16

Psychological interventions for acute pediatric pain

CHRISTINA LIOSSI AND LINDA S FRANCK

KEY LEARNING POINTS

- Psychological factors play an important role in shaping pain perception in children. These factors include personality (temperament), mood (anxiety, depression), and cognitions (attitudes, beliefs, meanings, expectancies, memories of previous painful experiences).
- Comprehensive assessment of the psychological factors that shape pain perception is imperative to maximize the success of pain management interventions.
- Psychological interventions are useful for the management of acute pediatric pain, although evidence for their efficacy varies depending on type of pain.
- For procedure-related pain, particularly needle procedures, distraction, hypnosis, and cognitive-behavior therapy are evidence-based interventions.
- For postoperative pain, preparation, guided imagery, and cognitive behavior therapy are promising.
- For acute pain due to illness or injury, cognitive behavior therapy is promising.
- How parents feel and what they think and do influences their child's pain perception and response. Parents need to be included in pain management interventions.

INTRODUCTION

The most common type of pain experienced by children is acute pain resulting from injury, illness, or, in many cases, necessary medical procedures. Healthy children undergo immunizations repeatedly throughout their childhood. Currently, the Advisory Committee on Immunization Practices (www.csc.gov/nip/acip), the American Academy of Family Physicians (www.aafp.org), and the Canadian Paediatric Society (www.cps.ca) recommend over 20 various immunizations before the age of 18 years. A variety of medical conditions can result in different levels of pain for children from mild to extreme. These include, but are not limited to, burns, otitis media, pharyngitis, acute headaches, orthopedic injuries, some cancers, sickle cell crises, and procedures such as venepunctures, lumbar punctures, and bone marrow aspirations. This chapter will focus on:

- **Procedure-related pain**. Defined as pain caused by a diagnostic or treatment procedure in the conscious patient (e.g. venepuncture, lumbar puncture, dental). These procedures, although sometimes perceived as intensely painful by children, are not necessarily tissue damaging or invasive (e.g. physiotherapy).

- **Acute postoperative pain**. Defined as pain after a surgical procedure, sometimes associated with drains, chest or nasogastric tubes, or related to postoperative mobilization and resumption of daily activities.
- **Acute pain due to an illness or injury**. Defined as disease-related physiological processes that cause tissue damage and acute or recurrent pain (e.g. sickle cell crisis, fractures with osteogenesis imperfecta, cancer) of less than three months duration.

SIGNIFICANCE OF THE PROBLEM

There is now a substantial body of research affirming that children who have been repeatedly exposed to anxiety-provoking painful medical events are at increased risk for developing adult dysfunctional cognitions and avoidant attitudes toward health care.[1] In some cases, serious mental health problems, such as posttraumatic stress can occur. Posttraumatic stress is characterized by severe memories of the traumatic event; avoidance of people, places, and things that remind the child of the trauma; poor sleep and nightmares; and difficulty feeling calm and in control. In a study of over 300 cancer survivors and their parents,[2] distressing recollections of pain and painful procedures were prominent, in both mothers' and children's accounts, supporting the notion that poorly managed pain during procedures contributes to long-term psychological difficulties for children and their parents. Relatively sophisticated theories have been developed that explain these risk mechanisms and give direction to specific approaches for clinical intervention.[3]

In recent years, great progress has been made in the use of pharmacological analgesia to prevent and treat children's acute pain. However, as yet there are no perfect analgesics that provide complete pain relief without risk or side effects. Thus, the risks of analgesics may outweigh the benefit for some acute pain situations, they may provide incomplete analgesia, or have bothersome side effects such that children or parents refuse them.[4] Furthermore, pharmacological analgesia does not adequately address the emotional, cognitive, and behavioral components that are integral to pain perception. Consequently, effective pain management requires an interdisciplinary approach and must include behavioral, psychological, and physical techniques, which can be used alone or in combination with pharmacologic treatment.

This chapter summarizes current knowledge about the theoretical, empirical, and clinical characteristics of certain psychological interventions, and aims to encourage practitioners working with children to make informed choices in their treatment selection, and understand the potential risks, as well as benefits, of specific treatment choices for their young patients. The chapter begins by briefly discussing a model of acute pediatric pain and the general assessment strategy that is required when evaluating children experiencing pain. It continues by presenting relevant developmental and cultural considerations. Following this, psychological interventions that are widely used in clinical practice and have been empirically investigated in acute pain management with children (such as preparation, relaxation, distraction, hypnosis, and multicomponent cognitive-behavioral programs) are presented in detail. For each intervention the available evidence supporting its efficacy for postoperative, procedure-related, and illness-related acute pain is discussed. The chapter concludes by reviewing the state of the knowledge regarding the role of parents in pediatric pain perception and management.

PSYCHOLOGICAL INFLUENCES ON CHILDREN'S ACUTE PAIN

Most researchers agree that many factors can influence a child's response to pain including historical events (previous personal and family experience with pain), environmental, developmental, sociocultural, psychological (cognitive, emotional, behavioral), and contextual.[5, 6, 7] Identifying psychological factors associated with acute pain not only has theoretical value, but is vital for the development and refinement of effective treatments. **Figure 16.1** presents a model of acute pediatric pain based on the biobehavioral model of pain[5, 8] and recent research findings. The main child-related factors contributing to pain perception and response are briefly discussed below.

Anxiety

Preoperative anxiety in young children undergoing surgery is associated with a more painful postoperative recovery and a higher incidence of sleep and other behavioral problems.[9][IV]

Anxiety sensitivity

Anxiety sensitivity is the fear of arousal-related somatic sensations, arising from beliefs that these sensations have harmful consequences (e.g. fear of palpitations arising from beliefs that cardiac sensations lead to heart attacks).[10] Lipsitz and colleagues[11] found that youngsters with noncardiac chest pain had higher levels of anxiety symptoms and anxiety sensitivity compared to youngsters with benign heart murmurs.

Expectancies

Expectancies are beliefs about a future state of affairs and arise from knowledge about outcome contingencies. They are subjective probabilities and vary in certainty.[12] Palermo and Drotar[13] in their model of postoperative pain propose that a child's postoperative pain report is a product of background variables (age, surgery severity, medication

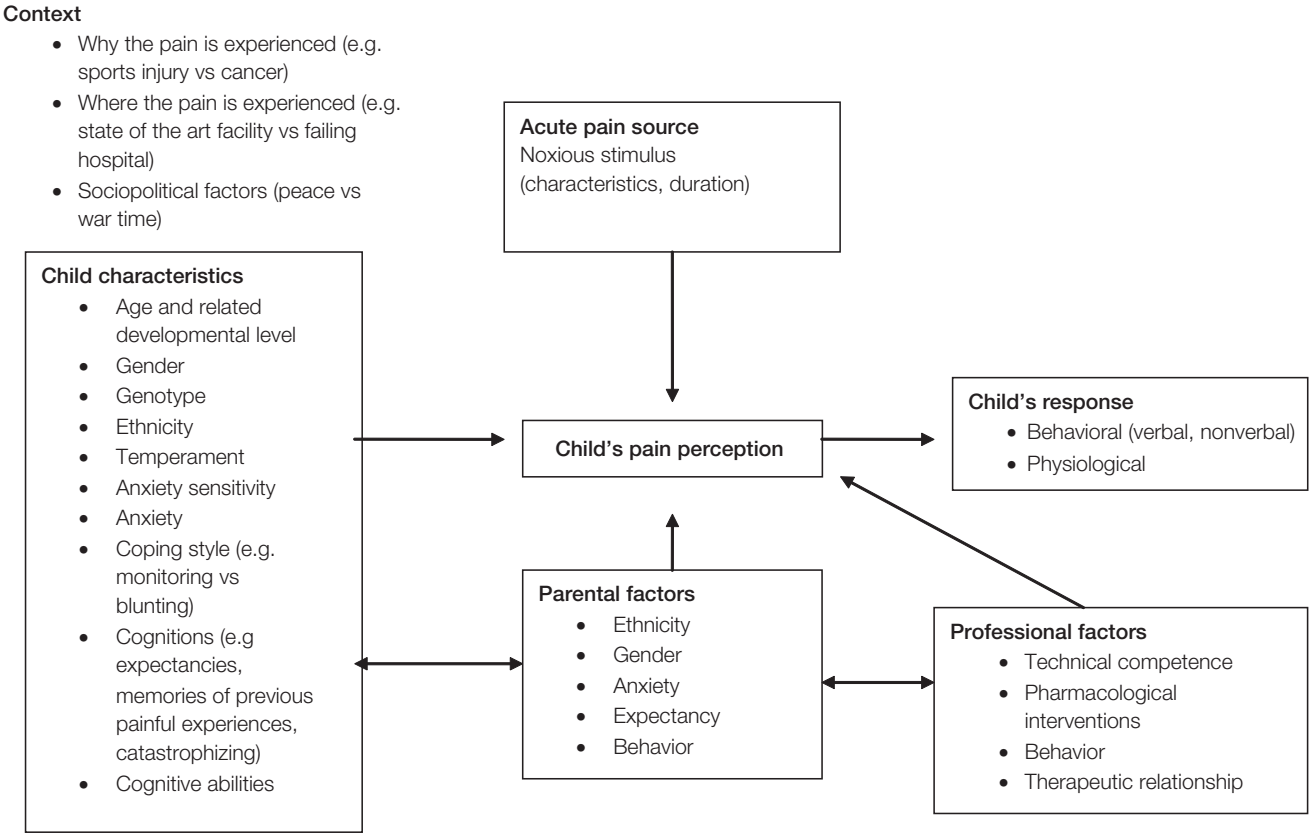

Figure 16.1 A model of acute pediatric pain.

received), anticipatory emotions (anxiety), and expectations about pain and analgesia. Logan and Rose[14] found that there is self-fulfilling prophesy in adolescents' postoperative pain experience, wherein teens who expect to have high levels of postoperative pain ultimately report more pain and use more opioid (via patient-controlled analgesia (PCA)) than those who expect lower levels of pain.

