

**Table B-2**

*Gender by Condition*

| | | Group | | Total |
|---|---|---|---|---|
| | | Cartoon | Control | |
| Gender | Boy | 25 [a] | 32 [a] | 57 |
| | Girl | 23 [a] | 20 [a] | 43 |
| Total | | 48 | 52 | 100 |

Note

[a] $\chi^2$ (1, $N$ = 100) = 0.91, $p$ =. 340.

**Table B-3**

*Previous Venepuncture by Condition*

| | | Group | | Total |
|---|---|---|---|---|
| | | Cartoon | Control | |
| History of Venepuncture | No previous venepuncture | 31 [a] | 40 [a] | 71 |
| | Venepuncture more than 2 years ago. | 17 [a] | 12 [a] | 29 |
| Total | | 48 | 52 | 100 |

Note

[a] $\chi^2$ (1, $N$ = 100) = 1.85, $p$ =. 174.

**Table B-4**

*Nurse taking Blood by Condition*

| | | Group | | Total |
|---|---|---|---|---|
| | | Cartoon | Control | |
| Nurse | 1 | 6 | 4 | 10 |
| | 2 | 18 | 14 | 32 |
| | 3 | 9 | 9 | 18 |
| | 4 | 5 | 4 | 9 |
| | 5 | 7 | 10 | 17 |
| | 6 | 2 | 11 | 13 |
| | 7 | 1 | 0 | 1 |
| Total | | 48 | 52 | 100 |

$X^2$ (6, $N$ = 100) = 8.63, $p$ =. 196.

**Table B-5**

*Time of Day by Condition*

| | | Group | | Total |
|---|---|---|---|---|
| | | Cartoon | Control | |
| Time of day | Morning | 14 | 18 | 32 |
| | Afternoon | 34 | 34 | 68 |
| Total | | 48 | 52 | 100 |

Note

[a] $\chi^2$ (1, $N$ = 100) = 0.34, $p$ =. 560.

**Table B-6**

*Parents Present by Condition*

| | Group | | Total |
|---|---|---|---|
| | Cartoon | Control | |
| Mother | 33 | 35 | 68 |
| Father | 8 | 6 | 14 |
| Both Parents | 6 | 10 | 16 |
| No Parents[a] | 0 | 1 | 1 |
| Other[b] | 1 | 0 | 1 |
| Total | 48 | 52 | 100 |

Note:
[a]One 16 year-old independent boy wanted to participate in the study and was included.
[b] One child was accompanied by a grandparent.
[c]$\chi^2$ (4, $N$ = 100) = 3.19, $p$ =. 527

## APPENDIX C

***Dependent Variable Untransformed Means and Standard Deviations by Condition in the Cartoon Study***

**Table C-1**

*Untransformed measures by condition in the Cartoon Study*

| | CONTROL | | | CARTOON | | |
|---|---|---|---|---|---|---|
| | *n* | Mean | SD | *n* | Mean | SD |
| Pain – CHEOPS | 29 | 10.66 | 2.00 | 25 | 8.44 | 2.04 |
| Pain – VAS | 36 | 35.97 | 24.10 | 33 | 27.39 | 23.25 |
| Fear – Poker Chip | 36 | 1.67 | 1.14 | 33 | .73 | .76 |

## APPENDIX D

### *Imagery Absorption Scale (IAS): Internal Consistency*

**Table D-1**

*IAS Corrected Item-Total Correlations*

| Scored Item | Corrected Item-Total Correlation | Alpha if Item Deleted |
|---|---|---|
| Eyes | .60 | .84 |
| Place | .38 | .87 |
| Relaxed | .66 | .84 |
| Speech | .79 | .82 |
| Flow | .69 | .84 |
| Affect | .66 | .84 |
| Duration | .74 | .83 |

**APPENDIX E**

***Checks on Randomisation of Participants in the Relaxation and Imagery Study.***

**Table E-1**

*Age by Condition*

| | n | Age | | | | | | | | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | |
| Control | 30 | 2 | 1 | 1 | 4 | 2 | 2 | 4 | 2 | 8 | 2 | 2 | 11.7[a] |
| RT/GI | 30 | 3 | 4 | 2 | 3 | 2 | 3 | 5 | 5 | 2 | 1 | | 10.33 [a] |
| Relaxation | 30 | 2 | 5 | 2 | 2 | 2 | 6 | 2 | 3 | 4 | 2 | | 10.53 [a] |
| Imagery | 30 | 1 | 6 | 3 | 2 | 3 | 3 | 6 | 2 | 1 | 2 | 1 | 10.37 [a] |
| | 120 | 8 | 16 | 8 | 11 | 9 | 14 | 17 | 12 | 15 | 7 | 3 | |

Note

[a] $F$ (3, 116) = 1.77, *ns*.

