Pain Management in Children: Developmental Considerations and Mind-body Therapies

Susan M. Gerik, MD

Abstract: One of the most challenging roles of medical providers serving children is to appropriately assess and treat their pain. Pain is one of the most misunderstood, underdiagnosed, and undertreated/untreated medical problems, particularly in children. New JCAHO regulations regard pain as "the fifth vital sign" and require caregivers to regularly assess and address pain. This review focuses on the clinical assessment of pain, based on a developmental model and addresses common beliefs and myths that affect the management of pain in children. We provide a review of the pain literature that focuses on the integration of mind-body therapies into the management of procedure-related pain, headache, and recurrent abdominal pain in children.

Key Words: attitudes, developmental assessment, mind-body therapies, pain

Perhaps one of the most difficult challenges professionally and emotionally is learning to handle pain in pediatric patients. It is sometimes a necessary part of our work to inflict pain during procedures, immunizations, and other treatments. In the past, there was a relative lack of accountability for providing pain relief. The major focus now is on how to properly assess pain. Culture has changed as evidenced by the new Joint Commission on Accreditation of Healthcare Organizations (JCAHO) regulations. Pain is considered "the fifth vital sign" requiring caregivers to regularly assess and address pain.[1] However, pain remains one of the most misunderstood, underdiagnosed, and undertreated/untreated medical problems.

The focus of this review article is the use of mind-body therapies for the reduction and alleviation of procedure-related and elusive pain syndromes. We discuss clinical assessment of pain, based on a developmental model and address common beliefs and myths about pain because these factors significantly impact the utility of mind-body therapies for the management of pain. We provide a review of the pain literature focused on the integration of mind-body therapies into the management of procedure-related pain, headache, and recurrent abdominal pain in children.

The definition of pain, as defined by the International Association for the Study of Pain, is "an unpleasant sensory and emotional experience associated with actual or potential damage, or described in terms of such damage."

That having been said, pain is a personal experience. Many different terms are used to describe different sensations. Individuals vary widely in their perception and tolerance of pain. What might feel like a little nagging pain to one person may be excruciating to another. Frequently, one's past pain experience often plays a role in his/her present experience of pain.

Categories of Pain

There are several categories of pain. One of the most common is that which is associated with a disease state (eg, arthritis, sickle-cell disease) or that which is associated with an observable physical injury or trauma (eg, burns, fractures). Some of the most challenging conditions involve pain that is not associated with a well-defined or specific disease state or phys-

Key Points

- Pain in children is often misunderstood and undertreated.
- Pain in children must be assessed giving appropriate attention to their age and developmental stage.
- Mind-body therapies may be useful in the attenuation of pain and anxiety that often accompany medical procedures.
- Mind-body therapies may be useful in treating elusive pain syndromes such as recurrent abdominal pain and recurrent headaches.

From Pediatrics and Family Medicine, University of Texas Medical Branch, Galveston, TX.

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Reprint requests to Dr. Susan M. Gerik, University of Texas Medical Branch, 301 University Blvd., Galveston, TX 77555–0340. Email: sgerik@utmb.edu

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ical injury (eg, tension headaches, recurrent abdominal pain). Pain may also be caused by the medical provider when the pain is associated with medical and dental procedures (eg, circumcisions, injections). Pain may be caused by our habits and behaviors as well (eg, overuse injuries, abdominal pain related to intake of alcohol or spicy foods, and so on).

Physiology of Pain

Pain sensation is a product of several interacting neural systems. Afferent transmission relies on a balance in the activity of both the pain fibers and large proprioceptive or mechanosensory fibers. Inhibitory interneurons are spontaneously active and inhibit projection neurons. Pain transmission can also be modulated by descending pathways that constitute the "analgesia" system.[2]