Temperament

Temperament is the behavior style or the "how" of behavior as contrasted with the abilities, or "what" of behavior, and the motivations, or "why" of behavior.[15] A more pain-sensitive temperament has been associated with increased reports of pain and anxiety during painful medical procedures. Chen and colleagues[16] found that pain sensitivity moderated the effectiveness of a psychological intervention in reducing observer-related distress during lumbar punctures. Children with higher pain sensitivity who received the intervention showed greater decreases in distress and systolic blood pressure than did children with lower pain sensitivity. In the control group, those with high pain sensitivity showed greater increases in these variables over time. In a postoperative setting, Helgadottir and Wilson[17] found that after tonsillectomy children who were more temperamentally active and had lower temperamental thresholds, had more negative moods, were distractible, and reported higher pain intensity.

Catastrophizing

Catastrophizing is defined as "an exaggerated negative mental set brought to bear during actual or anticipated pain experience."[18] Bennett-Branson and Craig[19] found that coping strategy use, perceived self-efficacy, and frequency of catastrophizing thoughts were significantly predictive of children's postoperative pain, affective distress, and physical recovery. Parental anxiety was positively related to child anxiety, and inversely related to child self-efficacy and frequency of cognitive coping.

Coping style

In the cognitive–social model of health-information processing, developed by Miller,[20, 21] the style of information processing where individuals typically cope with threat by distracting themselves and avoiding threatening cues is called "blunting." Blunters should respond best to pain management strategies such as distraction, which require them to direct their attention away from the noxious event or stimulus. In contrast, individuals who typically search

for and tune into threatening material and attend closely to physical sensations, termed "monitors" by Miller and colleagues,[21] should do best with pain management strategies such as sensation monitoring, which allow them to monitor or attend to the pain situation, while cognitively reconceptualizing the noxious stimulation in an objective, less affectively arousing manner.[21, 22]

Memory

Children's memories of painful experiences can have long-term consequences for their reaction to later painful events and their acceptance of later healthcare interventions.[23] Chen and colleagues[16] demonstrated that at any given age, children with greater exaggeration in negative memory of anxiety and pain, report higher distress during a future lumbar puncture.

DEVELOPMENTAL CONSIDERATIONS

Children and adolescents experience the same amount of pain as adults do for similar procedures and in many cases even more. For example, in athletes scheduled for arthroscopic anterior cruciate ligament reconstructive surgery using the patella autograft procedure, adolescents reported greater pain intensity, higher state anxiety, and greater pain catastrophizing (particularly helplessness and ruminations) than did adults.[24]

Children's understanding of pain and its relief is thought to follow Piagetian developmental stages (see **Table 16.1**), therefore pain measurement and management needs to be developmentally appropriate.[27] For example, in one study, children who received age-appropriate information about their upcoming medical procedure displayed less overt distress than those receiving age-advanced information.[28][III]

ETHNIC AND CULTURAL CONSIDERATIONS

Cultural competence in treatment is critical to adapting psychological treatment paradigms to clients from diverse cultural, religious, and racial/ethnic groups. Different cultural groups are likely to have varying norms regarding many relevant issues, such as the role of the family, styles

Table 16.1 Developmental considerations in relation to psychological interventions for children's pain.

Developmental stage	Cognitive abilities	Understanding of pain	Psychological interventions
Preoperational (2–7 years)	Learns to use language and to represent objects by images and words	Pain is understood as an aversive sensory experience	Children benefit from interventions that are active, concrete, and outward focused, e.g. simple electronic toys that make animal noises, recite a sentence, or play a tune when the child touches them may be effective distractors[26]
	Thinking is still egocentric: has difficulty taking the viewpoint of others	Children chose action over thought strategies to deal with negative emotions[25]	
	Classifies objects by a single feature, e.g. groups together all the red blocks regardless of shape or all the square blocks regardless of color		
Concrete operational (7–11 years)	Can think logically about objects and events	Incomplete understating of the psychosocial nature of pain	Use of a narrative rather than a rationalistic paradigm is preferable
	Achieves conservation of number (age 6 years), mass (age 7 years), and weight (age 9 years)	Self-regulatory abilities are developing	In a story, abstract concepts can become concrete, and analogy and metaphor can be used to demonstrate reasoning
	Classifies objects according to several features and can order them in series along a single dimension, such as size.	Limitations of domain-specific knowledge, memory, and motivation	
Formal operational (11 years and over)	Can think logically about abstract propositions and test hypotheses systematically	Pain is understood as a psychosocial experience	Children can benefit from verbally based, abstract, and introspective interventions, e.g. reframing beliefs by realistically appraising an aversive situation and their ability to cope with it
	Becomes concerned with the hypothetical, the future, and ideological problems	Has the ability for self-reflection and perspective taking, and can understand causality	

of coping with adverse life events, the cultural meaning of pain, the meaning of certain adverse life events such as illness, manners of trust and mistrust, stigma associated with disease, and reliance on informal sources of help and care.

Unfortunately, only a few studies have specifically addressed cultural and ethnic issues in children's pain. Pfefferbaum and colleagues[29] found a decrease in observed and reported distress with increasing age in children undergoing lumbar punctures or bone marrow aspirations, regardless of ethnic groups. Hispanic parents, however, reported significantly higher levels of anxiety than did Ango-American parents. Jones and colleagues[30] found few ethnic differences in parents' desire to be present during their child's painful medical procedures with most parents overall preferring to remain present even for highly invasive procedures. Interestingly, ethnic differences were established in the parents' desire to have the physician decide whether the parent should stay, with black parents less likely to want the physician to decide and English-speaking Hispanic parents more likely to want the physician to decide.

MANAGEMENT

A basic principle of all clinical practice is that assessment should precede the introduction of interventions. Pain can be measured using self-report, behavioral observation,[31] or physiologic measures, depending on the age of the child and his or her communication capabilities.[27, 32] Pain assessment is discussed in more detail elsewhere in this volume (see Chapter 38, Pain assessment in children in the *Practice and Procedures* volume of this series). Accurate acute pain assessment requires consideration of the plasticity and complexity of children's pain perception (see **Figure 16.1**), the influence of psychological and developmental factors discussed above (see above under Psychological influences on children's acute pain), and the appreciation of the potential severity and specific types of pain experienced.[7] There are at present no composite measures of these key factors, and assessment of anxiety, temperament, catastrophizing, and pain coping style are all measured with different instruments, all demonstrating good reliability and validity.

Psychological interventions for acute pain include a wide variety of physiological, behavioral, and cognitive techniques aimed at reducing pain and pain-related distress through the modulation of thoughts, behaviors, and sensory information.[33] Over the past two decades, the psychological management of children experiencing acute pain and their parents has received much attention by both the clinical and research communities. A large and rich clinical treatment literature has developed, describing interventions that are theoretically sound and have good clinical utility. Many of these treatments have been used by practitioners for some time, and are well accepted in the field. Most important, there is now a growing research literature testing the efficacy of these interventions with pediatric populations. Pediatric procedures, particularly needle procedures, have typically been used as a paradigm through which acute pain interventions have been studied. Though much research remains to be done, the efficacy of at least some treatments is supported theoretically, clinically, and empirically.

The approach to the management of acute pain varies according to the origin of the pain and the estimated intensity and duration of the expected pain. As a general principle, a quiet environment, calm adults, and clear, confident instructions increase the likelihood that the specific psychological strategy selected will be effective.

PREPARATION

Preparation includes specific interventions to provide information and reduce anxiety. Leventhal and Johnson,[34] in their Self-Regulation Theory, propose that reactions to threatening situations are influenced by cognitive factors; therefore individuals should be able to consciously influence the experience associated with such situations. Providing three types of information is central to the Self-Regulation Theory: information is provided about the procedure itself (i.e. steps that children must perform and steps that healthcare professionals will perform); the sensations the patient can expect to feel (e.g. sharp scratch, numbness); and about how to cope with the procedure.

A meta-analysis of predominantly adult studies[35][I] involving different stressful medical procedures and various indicators of physical and psychological comfort showed that a combination of procedural and sensory preparation was significantly better than control on all measures (negative affect, self-rated pain, other-rated pain/distress). Effect sizes were larger for the combination than either sensory or procedural information alone, suggesting that this is the most powerful intervention. Suls and Wan[35] explain the effectiveness of such information with their dual-process preparation hypothesis. The procedural information specifies events on which sensory information can be mapped; the sensory information assures that the anticipation of the procedural events is not interpreted in threatening terms.