**Table E-2**

*Gender by Condition*

| | Boy | Girl | Total |
|---|---|---|---|
| Control | 13 | 17 | 30 |
| RT/GI | 12 | 18 | 30 |
| Relaxation | 14 | 16 | 30 |
| Imagery | 13 | 17 | 30 |
| | 52 | 68 | 120 |

$\chi^2$ (3, $N$ = 120) = 0.27, *ns*.

**Table E-3**

*Nurse Performing the Venepuncture by Condition*

| | Nurse 1 | Nurse 2 | Nurse 3 | Nurse 4 | Nurse 5 | Nurse 6 | Nurse 7 | Total |
|---|---|---|---|---|---|---|---|---|
| Control | 3 | 3 | 4 | 8 | 4 | 3 | 5 | 30 |
| RT/GI | 5 | 5 | 1 | 8 | 5 | 2 | 4 | 30 |
| Relaxation | | 4 | 3 | 12 | 2 | 4 | 5 | 30 |
| Imagery | 8 | 3 | 5 | 8 | 2 | 3 | 1 | 30 |
| | 16 | 15 | 13 | 36 | 13 | 12 | 15 | 120 |

$\chi^2$ (18, $N$ = 120) = 18.87

**Table E-4**

*Caregiver Present by Condition*

| | Mother | Father | Both | Other | Total |
|---|---|---|---|---|---|
| Control | 21 | 4 | 3 | 2 | 30 |
| RT/GI | 22 | 3 | 2 | 3 | 30 |
| Relaxation | 21 | 5 | 3 | 1 | 30 |
| Imagery | 19 | 3 | 1 | 7 | 30 |
| | 83 | 15 | 9 | 13 | 120 |

$\chi^2$ (9, $N$ = 120) = 8.57, *ns.*

**Table E-5**

*Previous Venepuncture by Condition*

| | Previous venepuncture | | Total |
|---|---|---|---|
| | Yes | No | |
| Control | 21 | 9 | 30 |
| RT/GI | 22 | 8 | 30 |
| Relaxation | 22 | 8 | 30 |
| Imagery | 27 | 3 | 30 |
| | 92 | 28 | 120 |

$\chi^2$ (3, $N$ = 120) = 4.01, *ns.*

## APPENDIX F

### *Untransformed and Transformed Descriptive Statistics in the Relaxation and Imagery Study*

**Table F-1**

*Untransformed Descriptive Statistics – Whole Sample*

| | *N* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|
| Pain | 118 | 28.41 | 28.08 | 1.31 | .79 |
| Fear pre-test | 120 | 1.88 | 1.26 | .43 | -.89 |
| Fear Post-test | 120 | 1.16 | 1.20 | .95 | .05 |
| Bother | 119 | 24.75 | 31.48 | 1.38 | .69 |
| Uptight - Parent rating Pre-test | 120 | 4.81 | 3.54 | .02 | -1.39 |
| Uptight - Parent rating Post-test | 120 | 3.71 | 2.95 | .56 | -.65 |
| Uptight - Nurse rating Pre-test | 120 | 4.39 | 2.54 | .08 | -.60 |
| Uptight - Nurse rating Post-test | 120 | 3.87 | 2.72 | .48 | -.71 |
| Distress – OSBD | 117 | 1.41 | 3.03 | 4.39 | 26.72 |