Peripheral and central connections between sensory neurons and spinal dorsal horn cells occur early in fetal life. Neonates have the same number of pain nerve endings per square millimeter of skin as adults. They are present in fetal mucous membranes and in the skin within the second trimester. Synapses between sensory neurons and spinal interconnections start to develop by 3 months and are complete by the onset of the third trimester. The central nervous system tracts that subserve pain are completely myelinated by 30 weeks. Cortical interconnections with the thalamus, those tracts that play a role in higher perception of pain, are complete by 24 weeks. The descending inhibitory controllers of pain, though, are deficient in the neonate. This leads to the likelihood that neonates, particularly preterm neonates, may be more sensitive to pain than older children and adults.[3]

Postsurgical Stress Response: The Harm of Pain

Pain assists us in avoiding physical harm, but unrelieved pain may be inherently harmful both psychologically and physiologically. Failure to intervene early in children's pain may lead to impairment in functioning and disruption in families.[4] Unaddressed pain heightens anxiety and fear, which, in turn, increases perception of pain. Even more concerning, though, is the physiologic effect of pain as illustrated in the postsurgical stress response. The postsurgical stress response consists of a metabolic, hormonal, and hemodynamic response to major injury or surgery. This response sets off a neuroendocrine cascade with release of catecholamines, adrenocortical hormones, glucagon, and other catabolic hormones, which results in increased oxygen consumption, increased carbon dioxide production, hyperglycemia, and a generalized catabolic state with negative nitrogen balance. Anxiety induces the same neuroendocrine response. This response occurs even in preterm infants. The magnitude of the postsurgical stress response correlates with mortality rates.

Neonates experience increased sensitivity to pain compared with older age groups.[5] While critically ill and preterm neonates may not exhibit vigorous physical responses to painful stimuli, they mount a greater hormonal, metabolic, and cardiovascular response to surgical procedures.[6]

The plasticity of the neonatal brain increases its vulnerability to early adverse experiences, thus leading to abnormal behavior and development. Early experiences such as pain are associated with multiple alterations in the adult brain in a number of animal models. Repeated exposure to pain may cause altered pain sensitivity, anxiety, stress disorders, hyperactivity and attention deficit disorder, impaired social skills, and patterns of self-destructive behavior.[7]

Toddlers and infants perceive medical procedures as pain, fear, and separation.[8] The factors most likely to cause psychologic trauma for pediatric patients undergoing painful procedures include separation from parents, inadequate support from parents, and physical constraints.[9] Children often perceive invasive medical procedures as a threat to their bodies or even a punishment. Children rapidly develop conditioned anxiety responses to procedures and medical supplies used in procedures. Most children do not habituate to repeated procedures.[8] Furthermore, sedation tends to cloud thinking/understanding and may increase their sense of helplessness during procedures exacerbating the problem.

Attitudes About Pain: Barriers to Adequate Pain Management in Children

We have made a number of advances in our approach to pain management in children, but misconceptions still exist. Many providers believe that children do not remember pain, that children experience less pain than adults, that children are too fragile to receive potent drugs, and that narcotics may induce addiction.[10] Medical caregivers may believe that if one is urgently trying to save a life, there is no time to worry about pain control. Concentration on intensive care may put the neonate into the role of "biologic machine" rather than a human being capable of perceiving, responding to, and interacting with his or her environment.[3] Assumptions on the part of patients as well as caregivers affect pain assessment. Many children will deny pain because of fear of disappointing caregivers or fear of an injection. Many health care providers also at least subconsciously believe that they, rather than the child, can accurately judge a child's pain experience. They may attribute a child's distractibility to absence of pain. This perception represents a misunderstanding of the powerful roles of distraction and comforting in the attenuation or relief of pain. Even though we as caregivers accept that pain is a subjective experience, we still expect patients to react to pain with some predictable, visible signs such as sweating, tachycardia, wincing, crying, jerking away, and muscle tension. The absence of these typical signs may indicate adaptation on the part of the patient. As adaptation occurs, caregivers are left with fewer concrete indications of pain presence and intensity.[1] The result of these perspectives is ineffective pain treatment for most pediatric patients.