For pediatric patients, research suggests that psychological preparation for surgery generally improves psychological adjustment and the prepared patients require less pain medication during recovery. When preparatory information also includes instruction or training on coping with postoperative pain, prepared patients require significantly less analgesia than control patients.[36][II], [37] In a recent study, more specifically concerning venepuncture in children, Kolk and colleagues[38][II] found that distress before and during venepuncture was significantly reduced if parents themselves applied the anesthetic

cream and read their child a simple story containing information about the venepuncture procedure and the sensations the child was likely to experience. However, a recent meta-analysis[39][I] of 28 trials with 1951 participants receiving various psychological interventions for procedure-related pain management commented that while there may be preliminary evidence to support the efficacy of information/preparation there is not enough evidence at this time to make strong conclusions.

A growing body of literature suggests that preparatory interventions for stressful medical procedures are most effective when they conform to the patient's preferred way of coping.[40, 41, 42, 43, 44, 45] The literature examining individual differences in information processing or coping styles in response to pain management interventions has been more limited. The few available studies have also found that participants report less pain[46] and less physiological arousal during a painful procedure[47] when the content of the information provided in the intervention is matched to their coping style. However, there is some evidence that individuals react better to a distraction strategy in the early stages of coping with pain, regardless of their individual coping style, whereas the effectiveness of sensation monitoring strategies may be more apparent in chronic pain situations, during which sustained distraction is less feasible.[48, 49]

Based on available evidence, psychological preparation can improve acute pain management and postoperative recovery. However, the type of preparation should be matched to the child's coping style and stage of the procedure.

DISTRACTION

Attentional or cognitive strategies used to process information presented by painful stimuli appear to modulate (diminish or magnify) the salience of these events.[50, 51] Attentional capacity during painful episodes may be diverted away from pain and occupied by focusing on information irrelevant to the noxious stimulus (see **Box 16.1** for examples of distraction techniques). Alternatively, attention can be focused away from noxious stimulation by suppressing awareness of it. Suppression of pain, like distraction, entails directing attention away from a stimulus but, unlike distraction, does not involve thinking about things other than pain. A number of studies have examined distraction during painful procedures with good results.[52, 53, 54, 55, 56, 57, 58, 59, 60]

Leventhal[61] and Cioffi[62] have argued that thinking differently about pain may have longer-term effects than not thinking about the pain at all, because thinking about noxious events in a way that elaborates their benign content may provide a template for evaluating the next unpleasant event. Distraction may avoid making salient the worst emotionally charged elements of pain, but it does not provide a method of changing the meaning of what is happening. This has been proposed to account for some failures of distraction to provide analgesia,[63] and may also translate into relatively greater protection against future painful events for those who focus on sensory information during pain.[61] Fanurik and colleagues[64] found that children who were blunters in a matched (distraction) condition showed an increase in pain tolerance relative to baseline, whereas monitors using sensation monitoring showed no change from baseline.

Based on available evidence, distraction is effective in procedure-, particularly needle-related pain management.[39][I]

Box 16.1 Distraction techniques

Mental exercises Count back from 1000 in 7s; think of an animal beginning with each letter of the alphabet in turn; remember your favorite baseball game in detail; try to come up with some of your own mental exercises.
Pleasant memories and fantasies Imagine vividly concrete memories of a past experience (e.g. an enjoyable holiday) and fantasies (what will you do with the new bicycle that you get for Christmas?)
Counting thoughts Note the occurrence of any thoughts that go through your mind (for example, by marking a mark on a piece of paper) and put them to one side rather than letting them influence the way you feel. *Note to the healthcare professional: Counting thoughts is designed to promote distance from negative thinking.*
Focus on an object Focus your attention on an object and describe it to yourself in as much detail as possible, e.g. Where exactly is it? How big is it? What is it made of? Exactly how many of them are there? What is it for? Alternatively, describe your wider surroundings (e.g. room you're in).

RELAXATION

McCaffery and Beebe[65] define relaxation as "a state of relative freedom from both anxiety and skeletal muscle tension, a quieting or calming of the mind and muscles." This situation is characterized by decreased muscle tone, lower heart and respiratory rates, normal blood pressure, decreased skin resistance and intense, slow alpha-waves in the brain.[65, 66, 67] There are different types of relaxation including tension-release,[68] autogenic,[69] and meditation.[70] **Box 16.2** describes a simple relaxation exercise and how it could be presented to a young patient.

The choice of relaxation technique depends on the pain problem, the patient's preferences and abilities, availability of professional expertise, and available time.

Box 16.2 Relaxation techniques

1. Choose a quiet place where you won't be interrupted.
2. Before you start, do a few gentle stretching exercises to relieve muscular tension.
3. Make yourself comfortable, either sitting or lying down.
4. Start to breathe slowly and deeply, in a calm and effortless way.
5. Gently tense, then relax, each part of your body, starting with your feet and working your way up to your face and head.
6. As you focus on each area, think of warmth, heaviness, and relaxation.
7. Push any distracting thoughts to the back of your mind; imagine them floating away.
8. Stay like this for about 20 minutes, then take some deep breaths and open your eyes, but stay sitting or lying for a few moments before you get up.

Patterson[71] points out that progressive muscle relaxation generally requires lengthy and frequent training before the technique is sufficiently mastered. Certain patient populations, burned children for example, are often too exhausted and ill to invest the time or have the discipline required to learn these techniques. Taal[72] expresses further objections to this technique because the muscles must be tensed before they can be relaxed. Muscle tension in burned parts of the body can further increase pain during wound care. In other words, even a simple technique, such as progressive muscle relaxation, can be inappropriate for specific patient populations. More benefit for these patients can be expected from the use of alternative techniques, such as meditation or autogenic relaxation.[71, 72]

Although approximately 43–58 percent of pediatric hospitals in the USA use relaxation across a variety of acute pain situations,[73] uncertainty exists in the pediatric pain literature regarding the efficacy of relaxation as a sole analgesic in acute pain management. This is also reflected in the adult pain literature (see Chapter 15, Psychological therapies – adults). Based on available evidence, the efficacy of relaxation as a sole technique for acute pain management is limited. However, it may be useful in combination with other psychological and pharmacologic interventions.

BREATHING TECHNIQUES

Simple breathing relaxation techniques are particularly useful in pain management, are easy and quick to learn, can be employed immediately by the patient, and involve no risk.[74] However, even though breathing techniques are widely used in practice and form part of many relaxation interventions and multicomponent cognitive behavioral treatment programs, the individual effect of breathing exercises on acute pain has not been investigated. A recent literature review of 11 studies[74][V] using breathing exercises in the management of acute pain in general, and procedural pain in adult burn patients in particular, found insufficient evidence to establish the efficacy of breathing exercises in adult patients.

Box 16.3 describes a simple breathing exercise and how it could be presented to a young patient. Generally, given the lack of empirical evidence, the choice of a breathing technique, the moment to teach it, and how to coach the patient depend on the experience, background, and clinical judgment of the health professional. There is a lack of evidence of the effectiveness of breathing techniques as a single intervention in acute pain management.

Box 16.3 Diaphragmatic breathing techniques

Learning to breathe from your diaphragm is a skill you were born with and have most probably lost. Babies naturally breathe from their diaphragms, and so do you when you are asleep. Diaphragmatic breathing may take some practice to relearn and once you have the skill again you can reduce the tension in your body rapidly by breathing this way for 5 minutes. To perform this exercise while sitting in a chair:

1. Sit comfortably, with your knees bent and your shoulders, head, and neck relaxed.
2. Place one hand on your upper chest and the other just below your rib cage. This will allow you to feel your diaphragm move as you breathe.
3. Tighten your stomach muscles, letting them fall inward as you exhale through pursed lips. The hand on your upper chest must remain as still as possible.

You may notice an increased effort will be needed to use the diaphragm correctly. At first, you'll probably get tired while doing this exercise. Keep at it, because with continued practice, diaphragmatic breathing will become easy and automatic.

At first, practice this exercise 5–10 minutes about three or four times per day. Gradually increase the amount of time you spend doing this exercise, and perhaps even increase the effort of the exercise by placing a book on your abdomen.