**Table F-2**

*Untransformed Descriptive Statistics – Control Condition*

| | *n* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|
| Pain | 30 | 26.87 | 20.24 | .96 | -.15 |
| Fear Pre-test | 30 | 1.63 | 1.03 | .62 | .26 |
| Fear Post-test | 30 | 1.47 | 1.20 | .28 | -1.01 |
| Bothered | 30 | 26.50 | 28.97 | 1.27 | .84 |
| Uptight - Parent rating Pre-test | 30 | 4.07 | 3.50 | .21 | -1.45 |
| Uptight - Parent rating Post-test | 30 | 4.10 | 2.99 | .12 | -1.01 |
| Uptight - Nurse rating Pre-test | 30 | 3.70 | 2.48 | -.07 | -.99 |
| Uptight - Nurse rating Post-test | 30 | 3.90 | 2.76 | .122 | -.99 |
| Distress – OSBD | 30 | 1.11 | 1.60 | 1.35 | .78 |

**Table F-3**

*Untransformed Descriptive Statistics – Relaxation Condition*

| | *n* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|
| Pain | 30 | 28.37 | 31.93 | 1.47 | .77 |
| Fear Pre-test | 30 | 1.87 | 1.48 | .31 | -1.32 |
| Fear Post-test | 30 | 1.23 | 1.45 | 1.08 | -.20 |
| Bothered | 30 | 23.83 | 30.56 | 1.75 | 2.02 |
| Uptight - Parent rating Pre-test | 30 | 4.60 | 3.56 | .19 | -1.33 |
| Uptight - Parent rating Post-test | 30 | 3.43 | 2.75 | .72 | -.31 |
| Uptight - Nurse rating Pre-test | 30 | 4.33 | 2.43 | -.06 | -.30 |
| Uptight - Nurse rating Post-test | 30 | 3.63 | 2.36 | .83 | .43 |
| Distress – OSBD | 30 | 1.5143 | 4.60 | 4.38 | 20.70 |

**Table F-4**

*Untransformed Descriptive Statistics – Imagery Condition*

| | *n* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|
| Pain | 29 | 30.34 | 30.32 | 1.32 | .81 |
| Fear Pre-test | 30 | 2.03 | 1.38 | .19 | -1.16 |
| Fear Post-test | 30 | 1.23 | 1.22 | .85 | -.09 |
| Bothered | 29 | 22.17 | 30.90 | 1.46 | 1.09 |
| Uptight - Parent rating Pre-test | 30 | 4.87 | 3.79 | .00 | -1.52 |
| Uptight - Parent rating Post-test | 30 | 3.70 | 3.19 | .77 | -.50 |
| Uptight - Nurse rating Pre-test | 30 | 4.67 | 2.59 | .18 | -.45 |
| Uptight - Nurse rating Post-test | 30 | 4.03 | 3.05 | .63 | -.82 |
| Distress – OSBD | 28 | 2.00 | 3.16 | 1.75 | 2.54 |

**Table F-5**

*Untransformed Descriptive Statistics – Relaxation/Imagery Condition*

| | *n* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|
| Pain | 29 | 28.10 | 29.80 | 1.15 | .53 |
| Fear Pre-test | 30 | 2.00 | 1.14 | .74 | -.92 |
| Fear Post-test | 30 | .70 | .70 | .50 | -.78 |
| Bothered | 30 | 26.40 | 36.39 | 1.26 | .09 |
| Uptight - Parent rating Pre-test | 30 | 5.70 | 3.27 | -.28 | -1.15 |
| Uptight - Parent rating Post-test | 30 | 3.60 | 2.99 | .67 | -.27 |
| Uptight - Nurse rating Pre-test | 30 | 4.87 | 2.64 | .18 | -.88 |
| Uptight - Nurse rating Post-test | 30 | 3.90 | 2.78 | .36 | -.96 |
| OSBD Observer 1. | 29 | 1.05 | 1.82 | 2.34 | 5.86 |