A Developmental Approach to Assessment

To accurately assess pain in children, the medical caregiver must tailor assessment strategies to the child's developmental level (Table 1) and personality style and to the situation. Several factors modify pain perceptions including age, cognition, sex, previous pain experience, temperament, cultural and family factors, and situational factors. Chronologic age serves only as an estimate of a child's actual development. Attending to developmental level probably will increase the effectiveness of assessment and treatment of children's pain.[11] There are three widely used categories of behavioral indicators of pain: global rating scales, indirect measures, and behavioral observation scales. Global rating scales rely on assessment of predictable behavioral indicators of pain such as crying, wincing, or screaming. Indirect measures of pain may be assessed by requests for medication, or "well" behavior such as playing. We know from previous studies, however, that requests for pain medication are not reliably linked to pain intensity. Observation methods focus on documentation of specific behaviors indicative of pain.[12] Physiologic measures (eg, heart rate and blood pressure) are helpful as adjuncts to self-report and behavioral observation. They are neither sensitive nor specific as indicators of pain. Clinicians frequently use vital signs as an adjunct to pain assessment, although little evidence exists to support the practice.[13]

Neonates

There is no easy or scientific way to tell how much pain an infant is having. Behavioral observations and physiologic measures can be difficult to interpret. Neonates may manifest pain by crying or being silent, wiggling, or being still. The infant may make faces or not. In a study of 136 preterm neonates, reactivity to routine blood collection at 32 weeks' postconceptional age was assessed using behavioral and autonomic measures. Some neonates showed high behavioral but low physiologic reactivity, other neonates displayed the opposite, but the majority of neonates displayed concordance.[14] Vagal tone and heart rate variability are significantly reduced in direct proportion with the invasiveness of procedures. These changes parallel the changes in cry and behavior in neonates undergoing circumcision.[15] The cry of pain in the neonate is quite distinctive. Primary caregivers easily distinguish and interpret cries. When acoustically naive but experienced young mothers or developmental psychology graduate students trained in acoustics listen to and describe a tape of recorded cries, both types of listeners not only clearly recognized the infant's urgent cry during an invasive procedure but also matched their perception of distress closely with objective acoustic data.[15] The most helpful pain indicators in neonates of more than 28 weeks' gestation are behavioral observations such as changes in facial expression and sleep/wake cycles, together with physiologic indexes of heart rate and oxygen saturation.[14]

Table 1. Developmental approach to assessment of pain in children

Age group	Best approach to assessment
Neonate	Quality of cry; change in facial expression, changes in sleep/wake cycles, physiologic indices (heart rate, oxygen saturation) assessed together
Toddler	Caregiver's report
School-age	Child's report, symptom scales
Adolescent	Symptom diaries

Toddlers

Reports of caregivers can be invaluable in assessment of the toddler age group. The fear factor is a large contributor to experience of pain in this and the school-age group. Toddlers may become very quiet and inactive while in pain or may become very active. They frequently use only one word (owie, booboo). Parents report that "they aren't acting like they normally do." Interpreting toddlers' behavior may be difficult due to exacerbating factors such as separation anxiety, memory of previous painful experiences, and physical restraint. Sometimes toddlers manifest their pain and fear by aggressive outbursts.[16]

School-age Children

School-age children are more accurate in communicating about their pain. By age 8 years, children can very reliably describe location of pain. It is vital to take their report of pain seriously. Psychologic contributors should be examined as well, for example, recurrent abdominal pain, headache, and school absence. The clinician should be aware that behavioral observations could be misleading, for example, Nintendo, as a distraction. School-age children also exhibit self-control when they are experiencing pain. They may not report pain in an attempt to show bravery.[16]

Symptom scales and self-report tools are appropriate for most children 4 years of age and older. Children older than 8 years who understand the concept of order or number can use a numeric rating scale or a horizontal word-graphic rating scale. Older children can also use word-graphic rating scales. There are a number of helpful pain assessment tools (VAS, scales—tables, graphs, or diagrams—Wong Baker Faces Scale).[17] Pain diaries may be helpful in the school age populations.