HYPNOSIS

Hypnosis is a psychological state of heightened awareness and focused attention, in which critical faculties are reduced and susceptibility and receptiveness to ideas is greatly enhanced. Hypnosis is usually introduced to the patient as a suggestion for an imaginative experience. Hypnotic induction procedures traditionally involve suggestions to relax, although relaxation is not necessary for hypnosis, particularly with children who respond better to more active inductions. During hypnosis, the healthcare professional makes suggestions for changes in subjective experience, alterations in perception, sensation, emotion, thought, or behavior (see **Box 16.4** for examples of hypnotic inductions and suggestions).[75, 76]

Children have blurred boundaries between fantasy and reality which makes them particularly good candidates for hypnotic interventions. They are open to new experiences and find hypnosis interesting. The therapist guides the individual to concentrate and observe the suggested images as they are forming, and this promotes a feeling of being active and creative in the therapeutic process. Such an approach results in a kind of "playful" engagement between the therapist and the child as she imagines and awaits the images and emotions that emerge during a given exercise.[77] Unlike adults, children usually move and talk during hypnosis without this meaning that they are resisting the intervention. Young patients can also easily be taught and learn self-hypnosis.[78]

Hypnotic suggestions for analgesia are usually targeted towards both the sensory and affective dimensions of pain. Rainville and colleagues[79] pointed to the critical role that the nature of the hypnotic suggestion plays in pain management. Specifically, in a functional magnetic resonance imaging (fMRI) study suggestions for sensory reductions of pain resulted in decreased activity in the somatosensory cortex, and suggestions for affective pain reduction led to decreased activity in the arterior cingulate cortex (ACC), a part of the brain that processes emotion and suffering-related information.

Theoretical conceptualizations of hypnosis have been fiercely debated in the past and range from the ones that maintain that hypnosis represents a cognitive process distinct from normal day-to-day cognitive processes (i.e. the neodissociative[80] or dissociated control views[81]) to the social–cognitive models that suggest that the operative variables in hypnosis include contextual cues in the social environment, patient and subject expectancies, demand characteristics of the setting or situation, and role enactment.[82] The neodissociative model regards hypnosis as a state in which one or more forms of consciousness is split off from the rest of mental processing. Bowers and colleagues maintained that subsystems of control in the brain can be activated directly rather than through higher level executive control. In other words, the strategies subjects used to reduce pain were evoked automatically without any type of conscious strategy.[83, 84] According to the social–cognitive models, on the other hand, neither hypnotic induction nor the existence of an altered state of consciousness are necessary for hypnotic responding, including responses to suggestions for pain relief.[85] Hypnotic analgesia is thought to reduce pain instead through cognitive–behavioral mechanisms, in which changes in cognitions are thought to alter the affective states associated with pain.[85] This conceptualization is consistent with the evidence that cognitive–behavioral interventions reduce both acute[86][V], [87][I] and chronic clinical pain.[88][I] More recent theorists have suggested that attempting to explain the effects of hypnosis solely in terms of one school of thought presents distinctions that are too arbitrary.[82, 89] See Chapter 15, Psychological therapies – adults, for further evaluation of hypnosis in adult patients.

The findings from acute studies demonstrate consistent clinical effects with hypnotic analgesia that are superior to attention or standard care control conditions.[87][I], [90] Hypnosis has achieved status as an empirically validated, possibly efficacious intervention in the management of pediatric procedure-related pain,[91] according to the criteria devised by the American Psychological Association to judge the efficacy of psychological interventions.[92] All studies conducted to date[93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103] [II] found hypnosis effective in reducing the pain and anxiety of young patients during painful medical procedures, such as lumbar punctures, bone marrow aspirations, and voiding cystourethrography.

Limited support is available in the pediatric literature that hypnosis significantly lowers postoperative pain and anxiety ratings and contributes to shorter hospital stays. Lambert[104][II] randomly assigned 52 children (matched for sex, age, and diagnosis) to an experimental or control group. Significantly lower postoperative pain ratings and shorter hospital stays occurred for children in the

Box 16.4 Hypnotic techniques

Simple induction technique Just think about how you feel when you are building a Lego house at home; just let yourself feel that way now.
Topical anesthesia Just imagine painting numbing medicine on to that part of your body.
Moving pain away from the self Imagine for a while that that arm (or other body part) doesn't belong to you, isn't part of you … see it just floating out there by itself.
Directing attention to pain itself Imagine that you have come from another planet far deep in the universe where there is no pain … you have never experienced pain before … notice the discomfort very carefully … what sensations you have … how does it make you feel …

experimental group. State anxiety was decreased for the hypnosis group and increased postoperatively for the control group. This is in contrast to the adult literature in which a meta-analysis of 38 randomized controlled trials of different methods of psychological preparation prior to surgery reported that hypnosis did not reduce pain intensity or medication use.[105] [I]

Individual responsiveness to hypnotic suggestions varies. Four out of five studies[93, 98, 100, 101, 102] that have examined the relationship between the child's hypnotizability and pain relief during painful medical procedures reported a significant positive relationship between hypnotizability and clinical benefit following hypnosis treatment.

Based on available evidence, there is strong support for the efficacy of hypnosis in procedure-related pain management and a recent meta-analysis concluded that hypnosis is the most promising psychological intervention.[39]

GUIDED IMAGERY

Guided imagery is a self-regulatory technique that capitalizes on young patients' active imagination. Activities such as role-playing, pretending, and daydreaming are natural elements of children's play. Guided imagery was developed and refined by Roberto Assagioli[106] and involves paying attention to cognitively generated mental images. The child uses his or her imagination to create mental images, using as many senses as possible, to alter the pain experience. Naparstek[107] describes guided imagery as "a gentle but powerful technique that focuses and directs the imagination." She maintains that it is more than visualization (and since only approximately 55 percent of people are able to visualize strongly, this is worth bearing in mind); rather it involves all the senses. Naparstek[107] further elaborates that the body recognizes all sensory images as real, whether fact or fantasy. Research using positron emission tomography (PET) and fMRI methodologies[108] suggests that the neuronal processes underlying perception are also used in imagery "and can engage mechanisms used in memory, emotion and motor control" (p. 635). Furthermore, these researchers maintain, "there is much evidence that imagery of emotional events activates the autonomic nervous system and the amygdala. That is, visualizing an object has much the same effects on the body as actually seeing the object" (p. 641).

During a guided imagery session, a state of deep relaxation is usually induced using a relaxation technique which allows the child to then be guided in actively creating images that facilitate resolution of symptoms, such as pain. Imagery themes that may enhance safety include soothing environments (beach scenes, warmth of the sun, familiar places where the individual has felt safe), the construction of a protective structure, or the inclusion of a trusted individual. Two types of imagery can be incorporated in imagery exercises: directive, in which the image is specifically described ("imagine being on a school trip") and nondirective, in which less specific description allows for the formation of more personalized and spontaneous imagery ("imagine being outdoors"; "find some special place") (see **Box 16.5** for suggestions of guided imagery exercises). Some children experience difficulty with a nondirective suggestion and prefer the more direct approach. Images range from the concrete, such as objects or people, to the more abstract, such as a color or metaphor.

A number of factors may influence success with guided imagery, including imaging ability (the ability to create vivid mental images and to experience those images as if they were almost real) and outcome expectancy (an individual's expectation regarding the effects of a particular intervention on pain). Although related, guided imagery differs from hypnosis in that the child, through imagery, attempts to create his own solution to the problem rather than the therapist offering suggestions and alternatives for change.

The evidence for the efficacy of guided imagery in acute pain management is limited. A recent randomized controlled trial[109][II] investigated imagery administered pre- and postoperatively, as a supplement to routine analgesics, for reduction of pain and anxiety after

Box 16.5 Guided imagery techniques

Direct

Imagine your pain has a certain size, shape, and color …What does it feel like? Is it rough or smooth? Does it stay in one place or move around?… Allow the pain to melt and turn to a liquid the same size, shape, and color as before… let the liquid flow down to your arm or leg and let it flow out of your fingertips or toes. Watch it as it flows out of the room, out of the hospital, down the street.

Indirect

Ask the child to close their eyes, take several deep breaths, and relax. Introduce the exercise by giving them some background on the situation they will be visualizing. Encourage them to make use of all their senses as they imagine – sight, sound, physical sensations, and emotions. Suggest an image to children one sentence at a time, and pause for several seconds after each sentence to allow them time to process what you are saying and to visualize the picture. As images occur spontaneously, direct the child's attention by asking questions, e.g. "How do you feel here?", "When you observe this image, what feelings come forward?"

tonsillectomy and adenoidectomy in the ambulatory setting and at home in 73 children aged 7–12 years. After controlling for trait anxiety (i.e. personality-related anxiety) and for opioid and nonopioid analgesic intake one to four hours before pain measurement, the investigators found significantly lower self-reported pain and situation-related anxiety one to four hours after surgery in the imagery group, but not 22–27 hours after surgery.

Based on available evidence, there is strong theoretical support on guided imagery and one clinical trial suggesting efficacy for acute pain management.

COMBINED COGNITIVE AND BEHAVIORAL INTERVENTIONS

The most widely practiced and researched interventions in acute pain management are cognitive and behavioral. Cognitive behavioral interventions are based on the premise that symptoms develop and are maintained, at least in part, by maladaptive cognitions, as well as conditioned and learned behavioral responses.[110] Emphasis is given to the interdependence of thoughts, behaviors, feelings, as well as physiological responses. For the purpose of this review, cognitive interventions are defined as interventions which involve identifying and altering negative thinking styles related to anxiety about the painful situation, and replacing them with more positive beliefs and attitudes, leading to more adaptive behavior and coping styles.[111] Behavioral interventions are defined as interventions based on principles of behavioral science, as well as learning principles by targeting specific behaviors.[111] For pain management, cognitive and behavioral techniques are aimed at assisting the child develop and apply coping skills in order to manage the pain and distress, and when developmentally appropriate, to help the child comprehend how thoughts and behaviors can alter their experience of pain.[112] The treatment also focuses on conditioned emotional associations to memories and reminders of traumatic medical experiences, distorted cognitions about the event(s), and negative attributions about self, others, and the world. Treatment plans are based on comprehensive assessments and are individually tailored to address the patients' specific needs. The rationale for the use of cognitive and behavioral techniques is fully explained to young patients and their parents so that they can be active participants in developing and applying interventions in session, at home, and at the clinic. Parents are included in the treatment process to enhance support for the child, reduce parental distress, and teach appropriate strategies to manage child reactions. Cognitive–behavioral interventions are popular because the emphasis is goal directed, short term, teaching coping skills, promoting self-control, and enhancing self-efficacy.[113] **Box 16.6** describes some of the commonly used cognitive–behavioral interventions in the management of acute pain in children.

