

Psychological interventions for acute pediatric pain

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Introduction	308	Relaxation	313
Significance of the problem	309	Breathing techniques	314
Psychological influences on children's acute pain	309	Hypnosis	315
Developmental considerations	311	Guided imagery	316
Ethnic and cultural considerations	311	Combined cognitive and behavioral interventions	317
Management	312	Parental involvement in acute pain management	318
Preparation	312	Conclusions	319
Distraction	313	References	319

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 colleagues¹¹ 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 Drotar¹³ in their model of postoperative pain propose that a child's postoperative pain report is a product of background variables (age, surgery severity, medication

Context

- Why the pain is experienced (e.g. sports injury vs cancer)
- Where the pain is experienced (e.g. state of the art facility vs failing hospital)
- Sociopolitical factors (peace vs war time)

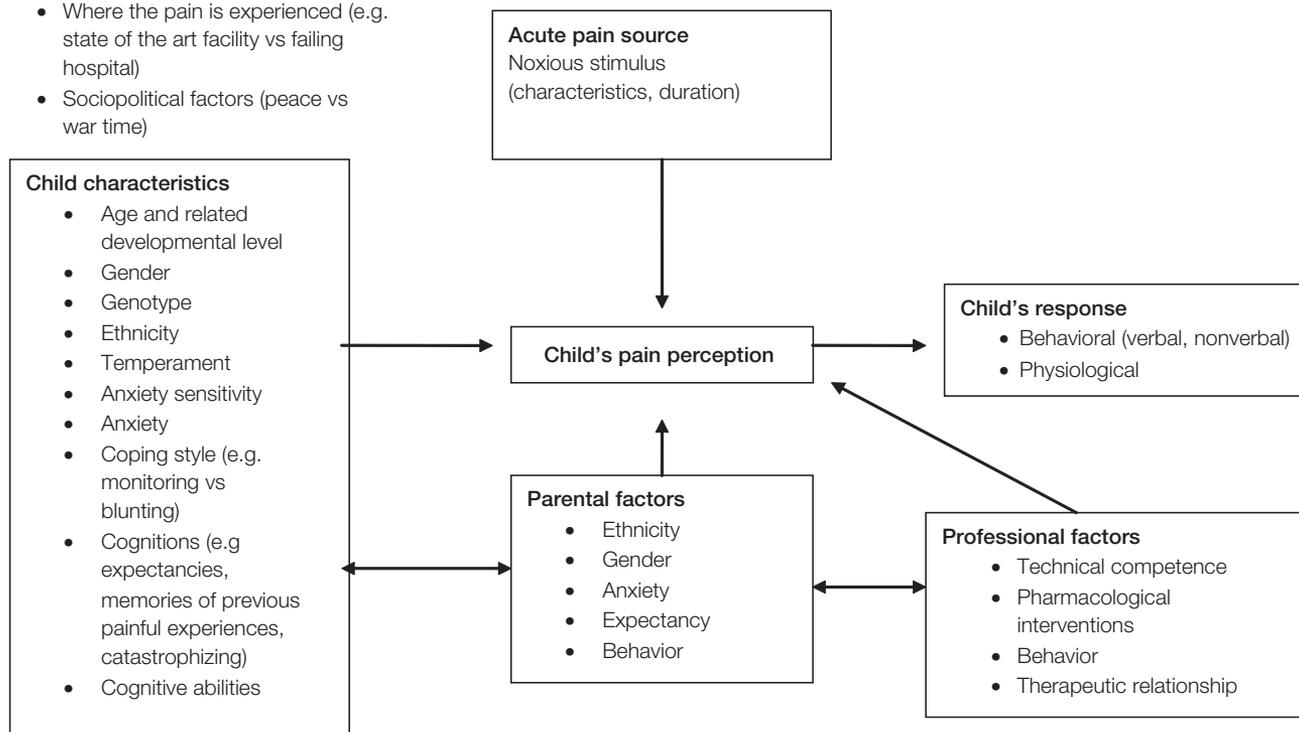


Figure 16.1 A model of acute pediatric pain.

received), anticipatory emotions (anxiety), and expectations about pain and analgesia. Logan and Rose¹⁴ 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 colleagues¹⁶ 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 Wilson¹⁷ 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 Craig¹⁹ 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 colleagues¹⁶ 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 In a story, abstract concepts can become concrete, and analogy and metaphor can be used to demonstrate reasoning
	Achieves conservation of number (age 6 years), mass (age 7 years), and weight (age 9 years)	Self-regulatory abilities are developing	
	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 colleagues²⁹ 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 Anglo-American parents. Jones and colleagues³⁰ 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 studies³⁵[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 Wan³⁵ 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 colleagues³⁸[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-analysis³⁹[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 pain⁴⁶ and less physiological arousal during a painful procedure⁴⁷ 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}

Leventhal⁶¹ and Cioffi⁶² 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

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).

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 colleagues⁶⁴ found that children who were blunterners 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]

RELAXATION

McCaffery and Beebe⁶⁵ 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.

Patterson⁷¹ 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. Taal⁷² 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,

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.

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 studies⁷⁴[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.

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 colleagues⁷⁹ 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 anterior 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 neodissociative⁸⁰ or dissociated control views⁸¹) 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 acute⁸⁶[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. Lambert¹⁰⁴[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 Assagioli¹⁰⁶ 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. Naparstek¹⁰⁷ 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. Naparstek¹⁰⁷ further elaborates that the body recognizes all sensory images as real, whether fact or fantasy. Research using positron emission tomography (PET) and fMRI methodologies¹⁰⁸ 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

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?"

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 trial¹⁰⁹[II] investigated imagery administered pre- and postoperatively, as a supplement to routine analgesics, for reduction of pain and anxiety after

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-analysis³⁹[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 skills¹²⁵[II] are effective for reducing preoperative fear, anxiety, and distress. In older adolescents, LaMontagne and colleagues¹²⁶[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 colleagues¹²⁷[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 models¹²⁹ 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 colleagues¹³⁵ 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 colleagues¹⁴¹ 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. Lioffi and colleagues¹⁴² 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

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