Adolescents

Adolescents are able to characterize and accurately describe pain, intensity, and, location; psychologic overlay can also be important in this group. Adolescents can explain pain more clearly because they understand words and concepts that younger children do not. Adolescents exhibit a high degree of control in their response to pain. They are most con-

cerned about maintaining a sense of control. Clinicians must elicit trust from the adolescent to get an accurate report of pain from an adolescent.[16]

Mind-body Therapies for Pain Management

Children are particularly responsive to pain-controlling strategies that involve their imaginations and senses of play. Sensory and procedural information coupled with behavioral techniques can be used to distract children away from painful procedures and to decrease fear and anxiety (Table 2).[18]

All patients in pain can benefit from well-chosen use of psychologic techniques. This approach in children must take into account the developmental level of the child. Approaches as simple as covering the wound or as involved as play therapy may be used. It is wise to keep children with their caregivers if at all possible. With proper guidance, parents assist with distracting the child and reinforcing the suggestions of the medical team. Developing a calm, patient, understanding approach to the needs of the child and his or her caregivers can markedly enhance the encounter.[10]

Parents participate in the care of their children using nonpharmacologic methods in relieving their hospitalized children's postoperative pain. A questionnaire survey was administered to 192 parents of children ages 8 to 12 years hospitalized on a surgical ward in five university hospitals in Finland. Nonpharmacologic methods such as emotional support and assistance with daily activities were frequently used, whereas cognitive-behavioral strategies were more frequently used. The hospitalized child's sex, the time of the surgical procedure, and the parents' assessment of their child's pain intensity were significantly related to the strategies.[19]

Parents naturally assist children receiving immunizations. In a study of 40 children, ages 18 months to 6 years, three strategies were used during and after the immunizations. Strategies used before the immunization included information, distraction, and physical contact. Strategies used after the immunization included physical contact, praise, and rewards.[20]

Children make efforts to relieve their own pain through nonpharmacologic approaches. A study looked at children ages 8 to 12 years and their experiences with postsurgical pain-relieving measures. The children rated the intensity of their pain on a visual analog scale. The results indicated each of 52 children used at least one self-initiated pain relieving method in addition to receiving assistance in pain relief from nurses and their parents. The children also provided suggestions for effective pain relief (ie, approaches that would create a more comfortable environment).[21]

Table 2. Pain reduction techniques

Category of techniques	Examples
Kinesthetic	Rocking, stroking, blowing, massage, relaxation
Behavioral	Sucking, bubble-blowing, modeling, distraction, procedural rehearsal
Imaginal	Imagery, hypnosis
Sensory	Thermal regulation, massage, acupressure, positioning, sucking, transcutaneous electrical nerve stimulation
Cognitive	Hypnosis, imagery, prayer, cognitive restructuring, humor
Cognitive-behavioral	Distraction, play therapy, biofeedback, exercise, psychologic preparation, relaxation techniques

Specific Mind-body Therapies

Mind-body therapies rely principally on distraction and relaxation for their efficacy.

Breathing techniques

Breathing techniques can be very effective to attenuate pain. During pain, patients frequently take very shallow breaths or hold their breath. Simply breathing deeply can effectively induce a relaxation response. One might use rhythmic, deep-chest breathing or patterned, shallow breathing to reduce pain, stress, anxiety, and even panic. The Lamaze technique is the well-known application of breathing techniques during natural childbirth. Breathing techniques can be applied in a similar fashion for a variety of painful procedures in children. In a study of patients undergoing bone marrow aspiration, breathing exercises were found to be helpful to reduce behavioral distress.[22]

How to use the technique. Instruct the child to put his/her hand over his belly, to breathe in deep into the lungs, and to feel the belly expand. Next instruct the child to breathe out through the mouth, slowly allowing the belly to deflate. This breathing technique may be repeated throughout a painful procedure. For ongoing pain, this deep "belly-breathing" may be continued for 1 to 2 minutes and gradually increase to 20 to 30 minutes as the child becomes more proficient.

Resources for learning more:

The Breathing Book: Good Health and Vitality Through Essential Breath Work, by Donna Farhi, Owl Books, 1996.