Box 16.6 Cognitive–behavioral therapy interventions

Reframing

Reframing involves helping the child to modify or restructure how they perceive their difficulties, and the context in which they take place, in a different way. Aims to modify or restructure a child's view or perception of pain.

Modeling and rehearsal

Live or videotaped demonstration by another child of coping strategies relevant to the situation that the young patient is in.

Thought stopping

When the child begins to think about the painful experience refuses to allow negative thoughts to continue and gain strength by some positive and defined action (e.g. visualize a STOP sign in your mind's eye; saying "stop" out loud).

Positive self-statements

"I've had this procedure before and I coped successfully."

Cognitive and behavioral interventions may modulate pain, altering pain transmission and pain perception, by distracting attention from the pain stimulus, producing relaxation, or influencing mood or emotional context.[114] The evaluation of the current literature regarding the efficacy of combined interventions is complicated by the range of techniques that are combined in different permutations and the lack of clear specifications of therapeutic activity and integrity checks. Distraction, relaxation training, imagery, breathing exercises, desensitization, preparation, modeling,[115] rehearsal, reinforcement, making positive coping statements, and coaching a child to engage in such strategies are all examples of some of the interventions that are frequently used to help decrease pain and distress in children and are included in multicomponent cognitive–behavioral programs.[16] A number of studies[37, 100, 116, 117, 118] have tested the efficacy of these programs for procedure-related pain with good results. A recent meta-analysis[39][I] for needle procedures concluded that taken together the evidence for these interventions shows that they are not effective in reducing self-reported pain, observer-reported pain, self-reported distress, or heart rate. However, combined cognitive and behavioral interventions are effective at reducing other reported distress and behavioral measures of distress. Similarly, in children undergoing a voiding cystourethrogram,[119][II] it was found that children who received a cognitive–behavioral intervention displayed fewer distress behaviors and greater coping behaviors, and

were rated as more cooperative than children receiving standard care. However, children's fear and pain ratings did not differ significantly between groups. Research also supports the efficacy of memory modification via suggestive post-event interviews. An intervention that targeted children's memories of their most recent lumbar puncture reduced anticipatory physiological and self-report distress ratings relative to a control group at post-intervention.[120][II]

Cognitive and behavioral interventions, tested with younger children (2–12 years) undergoing minor surgery indicate that strategies such as relaxation,[121][V] role play,[122][IV], [123][II] film modeling,[124][II] and training in coping skills[125][II] are effective for reducing preoperative fear, anxiety, and distress. In older adolescents, LaMontagne and colleagues[126][II] conducted a randomized controlled trial with adolescents undergoing major orthopedic surgery, exploring the efficacy of a videotaped intervention (information only, coping only, information plus coping, or control). It was found that information plus coping was most effective for reducing postoperative anxiety in adolescents with high preoperative anxiety. Coping instruction led to less postoperative anxiety and pain for adolescents aged 13 years and younger. The control group reported the highest levels of pain. Recently, Kain and colleagues[127][II] found that the family-centered preoperative ADVANCE preparation program (family-centered behavioral preparation) is effective in the reduction of preoperative anxiety and improvement in postoperative outcomes (exhibited a lower incidence of emergence delirium after surgery, required significantly less analgesia in the recovery room, and were discharged from the recovery room earlier). In a review of psychosocial interventions for pain in sickle cell disease, cognitive–behavioral techniques were considered as "probably efficacious" for sickle cell pain.[128][I]

Based on the available evidence, combined cognitive and behavioral interventions in children undergoing needle procedures reduce other reported distress and behavioral measures of distress. Some combinations of cognitive and behavioral interventions, but not all, reduce self-reported pain and distress. There is also good evidence for the efficacy of combined interventions designed to prepare children and adolescents for surgery.

PARENTAL INVOLVEMENT IN ACUTE PAIN MANAGEMENT

Theoretical models emphasize the role of parenting in the development, maintenance, and amelioration of child anxiety.[129, 130, 131, 132, 133] Some models[129, 131, 132] hypothesize that when parents are highly controlling in contexts when it is developmentally appropriate for children to act independently (e.g. attending elementary school), children may experience decreased self-efficacy, and thus, increased anxiety,[134] for example, about their ability to function on their own within their environments. Conversely, some models[129] have hypothesized that parental encouragement of children's autonomy and independence (e.g. in novel contexts) may augment children's perceptions of mastery over the environment, leading to anxiety reduction.

In the pediatric pain literature, a number of studies point to the role that parents play in shaping their child's pain perception and response. Frank and colleagues[135] found that during immunization, maternal behavior accounted for 53 percent of the variance in child distress behavior. Certain parental behaviors are associated with child coping and others with child distress when children undergo painful medical procedures. Parenting behaviors, such as agitation, provision of reassurance, empathic comments, giving control, excessive explanations and apologies to their children, have been shown to be associated with (and indeed precede) elevated distress and increased pain intensity during medical procedures[136, 137, 138] and experimentally induced pain.[139] Humor, commands to use coping strategies, and nonprocedural talk are associated with increases in a child's coping. There is experimental evidence that maternal modeling of pain behaviors can result in elevated pain perception in their children and particularly their daughters.[140] Dahlquist and colleagues[141] demonstrated the influence of speech function on pain distress. Their results showed that vague commands by caregivers were positively associated with child distress during painful procedures. Liossi and colleagues[142] showed that parental expectancies are highly predictive of experienced pain in children undergoing lumbar punctures. Taken together these results lend support to the theoretical models that emphasize the importance of parental control and behavior in the development, maintenance, and/or amelioration of pain reactions, but the results do not clarify the direction of effects or the specific process involved. These remain important questions for future research. It is possible that when parents fail to provide children with the opportunity to experience control in age-appropriate contexts, children may not develop a sense of self-efficacy, thereby increasing their sense of vulnerability to threat and heightened anxiety.

Children's pain while in hospital is one of the foremost concerns of parents and they can potentially contribute to more effective pain management for their children.[143] Parent involvement in pain management has resulted in parents acting as helpful agents in treating children's pain problems, while enhancing the parents' feelings of usefulness and competency in the process. At home, parents are expected to manage children's pain, but are often given inadequate instruction at discharge and no follow-up support.[144] Postoperative pain is a significant post-hospital behavior problem at four weeks and has been shown to adversely affect children's attitudes towards doctors and nurses.[144] Parents who have been educated regarding expected child posthospital behavior problems

and who have been given instructions on how they can assist in the care of their children have reported less negative mood states, less depression, and fewer negative outcomes in their children.[145]

Parents are often anxious not only about their child's distress but also about their own ability to support and comfort their child through a painful experience. Thus, parents need to be included in interventions and helped to control their own anxiety which in turn will ensure less anxiety being communicated to the child. Simple educational leaflets can give useful information and more extensive training programs can teach parents what to do.[146]

CONCLUSIONS

Psychological factors play an important role in shaping pain perception in children and comprehensive assessment of the psychological factors that shape pain perception is imperative to maximize the success of pain management interventions. Psychological interventions are useful for the management of acute pediatric pain, although evidence for their efficacy varies depending on type of pain. For procedure-related pain, particularly needle procedures, distraction, hypnosis, and cognitive–behavior therapy are evidence-based interventions. For postoperative pain, preparation, guided imagery, and cognitive–behavior therapy are promising. For acute pain due to illness or injury, cognitive–behavior therapy is promising. How parents feel and what they think and do influences their child's pain perception and response. Parents need to be included in pain management interventions.