**Table F-6**

*Transformed Descriptive Statistics – Control Condition*

| | Transformation X = Score | *n* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Pain | $X^{.4}$ | 30 | 3.45 | 1.21 | -.33 | .90 |
| Fear Pre | $X^{.7}$ | 30 | 1.33 | .67 | -.15 | .25 |
| Fear Post | $X^{.7}$ | 30 | 1.17 | .84 | -.18 | -1.19 |
| Bother | $X^{.4}$ | 30 | 3.04 | 1.83 | -.01 | -.70 |
| Uptight – Parent rating Pre-test | $X^{.8}$ | 30 | 2.81 | 2.25 | .01 | -1.52 |
| Uptight – Parent rating Post-test | $X^{.8}$ | 30 | 2.90 | 1.93 | -.18 | -1.02 |
| Uptight – Nurse rating Pre-test | $X^{.8}$ | 30 | 2.70 | 1.65 | -.36 | -.90 |
| Uptight – Nurse rating Post-test | $X^{.8}$ | 30 | 2.81 | 1.78 | -.16 | -1.04 |
| Distress – OBSD | $X^{.1}$ | 30 | .49 | .54 | .18 | -2.07 |
| Relaxed | Reflected $X^{.5}$ | 30 | 2.39 | .59 | -.63 | -.20 |

**Table F-7**

*Transformed Descriptive Statistics – Relaxation Condition*

| | Transformation X = Score | *n* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Pain | $X^{.4}$ | 30 | 3.33 | 1.53 | .87 | -.38 |
| Fear Pre | $X^{.7}$ | 30 | 1.40 | .95 | -.11 | -1.17 |
| Fear Post | $X^{.7}$ | 30 | .95 | .97 | .64 | -.85 |
| Bother | $X^{.4}$ | 30 | 2.77 | 1.91 | .19 | -.43 |
| Uptight – Parent rating Pre-test | $X^{.8}$ | 30 | 3.17 | 2.21 | -.04 | -1.33 |
| Uptight – Parent rating Post-test | $X^{.8}$ | 30 | 2.53 | 1.74 | .42 | -.68 |
| Uptight – Nurse rating Pre-test | $X^{.8}$ | 30 | 3.12 | 1.54 | -.41 | -.26 |
| Uptight – Nurse rating Post-test | $X^{.8}$ | 30 | 2.71 | 1.45 | .50 | -.03 |
| Distress – OBSD | $X^{.1}$ | 30 | .36 | .52 | .82 | -1.29 |
| Relaxed | Reflected $X^{.5}$ | 29 | 1.77 | .62 | .45 | -.76 |

**Table F-8**

*Transformed Descriptive Statistics – Imagery Condition*

| | Transformation X = Score | *n* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Pain | $X^{.4}$ | 29 | 3.40 | 1.66 | -.01 | -.10 |
| Fear Pre | $X^{.7}$ | 30 | 1.53 | .86 | -.31 | -.74 |
| Fear Post | $X^{.7}$ | 30 | 1.00 | .86 | .29 | -.94 |
| Bother | $X^{.4}$ | 29 | 2.40 | 2.14 | .41 | -1.09 |
| Uptight – Parent rating Pre-test | $X^{.8}$ | 30 | 3.29 | 2.38 | -.20 | -1.46 |
| Uptight – Parent rating Post-test | $X^{.8}$ | 30 | 2.66 | 1.98 | .48 | -.77 |
| Uptight – Nurse rating Pre-test | $X^{.8}$ | 30 | 3.32 | 1.59 | -.19 | -.22 |
| Uptight – Nurse rating Post-test | $X^{.8}$ | 30 | 2.90 | 1.86 | .39 | -.93 |
| Distress – OBSD | $X^{.1}$ | 28 | .55 | .57 | .07 | -2.06 |
| Relaxed | Reflected $X^{.5}$ | 29 | 2.13 | .74 | -.34 | -1.04 |
| Imagery – IAS | Log Reflected X | 30 | .60 | .30 | -.61 | -.32 |

**Table F-9**

*Transformed Descriptive Statistics – Relaxation and Imagery Condition*

| | Transformation X = Score | *n* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Pain | $X^{.4}$ | 29 | 3.10 | 1.90 | -.10 | -.88 |
| Fear Pre | $X^{.7}$ | 30 | 1.57 | .63 | .61 | -1.13 |
| Fear Post | $X^{.7}$ | 30 | .65 | .61 | .11 | -1.49 |
| Bother | $X^{.4}$ | 30 | 2.54 | 2.33 | .40 | -1.22 |
| Uptight – Parent rating Pre-test | $X^{.8}$ | 30 | 3.88 | 1.98 | -.51 | -.85 |
| Uptight – Parent rating Post-test | $X^{.8}$ | 30 | 2.59 | 1.91 | .30 | -.64 |
| Uptight – Nurse rating Pre-test | $X^{.8}$ | 30 | 3.46 | 1.57 | .00 | -.99 |
| Uptight – Nurse rating Post-test | $X^{.8}$ | 30 | 2.83 | 1.74 | .12 | -1.08 |
| Distress – OBSD | $X^{.1}$ | 29 | .44 | .54 | .40 | -1.94 |
| Relaxed | Reflected $X^{.5}$ | 30 | 1.87 | .72 | .34 | -1.14 |
| Imagery – IAS | Log Reflected X | 30 | .51 | .41 | -.07 | -1.70 |