The Secrets of Abdominal Breathing Techniques, by Pham Van Chinh, First Books Library, 2004.

Guided imagery

Guided imagery is a form of relaxed, focused concentration. The child is guided to imagine a favorite place or a favorite activity. Guided imagery not only produces distraction but also enhances relaxation. A study of 10 children with recurrent abdominal pain experienced less pain with guided imagery coupled with relaxation.[23] Guided imagery used with progressive muscle relaxation showed similar improvement in abdominal pain in a study of 18 children.[24]

How to use the technique. A script such as the following may be used: Relax for a few minutes and imagine a happy, comfortable place. This place may be a place you have been before or a place you would like to go. It could be a place that

you have just imagined. Choose one place knowing that you can visit others another time. Now pretend that you are in that special place. Notice what you see. What do you hear? Are there scents in that place? What do you feel in that special place? Now spend a few minutes just enjoying everything about your special place.

Resources for learning more:

Healing Images for Children: Teaching Relaxation and Guided Imagery to Children Facing Cancer and Other Serious Illnesses, by Nancy C. Klein, Matthew Holden Inner Coaching, 2001.

Guided Imagery for Healing Children and Teens: Wellness Through Visualization, by Ellen Curran, Beyond Words Publishing, 2001.

Thirty Scripts for Relaxation Imagery and Inner Healing, by Julie T. Lusk, Whole Person Associates, 1992.

Academy for Guided Imagery, http://www.academyforguidedimagery.com/

Progressive muscle relaxation

Progressive muscle relaxation helps the patient to recognize and reduce body tension associated with pain. It can decrease anxiety and discomfort and increase body awareness.[18] Eighteen patients with headaches, using progressive relaxation, reported a reduction in headache hours.[25]

How to use the technique. Ask the child to lie down in a comfortable position. Ask them to notice how their muscles feel in each part of the body. Taking individual areas of the body one at a time (face, shoulders, arms, hands, fingers, abdomen, thighs, lower legs, feet, and toes), instruct the child to clench the muscles for approximately 5 seconds, take a deep breath, and release. Next instruct the child to clench all muscles simultaneously, hold for 5 seconds, then release. Finally, ask him to notice how his muscles feel after the exercise.

Resources for learning more:

Progressive Muscle Relaxation, http://ourworld.compuserve.com/homepages/har/les1.htm

Biofeedback

Biofeedback is an approach that uses instruments to detect and amplify specific physical states in the body and help bring them under one's voluntary control. The mechanism of pain relief is based on specific physiologic changes caused by the biofeedback. Very elegant systems are available that provide immediate positive feedback to young patients and thus reinforce their ability to elicit relaxation and thus reduce pain and anxiety. For example, a child may sit in front of a computer monitor that displays a clown that may juggle or a flower that may open. Frequently, music accompanies the video display. Selected physiologic functions are measured such as heart rate, skin temperature, galvanic skin response, electromyogram, or even electroencephalogram waves. The child applies relaxation techniques to bring those physiologic functions into some desired ranged and is promptly rewarded with a pleasing graphical display (clown juggling, flower opening) and pleasing music. When the physiologic functions are out of range (suggesting a stress response), the music and display cease. These systems are very effective in helping train children in biofeedback. Biofeedback has been used in a number of clinical settings to help attenuate or relieve pain. Several studies have shown efficacy of biofeedback in the management of headaches in children with decrease in frequency, intensity, and duration of headaches.[26–31]

How to use the technique. For elaborate systems, the child may be referred to a practitioner trained in biofeedback techniques. For a more simple, low-cost approach, a simple thermistor or biodot may be used. The thermistor is applied to the finger and measures the skin temperature. The biodot is applied as a sticker to the skin. Changes in temperature of the skin causes changes in the color of the biodot. Thermistors and biodots may be purchased through sources listed below.

Resources for learning more:

Biofeedback, Third Edition: A Practitioner's Guide, by Mark S. Schwartz, Frank Andrasik, Guilford Publications, 2003.