Children with acute pain require proactive psychological treatment approaches aiming to reduce current pain, prevent pain in the future, and reduce risk for subsequent physical or psychological morbidity. In recent years, a wide range of behavioral and cognitive techniques have been found to be efficacious for helping children to cope with acute pain. However, although a number of strategies are promising, there have been relatively few attempts to customize treatments on the basis of patient characteristics. Rather, patients tend to be treated with a one size fits all approach, which may actually undermine their natural coping style and artificially underestimate the apparent efficacy of a particular pain management strategy.[147]

REFERENCES

1. Pate JT, Blount RL, Cohen LL, Smith AJ. Childhood medical experiences and temperament as predictors of adult functioning in medical situations. *Children's Health Care*. 1996; **25**: 281–98.
2. Kazak AE, Barakat LP, Meeske K *et al*. Posttraumatic stress, family functioning, and social support in survivors of childhood leukemia and their mothers and fathers. *Journal of Consulting and Clinical Psychology*. 1997; **65**: 120–9.
3. Kazak AE, Kassam-Adams N, Schneider S *et al*. An integrative model of pediatric medical traumatic stress. *Journal of Pediatric Psychology*. 2006; **31**: 343–55.
4. Weisman SJ, Bernstein B, Schechter NL. Consequences of inadequate analgesia during painful procedures in children. *Archives of Pediatrics and Adolescent Medicine*. 1998; **152**: 147–9.
5. McGrath PA. *Pain in children: nature, assessment, and treatment*. New York: Guilford Press, 1990.
6. Liossi C. Acute procedural pain management. In: Schmidt RF, Willis WD (eds). *Encyclopedia of pain*. Berlin: Springer-Verlag, 2007.
7. * McGrath PA, Brigham MC. The assessment of pain in children and adolescents. In: Turk DC (ed.). *Handbook of pain assessment*. New York: Guilford Press, 1992: 295–314.
8. Varni JW, Blount RL, Waldron SA, Smith AJ. Management of pain and distress. In: Roberts MC (ed.). *Handbook of pediatric psychology*, 2nd edn. New York: Guilford, 1995: 105–23.
9. Kain ZN, Mayes LC, Caldwell-Andrews AA *et al*. Preoperative anxiety, postoperative pain, and behavioral recovery in young children undergoing surgery. *Pediatrics*. 2006; **118**: 651–8.
10. Taylor S. *Anxiety sensitivity: theory, research, and treatment of the fear of anxiety*. London: Lawrence Erlbaum Associates, 1999: 370.
11. Lipsitz JD, Masia-Warner C, Apfel H *et al*. Anxiety and depressive symptoms and anxiety sensitivity in youngsters with noncardiac chest pain and benign heart murmurs. *Journal of Pediatric Psychology*. 2004; **29**: 607–12.
12. Kirsch I. Response expectancy as a determinant of experience and behavior. *American Psychologist*. 1985; **40**: 1189–202.
13. Palermo TM, Drotar D. Prediction of children's postoperative pain: the role of presurgical expectations and anticipatory emotions. *Journal of Pediatric Psychology*. 1996; **21**: 683–98.
14. Logan DE, Rose JB. Is postoperative pain a self-fulfilling prophecy? Expectancy effects on postoperative pain and patient-controlled analgesia use among adolescent surgical patients. *Journal of Pediatric Psychology*. 2005; **30**: 187–96.
15. Thomas A, Chess S. *Temperament and development*. New York: Bunner/Mazel, 1977.
16. Chen E, Joseph MH, Zeltzer LK. Behavioral and cognitive interventions in the treatment of pain in children. *Pediatric Clinics of North America*. 2000; **47**: 513–25.
17. Helgadottir HL, Wilson ME. Temperament and pain in 3 to 7-year-old children undergoing tonsillectomy. *Journal of Pediatric Nursing*. 2004; **19**: 204–13.
18. Sullivan MJ, Thorn B, Haythornthwaite JA *et al*. Theoretical perspectives on the relation between catastrophizing and pain. *Clinical Journal of Pain*. 2001; **17**: 52–64.
19. Bennett-Branson SM, Craig KD. Postoperative pain in children: Developmental and family influences on

spontaneous coping strategies. *Canadian Journal of Behavioural Science Revue Canadienne des Sciences du Comportement*. 1993; **25**: 355–83.

20. Miller SM. Monitoring and blunting: validation of a questionnaire to assess styles of information seeking under threat. *Journal of Personality and Social Psychology*. 1987; **52**: 345–53.
21. Miller SM, Shoda Y, Hurley K. Applying cognitive-social theory to health-protective behavior: breast self-examination in cancer screening. *Psychological Bulletin*. 1996; **119**: 70–94.
22. Leventhal H, Everhart D. Emotion, pain, and physical illness. In: Izard CE (ed.). *Emotions in personality and psychopathology*. New York: Plenum, 1979: 263–98.

* 23. von Baeyer CL, Marche TA, Rocha EM, Salmon K. Children's memory for pain: overview and implications for practice. *Journal of Pain*. 2004; **5**: 241–9.

24. Stanish WD, Tripp DA, Coady C, Biddulph M. Injury and pain in the adolescent athlete. In: Finley GA, McGrath PJ (eds). *Acute and procedure pain in infants and children*. Progress in Pain Research and Management, 20. Seattle: IASP Press, 2001.
25. Harter S. Developmental and dynamic changes in the nature of the self-concept: Implications for child psychotherapy. In: Shirk SR (ed.). *Cognitive development and child psychotherapy*. New York: Plenum Press, 1988.
26. Dahlquist LM. *Pediatric pain management*. New York: Kluwer Academic/Plenum Publishers, 1999.

* 27. Gaffney A, McGrath PJ, Dick BD. Measuring pain in children: Developmental and instrument issues. In: Schechter CB N, Yaster M (eds). *Pain in infants, children, and adolescents*, 2nd edn. Baltimore: Williams & Wilkins, 2003.

28. Rasnake LK, Linscheid TR. Anxiety reduction in children receiving medical care: developmental considerations. *Journal of Developmental and Behavioral Pediatrics*. 1989; **10**: 169–75.
29. Pfefferbaum B, Adams J, Aceves J. The influence of culture on pain in Anglo and Hispanic children with cancer. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1990; **29**: 642–7.
30. Jones M, Qazi M, Young KD. Ethnic differences in parent preference to be present for painful medical procedures. *Pediatrics*. 2005; **116**: e191–7.

* 31. von Baeyer CL, Spagrud LJ. Systematic review of observational (behavioral) measures of pain for children and adolescents aged 3 to 18 years. *Pain*. 2007; **127**: 140–50.

32. Franck LS, Greenberg CS, Stevens B. Pain assessment in infants and children. *Pediatric Clinics of North America*. 2000; **47**: 487–512.
33. Anderson C, Zeltzer L, Fanuric D. Procedural pain. In: Schechter NL, Berde CB, Yaster M (eds). *Pain in infants, children and adolescents*. Baltimore, MD: Williams & Wilkins, 1993: 435–58.
34. Leventhal H, Johnson JE. In: Woolridge P (ed.). *Behavioral science and nursing theory*. St Louis: Mosby, 1983: 54–127.
35. Suls J, Wan CK. Effects of sensory and procedural information on coping with stressful medical procedures and pain: a meta-analysis. *Journal of Consulting and Clinical Psychology*. 1989; **57**: 372–9.
36. Langer EJ, Janis IL, Wolfer JA. Reduction of psychological stress in surgical patients. *Journal of Experimental Social Psychology*. 1975; **11**: 155–65.

* 37. Powers SW. Empirically supported treatments in pediatric psychology: procedure-related pain. *Journal of Pediatric Psychology*. 1999; **24**: 131–45.

* 38. Kolk AM, van Hoof R, Fiedeldij Dop MJ. Preparing children for venepuncture. The effect of an integrated intervention on distress before and during venepuncture. *Child: Care, Health and Development*. 2000; **26**: 251–60.

* 39. Uman LS, Chambers CT, McGrath PJ, Kisely S. Psychological interventions for needle-related procedural pain and distress in children and adolescents. *Cochrane Database of Systematic Reviews*. 2006; **CD005179**.

40. Davis TM, Maguire TO, Haraphongse M, Schaumberger MR. Preparing adult patients for cardiac catheterization: informational treatment and coping style interactions. *Heart and Lung*. 1994; **23**: 130–9.
41. Gattuso SM, Litt MD, Fitzgerald TE. Coping with gastrointestinal endoscopy: self-efficacy enhancement and coping style. *Journal of Consulting and Clinical Psychology*. 1992; **60**: 133–9.
42. Miller SM, Mangan CE. Interacting effects of information and coping style in adapting to gynecologic stress: should the doctor tell all? *Journal of Personality and Social Psychology*. 1983; **45**: 223–36.
43. Miller SM, Buzaglo JS, Simms SL *et al*. Monitoring styles in women at risk for cervical cancer: Implications for the framing of health-relevant messages. *Annals of Behavioral Medicine*. 1999; **21**: 27–34.
44. Watkins LO, Weaver L, Odegaard V. Preparation for cardiac catheterization: tailoring the content of instruction to coping style. *Heart and Lung*. 1986; **15**: 382–9.
45. Williams-Piehota P, Pizarro J, Schneider TR *et al*. Matching health messages to monitor-blunter coping styles to motivate screening mammography. *Health Psychology*. 2005; **24**: 58–67.
46. Martelli MF, Auerbach SM, Alexander J, Mercuri LG. Stress management in the health care setting: matching interventions with patient coping styles. *Journal of Consulting and Clinical Psychology*. 1987; **55**: 201–7.
47. Bonk VA, France CR, Taylor BK. Distraction reduces self-reported physiological reactions to blood donation in novice donors with a blunting coping style. *Psychosomatic Medicine*. 2001; **63**: 447–52.
48. Roth S, Cohen LJ. Approach, avoidance, and coping with stress. *American Psychologist*. 1986; **41**: 813–9.
49. Suls J, Fletcher B. The relative efficacy of avoidant and nonavoidant coping strategies: a meta-analysis. *Health Psychology*. 1985; **4**: 249–88.