## APPENDIX G

***Untransformed Descriptive Statistics: Relaxation Scores, Whole Sample and by Condition.***

**Table G-1**

*Untransformed Relaxation Scores*.

| | *N* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|
| Whole Sample | 118 | 6.34 | 2.89 | -.38 | -.89 |
| Control | 30 | 4.97 | 2.63 | .11 | -.67 |
| RT/GI | 30 | 7.00 | 2.89 | -.76 | -.49 |
| Relaxation | 29 | 7.48 | 2.4 | -.97 | .34 |
| Imagery | 29 | 5.93 | 3.03 | -.19 | -.80 |

**APPENDIX H**

***Untransformed Descriptive Statistics: IAS Scores, Whole Sample and by Condition.***

**Table H-1**

*Untransformed IAS Scores*.

| | *N* | Mean | *SD* | Skewness | Kurtosis |
|---|---|---|---|---|---|
| Whole Sample | 60 | 8.22 | 3.26 | -.48 | -1.01 |
| RT/GI | 30 | 8.27 | 3.73 | -.48 | -1.33 |
| Imagery | 30 | 8.17 | 2.78 | -.51 | -.61 |

## APPENDIX I

***Correlations between the Post-Procedural Measures in the Non-Imaging and Imaging Conditions***

**Table I-1**

*Correlations: Non-Imaging Conditions – Post-procedural measures (N = 60)*

| | Pain | Fear Post | Bother | Valency of Thoughts | Valency of Feelings | Parent Post | Nurse Post | Distress |
|---|---|---|---|---|---|---|---|---|
| Pain | 1.000 | .808** | .732** | .532** | .624** | .536** | .420** | .468** |
| Fear Post | | 1.000 | .664** | .602** | .592** | .587** | .416** | .355** |
| Bother | | | 1.000 | .569** | .537** | .497** | .395** | .380** |
| Thoughts | | | | 1.000 | .553** | .582** | .255* | .288 |
| Feelings | | | | | 1.000 | .434** | .343** | .413** |
| Parent Post | | | | | | 1.000 | .533** | .197 |
| Nurse Post | | | | | | | 1.000 | .255* |
| Distress | | | | | | | | 1.000 |

Note:

*  Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

**Table I-2**

*Correlations: Imaging Conditions – Post-procedural measures*

| | | Pain | Fear Post | Bother | Valency of Thoughts | Valency of Feelings | Parent Post | Nurse Post | Distress |
|---|---|---|---|---|---|---|---|---|---|
| Pain | r | 1.000 | .543** | .765** | .397** | .406** | .493** | .560** | .440** |
| | N | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 55 |
| Fear Post | r | | 1.000 | .417** | .438** | .357** | .520** | .494** | .348** |
| | N | | 60 | 59 | 60 | 60 | 60 | 60 | 57 |
| Bother | r | | | 1.000 | .419** | .471** | .544** | .587** | .534** |
| | N | | | 59 | 59 | 59 | 59 | 59 | 56 |
| Thoughts | r | | | | 1.000 | .337** | .387** | .273* | .257 |
| | N | | | | 60 | 60 | 60 | 60 | 57 |
| Feelings | r | | | | | 1.000 | .337** | .184 | .214 |
| | N | | | | | 60 | 60 | 60 | 57 |
| Parent Post | r | | | | | | 1.000 | .688** | .529** |
| | N | | | | | | 60 | 60 | 57 |
| Nurse Post | r | | | | | | | 1.000 | .545** |
| | N | | | | | | | 60 | 57 |
| Distress | r | | | | | | | | 1.000 |
| | N | | | | | | | | 57 |

Note:

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

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