The Stress Eliminator: Biodots, http://www.commandotrader.com/StressElim.htm

Association for Applied Psychophysiology and Biofeedback, http://www.aapb.org/

Hypnosis

Hypnosis induces an altered state of consciousness in which concentration is focused, narrowed, and absorbed. Techniques are quite similar to relaxation and guided imagery exercises; however, specific suggestions are made during the deepest relaxation phase of the exercise. These suggestions seek to train the unconscious mind to promote pain relief, healing, or some other desired outcome. Hypnosis has been used in children in a variety of contexts. It has proved helpful for procedure-related pain as well as pain syndromes.[32] A study of 27 children undergoing bone marrow aspiration showed that hypnosis reduced self-reported pain.[33] Hypnosis is generally used as an adjunct to analgesic medications for the reduction of procedure-related pain, but one study showed its efficacy alone for the reduction of pain and anxiety in four children undergoing reduction of angulated forearm fracture in Mexico. No other form of sedation or analgesia was available to these children. Two hours after the reduction, all four patients had no memory of having the fracture reduced and denied pain during their emergency department stay.[34] Self-hypnosis was shown to reduce dyspepsia in 17 children with recurrent abdominal pain.[35] A study of 28 children with headaches showed that self-hypnosis reduced headache number when compared with propranolol.[36]

How to use the technique. Hypnosis is generally provided by individuals specifically trained in this technique. Self-hypnosis can be taught by these providers. Information for referral is included in the resource list below.

Resources for learning more:

Hypnosis and Hypnotherapy With Children: Third Edition, by Karen Olness et al, Guilford Publications, 1996.

Hypnotherapy of Pain In Children With Cancer, by Josephine R. Hilgard, Brunner-Routledge, 1984.
American Psychotherapy and Medical Hypnosis Association, www.apmha.com

Cognitive-behavioral training

Cognitive-behavioral training focuses on the role of thoughts in how the patient feels. Patients are trained to identify thinking that contributes to negative feelings or pain and to replace it with thoughts that promote health and wellness. Children may use this approach with pain syndromes, which are often affected by thoughts. They may use this approach with procedure-related pain to decrease their anxiety and increase their tolerance to pain. Cognitive-behavioral training has been used successfully in children with recurrent abdominal pain[37] and headache.[38,39] Cognitive-behavioral training is equally efficacious for pediatric headache if administered by a therapist in a group setting as if administered in a self-help format. In both groups, headaches decreased markedly.[40]

How to use the technique. Cognitive-behavioral training is provided by individuals trained in this technique. Children may be referred to psychologists, counselors, or social workers to provide this training to children.

Resources for learning more:
Child and Adolescent Therapy: Cognitive-Behavioral Procedures, Second Edition, by Philip C. Kendall (editor), The Guilford Press, 2000.
Therapeutic Exercises for Children: Guided Self-Discovery Using Cognitive-Behavioral Techniques, by Robert D. Friedberg, et al, Professional Resource Press, 2001.

Music therapy

Music therapy is the controlled use of music to effect clinical change. The literature is rich with examples in which music therapy has been effective in eliciting desired clinical outcomes. It has been used in the perioperative setting, for painful procedures in burn units and emergency departments, and for reduction of anxiety and distress.[41] Music as a treatment tool is quite flexible and can be integrated with other treatment modalities. A pilot study on the effects of interactive music therapy on hospitalized children with cancer conducted at the Hospital for Sick Children and the University of Toronto suggested a positive impact on the child's well being. There was significant improvement in children's ratings of their feelings from pre- to post-music therapy. Parents reported an improved play performance in preschool children and adolescents.[42]

How to use the technique. Clinicians may determine the child's taste and preferences and provide music in the context of medical procedures. They may instruct patients to incorporate music into their relaxation exercises for ongoing pain. Music may be offered by child life specialists as well. In many medical centers, music therapists are available to provide interventions as simple as selecting music that is pleasing to a particular child or as complex as synchronizing music with specific physiologic processes.