50. Michael ES, Burns JW. Catastrophizing and pain sensitivity among chronic pain patients: moderating effects of sensory and affect focus. *Annals of Behavioral Medicine*. 2004; **27**: 185–94.
51. Valet M, Sprenger T, Boecker H *et al*. Distraction modulates connectivity of the cingulo-frontal cortex and the midbrain during pain – an fMRI analysis. *Pain*. 2004; **109**: 399–408.
52. Cassidy KL, Reid GJ, McGrath PJ *et al*. Watch needle, watch TV: Audiovisual distraction in preschool immunization. *Pain Medicine*. 2002; **3**: 108–18.
53. Fanurik D, Koh JL, Schmitz ML. Distraction techniques combined with EMLA: Effects on IV insertion pain and distress in children. *Childrens Health Care*. 2000; **29**: 87–101.
54. Fowler-Kerry S, Lander JR. Management of injection pain in children. *Pain*. 1987; **30**: 169–75.
55. Gonzalez JC, Routh DK, Armstrong FD. Effects of maternal distraction versus reassurance on children's reactions to injections. *Journal of Pediatric Psychology*. 1993; **18**: 593–604.
56. Kleiber C, Craft-Rosenberg M, Harper DC. Parents as distraction coaches during i.v. insertion: a randomized study. *Journal of Pain and Symptom Management*. 2001; **22**: 851–61.
57. Press J, Gidron Y, Maimon M *et al*. Effects of active distraction on pain of children undergoing venipuncture: Who benefits from it? *Pain Clinic*. 2003; **15**: 261–9.
58. Tak JH, van Bon WH. Pain- and distress-reducing interventions for venepuncture in children. *Child: Care, Health and Development*. 2006; **32**: 257–68.
59. Vessey JA, Carlson KL, McGill J. Use of distraction with children during an acute pain experience. *Nursing Research*. 1994; **43**: 369–72.
60. Zabin MA. 'Modification of children's behavior during bloodwork procedures'. Unpublished doctoral dissertation, West Virginia University, 1982.
61. Leventhal H. I know distraction works even though it doesn't! *Health Psychology*. 1992; **11**: 208–9.
62. Cioffi D. Beyond attentional strategies: cognitive-perceptual model of somatic interpretation. *Psychological Bulletin*. 1991; **109**: 25–41.
63. Eccleston C. The attentional control of pain: methodological and theoretical concerns. *Pain*. 1995; **63**: 3–10.
64. Fanurik D, Zeltzer LK, Roberts MC, Blount RL. The relationship between children's coping styles and psychological interventions for cold pressor pain. *Pain*. 1993; **53**: 213–22.
65. McCaffery M, Beebe A. *Pain, clinical manual for nursing practice*. London: Mosby, 1994.
66. Bulechek GM, McCloskey JC. *Nursing interventions, essential nursing treatments*. Philadelphia: WB Saunders Company, 1992.
67. Watt-Watson J, Donovan MI. *Pain management, nursing perspective*. St Louis: Mosby-Year Book Inc., 1992.
68. Jacobson E. *Progressive relaxation*. Chicago: Chicago University Press, 1938.
69. Schultz JH, Luthe W. *Autogenic methods*. Autogenic therapy, 1. New York: Grune & Stratton, 1969.
70. Perez-De-Albeniz A, Holmes J. Meditation: Concepts, effects and uses in therapy. *International Journal of Psychotherapy*. 2000; **5**: 49–59.
71. Patterson DR. Practical applications of psychological techniques in controlling burn pain. *Journal of Burn Care and Rehabilitation*. 1992; **13**: 13–8.
72. Taal LA. *The psychological aspects of burn injuries*. Maastricht: Shaker Publishing, 1998.
73. O'Byrne KK, Peterson L, Saldana L. Survey of pediatric hospitals' preparation programs: evidence of the impact of health psychology research. *Health Psychology*. 1997; **16**: 147–54.
74. de Jong AEE, Gamel C. Use of a simple relaxation technique in burn care: literature review. *Journal of Advanced Nursing*. 2006; **54**: 710–21.
75. Green JP, Barabasz AF, Barrett D, Montgomery GH. Forging ahead: the 2003 APA Division 30 definition of hypnosis. *International Journal of Clinical and Experimental Hypnosis*. 2005; **53**: 259–64.
* 76. Liossi C. *Procedure-related cancer pain in children*. Oxford: Radcliffe Medical Press, 2002.
77. Liossi C, Mystakidou K. Clinical hypnosis in palliative care. *European Journal of Palliative Care*. 1996; **3**: 56–8.
78. Gardner GG, Olness K. *Hypnosis and hypnotherapy with children*. New York: Grune & Stratton, 1981.
79. Rainville P, Carrier B, Hofbauer RK *et al*. Dissociation of sensory and affective dimensions of pain using hypnotic modulation. *Pain*. 1999; **82**: 159–71.
80. Hilgard ER, Hilgard JR. *Hypnosis in the relief of pain*. New York: Brunner/Mazel, 1994.
81. Bowers KS, LeBaron S. Hypnosis and hypnotizability: implications for clinical intervention. *Hospital and Community Psychiatry*. 1986; **37**: 457–67.
82. Kirsch I, Lynn SJ. The altered state of hypnosis – changes in the theoretical landscape. *American Psychologist*. 1995; **50**: 846–58.
83. Bowers KS. Unconscious influences and hypnosis. In: Singer JL (ed.). *Repression and dissociation: Implications for personality theory, psychopathology and health*. Chicago: University of Chicago Press, 1990: 143–78.
84. Bowers KS. Imagination and dissociation in hypnotic responding. *International Journal of Clinical and Experimental Hypnosis*. 1992; **40**: 253–75.
85. Chaves JF. Hypnosis in pain management. In: Rhue JW, Lynn SJ, Kirsch I (eds). *Handbook of clinical hypnosis*. Washington DC: American Psychiatric Association, 1993: 511–32.
86. Carr DB, Goudas LC. Acute pain. *Lancet*. 1999; **353**: 2051–8.
* 87. Montgomery GH, DuHamel KN, Redd WH. A meta-analysis of hypnotically induced analgesia: how effective is hypnosis? *International Journal of Clinical and Experimental Hypnosis*. 2000; **48**: 138–53.

88. Thorn BE, Cross TH, Walker BB. Meta-analyses and systematic reviews of psychological treatments for chronic pain: Relevance to an evidence-based practice. *Health Psychology*. 2007; **26**: 1–9.
89. Kihlstrom JF. Hypnosis: a sesquicentennial essay. *International Journal of Clinical and Experimental Hypnosis*. 1992; **40**: 301–14.
90. Patterson DR, Jensen MP. Hypnosis and clinical pain. *Psychological Bulletin*. 2003; **129**: 495–521.
91. Liossi C. Management of paediatric procedure-related cancer pain. *Pain Reviews*. 1999; **6**: 279–302.
92. Chambless DL, Hollon SD. Defining empirically supported therapies. *Journal of Consulting and Clinical Psychology*. 1998; **66**: 7–18.
93. Hilgard JR, LeBaron S. Relief of anxiety and pain in children and adolescents with cancer: quantitative measures and clinical observations. *International Journal of Clinical and Experimental Hypnosis*. 1982; **30**: 417–42.
94. Zeltzer L, LeBaron S. Hypnosis and nonhypnotic techniques for reduction of pain and anxiety during painful procedures in children and adolescents with cancer. *Journal of Pediatrics*. 1982; **101**: 1032–5.
95. Kellerman J, Zeltzer L, Ellenberg L, Dash J. Adolescents with cancer. Hypnosis for the reduction of the acute pain and anxiety associated with medical procedures. *Journal of Adolescent Health Care*. 1983; **4**: 85–90.
96. Katz ER, Kellerman J, Ellenberg L. Hypnosis in the reduction of acute pain and distress in children with cancer. *Journal of Pediatric Psychology*. 1987; **12**: 379–94.
97. Kuttner L, Bowman M, Teasdale M. Hypnotic versus active cognitive strategies for alleviation of procedural distress in pediatric oncology patients. *Journal of Developmental and Behavioral Pediatrics*. 1988; **9**: 374–82.
98. Wall VJ, Womack W. Hypnotic versus active cognitive strategies for alleviation of procedural distress in pediatric oncology patients. *American Journal of Clinical Hypnosis*. 1989; **31**: 181–91.
99. Hawkins P, Liossi C, Ewart B, Hatira P. Hypnosis in the alleviation of procedure related pain and distress in paediatric oncology patients. *Contemporary Hypnosis*. 1998; **15**: 199–207.
100. Liossi C, Hatira P. Clinical hypnosis versus cognitive behavioral training for pain management with pediatric cancer patients undergoing bone marrow aspirations. *International Journal of Clinical and Experimental Hypnosis*. 1999; **47**: 104–16.
101. Liossi C, Hatira P. Clinical hypnosis in the alleviation of procedure-related pain in pediatric oncology patients. *International Journal of Clinical and Experimental Hypnosis*. 2003; **51**: 4–28.
102. Liossi C, White P, Hatira P. Randomized clinical trial of local anesthetic versus a combination of local anesthetic with self-hypnosis in the management of pediatric procedure-related pain. *Health Psychology*. 2006; **25**: 307–15.
103. Butler LD, Symons BK, Henderson SL *et al*. Hypnosis reduces distress and duration of an invasive medical procedure for children. *Pediatrics*. 2005; **115**: e77–85.
104. Lambert SA. The effects of hypnosis/guided imagery on the postoperative course of children. *Journal of Developmental and Behavioral Pediatrics*. 1996; **17**: 307–10.
*105. Johnston M, Vogele C. Benefits of psychological preparation for surgery: A meta-analysis. *Annals of Behavioral Medicine*. 1993; **15**: 245–56.
106. Assagioli R. *Psychosynthesis: A manual of principles and techniques*. New York: Hobbs, Dorman and Company, 1965.
107. Naparstek B. *Staying well with guided imagery*. New York: Warner Books, 1994.
108. Kosslyn SM, Ganis G, Thompson WL. Mental imagery: against the nihilistic hypothesis. *Trends in Cognitive Sciences*. 2003; **7**: 109–11.
109. Huth MM, Broome ME, Good M. Imagery reduces children's post-operative pain. *Pain*. 2004; **110**: 439–48.
110. Brewin CR. Cognitive change processes in psychotherapy. *Psychological Review*. 1989; **96**: 379–94.
111. Barlow DH, Durand VM. *Abnormal psychology: an integrative approach*. California: Brooks/Cole Publishing Company, 1999.
112. Keefe FJ, Dunsmore J, Burnett R. Behavioral and cognitive-behavioral approaches to chronic pain: recent advances and future directions. *Journal of Consulting and Clinical Psychology*. 1992; **60**: 528–36.
113. Kendall PC, Panichelli-Mindel SM. Cognitive-behavioral treatments. *Journal of Abnormal Child Psychology*. 1995; **23**: 107–24.
114. Villemure C, Bushnell MC. Cognitive modulation of pain: how do attention and emotion influence pain processing? *Pain*. 2002; **95**: 195–9.
115. Greenbaum PE, Melamed BG. Pretreatment modeling. A technique for reducing children's fear in the dental operatory. *Dental Clinics of North America*. 1988; **32**: 693–704.
116. Cohen LL, Blount RL, Panopoulos G. Nurse coaching and cartoon distraction: an effective and practical intervention to reduce child, parent, and nurse distress during immunizations. *Journal of Pediatric Psychology*. 1997; **22**: 355–70.
117. Cohen LL, Bernard RS, Greco LA, McClellan CB. A child-focused intervention for coping with procedural pain: are parent and nurse coaches necessary? *Journal of Pediatric Psychology*. 2002; **27**: 749–57.
118. Tyc VL, Leigh L, Mulhern RK *et al*. Evaluation of a cognitive-behavioral intervention for reducing distress in pediatric cancer patients undergoing magnetic resonance imaging procedures. *International Journal of Rehabilitation and Health*. 1997; **3**: 267–79.
119. Zelikovsky N, Rodrigue JR, Gidycz CA, Davis MA. Cognitive behavioral and behavioral interventions help young children cope during a voiding cystourethrogram. *Journal of Pediatric Psychology*. 2000; **25**: 535–43.
120. Chen E, Zeltzer LK, Craske MG, Katz ER. Alteration of memory in the reduction of children's distress during repeated aversive medical procedures. *Journal of Consulting and Clinical Psychology*. 1999; **67**: 481–90.

121. Kain ZN, Caldwell-Andrews A, Wang SM. Psychological preparation of the parent and pediatric surgical patient. *Anesthesiology Clinics of North America*. 2002; **20**: 29–44.
122. Hatava P, Olsson GL, Lagerkranser M. Preoperative psychological preparation for children undergoing ENT operations: a comparison of two methods. *Paediatric Anaesthesia*. 2000; **10**: 477–86.
123. Kain ZN, Mayes LC, Caramico LA. Preoperative preparation in children: a cross-sectional study. *Journal of Clinical Anesthesia*. 1996; **8**: 508–14.
124. Pinto RP, Hollandsworth Jr JG. Using videotape modeling to prepare children psychologically for surgery: influence of parents and costs versus benefits of providing preparation services. *Health Psychology*. 1989; **8**: 79–95.
125. Kain ZN, Caramico LA, Mayes LC *et al*. Preoperative preparation programs in children: a comparative examination. *Anesthesia and Analgesia*. 1998; **87**: 1249–55.
126. LaMontagne LL, Hepworth JT, Cohen F, Salisbury MH. Cognitive-behavioral intervention effects on adolescents' anxiety and pain following spinal fusion surgery. *Nursing Research*. 2003; **52**: 183–90.
127. Kain ZN, Caldwell-Andrews AA, Mayes LC *et al*. Family-centered preparation for surgery improves perioperative outcomes in children: a randomized controlled trial. *Anesthesiology*. 2007; **106**: 65–74.
*128. Chen E, Cole SW, Kato PM. A review of empirically supported psychosocial interventions for pain and adherence outcomes in sickle cell disease. *Journal of Pediatric Psychology*. 2004; **29**: 197–209.
129. Chorpita BF, Barlow DH. The development of anxiety: the role of control in the early environment. *Psychological Bulletin*. 1998; **124**: 3–21.
130. Dadds MR, Roth JH. Family processes in the development of anxiety problems. In: Vasey MW, Dadds MR (eds). *The developmental psychopathology of anxiety*. New York: Oxford University Press, 2001: 278–303.
131. Krohne HW. Parental childrearing and anxiety development. In: Hurrelmann K, Losel F (eds). *Health hazards in adolescence*. New York: Walter de Gruyter, 1990: 115–30.
132. Rapee RM. The development of generalized anxiety. In: Vasey MW, Dadds MR (eds). *The developmental psychopathology of anxiety*. New York: Oxford University Press, 2001: 481–503.
133. Vasey MW, Dadds MR. An introduction to the developmental psychopathology of anxiety. In: Vasey MW, Dadds MR (eds). *The developmental psychopathology of anxiety*. New York: Oxford University Press, 2001: 3–26.
134. Wood JJ. Parental intrusiveness and children's separation anxiety in a clinical sample. *Child Psychiatry and Human Development*. 2006; **37**: 73–87.
135. Frank NC, Blount RL, Smith AJ *et al*. Parent and staff behavior, previous child medical experience, and maternal anxiety as they relate to child procedural distress and coping. *Journal of Pediatric Psychology*. 1995; **20**: 277–89.
136. Blount RL, Corbin SM, Sturges JW *et al*. The relationship between adults behavior and child coping and distress during Bma Lp procedures – a sequential analysis. *Behavior Therapy*. 1989; **20**: 585–601.
137. Blount RL, Bunke VL, Zaff JF. The integration of basic research, treatment research, and clinical practice in pediatric psychology. In: Drotar D (ed.). *Handbook of research in pediatric and clinical child psychology. Practical strategies and methods*. Dordrecht: Kluwer Academic Publishers, 2000: xiii, 557.
138. Dahlquist LM, Power TG, Carlson L. Physician and parent behavior during invasive pediatric cancer procedures: relationships to child behavioral distress. *Journal of Pediatric Psychology*. 1995; **20**: 477–90.
139. Chambers CT, Craig KD, Bennett SM. The impact of maternal behavior on children's pain experiences: an experimental analysis. *Journal of Pediatric Psychology*. 2002; **27**: 293–301.
140. Goodman JE, McGrath PJ. Mothers' modeling influences children's pain during a cold pressor task. *Pain*. 2003; **104**: 559–65.
141. Dahlquist LM, Pendley JS, Power TG *et al*. Adult command structure and children's distress during the anticipatory phase of invasive cancer procedures. *Childrens Health Care*. 2001; **30**: 151–67.
142. Liossi C, White P, Franck L, Hatira P. Parental pain expectancy as a mediator between child expected and experienced procedure-related pain intensity during painful medical procedures. *Clinical Journal of Pain*. 2007; **23**: 392–9.
143. Kristensson-Hallstrom I. Strategies for feeling secure influence parents' participation in care. *Journal of Clinical Nursing*. 1999; **8**: 586–92.
144. Kotiniemi LH, Ryhanen PT, Valanne J *et al*. Postoperative symptoms at home following day-case surgery in children: a multicentre survey of 551 children. *Anaesthesia*. 1997; **52**: 963–9.
145. Melnyk BM, Alpert-Gillis L, Feinstein NF *et al*. Creating opportunities for parent empowerment: program effects on the mental health/coping outcomes of critically ill young children and their mothers. *Pediatrics*. 2004; **113**: e597–607.
146. Power N, Liossi C, Franck L. Helping parents to help their child with procedural and everyday pain: practical, evidence-based advice. *Journal for Specialists in Pediatric Nursing*. 2007; **12**: 203–9.
147. Turk DC. Customizing treatment for chronic pain patients: who, what, and why. *Clinical Journal of Pain*. 1990; **6**: 255–70.