Resources for learning more:
American Music Therapy Association, www.musictherapy.org

Managing Pain in Specific Settings

Procedure-related pain

Children may perceive invasive medical procedures such as venipuncture, injections, lumbar punctures, and bone marrow aspirations as worse than the underlying disease that brought them to medical care. Sometimes such procedures are understood as punishment and convey a sense of physical threat. A sense of control is essential for children undergoing painful procedures. How the medical providers approach that child can make an important difference in the child's level of anxiety and fear, their perception of pain, and their memory long after the procedure (Table 3).

There are three phases of coping with a painful procedure: the anticipation of the procedure and preparation, the actual procedure, and the aftermath of the procedure. Inadequate explanations as well as magical thinking may worsen a child's anxiety. Providers should prepare for procedures in

Table 3. Mind-body therapies for procedure-related pain

Therapy	Procedure	Findings
Music therapy	Hospitalization[42]	Improved ratings of feelings
Distraction, relaxation	Invasive procedures[22,44]	Decrease in fear, decrease in pain
	Lumbar puncture[45]	
Information	Hernia surgery[46]	Decreased pain scores
Hypnosis	Fracture reduction,[34] bone marrow aspiration,[33,47] lumbar puncture[48]	Decreased memory of procedure, decreased pain, less anxiety, less behavioral distress
Imagery	Local anesthetic dental injection,[49] burn dressing changes[50]	Successful imagery, no decrease in distress
Modeling, reinforcement, breathing exercises, imagery, distraction, and behavioral rehearsal	Bone marrow aspiration[22]	Reduced behavioral distress
Virtual reality analgesia	Postoperative physiotherapy[51]	Reduced pain rating

Table 4. Mind-body therapies for recurrent abdominal pain

Therapy	Findings
Fiber + biofeedback ± cognitive-behavioral ± parental support[37]	Decrease in pain
Relaxation, guided imagery[23]	Decrease in pain
Self-hypnosis[35]	Decrease in pain
Guided imagery, progressive muscle relaxation[24]	Decrease in pain

advance by assessing the child's stage of development, language ability, imagination, and personality and assess the family situation.[43] Clinicians should establish a trusting relationship with the child, having the equipment and supplies ready before the child enters the room, allow the parents to remain with the child if possible, avoid deceptive statements ("This will not hurt."), involve the child in the procedure, and use positive suggestions and ego-supporting statements.[8]

Recurrent abdominal pain

Recurrent abdominal pain is a particular challenge for children, parents, and medical providers. A number of mind-body therapies such as guided imagery, relaxation, biofeedback, and hypnosis have shown promise in the alleviation of recurrent abdominal pain (Table 4).

Headache

Recurrent headache is another clinical challenge. Untreated, they adversely impact children's quality of life and frequently lead to family dysfunction as well. The mind-body therapies have been studied rather extensively. Therapies such as biofeedback, cognitive-behavioral training, progressive relaxation, and self-hypnosis have shown substantial promise in the reduction of frequency and intensity of headaches (Table 5).

Table 5. Mind-body therapies for headache

Therapy	Findings
Biofeedback[26–30]	Decreased frequency, intensity, and duration of headaches
Cognitive, stress reduction[38]	Decreased headache
Relaxation training[52–55]	Decreased frequency, intensity, and duration of headaches, increase in headache-free days
Concentration exercises[56]	Decreased frequency and duration, increased intensity of headaches
Progressive relaxation[25]	Reduction in headache hours
Self-hypnosis[36]	Reduction in headache number, no change in intensity vs propranolol
Cognitive-behavioral therapy[40]	Similar efficacy if administered by therapist or self-administered

Table 6. American Academy of Pediatrics recommendations regarding pain in children[a]

Expand their knowledge about pediatric pain.
Provide a calm environment for procedures.
Use appropriate pain assessment tools and techniques.
Anticipate predictable painful experiences, intervene, and monitor.
Use a multimodal approach to pain management.
Involve families, tailor interventions to individual child.
Advocate for child-specific research in pain management.
Advocate for effective use of pain medication in children to ensure compassionate, competent management of their pain.

[a]*From Reference 57.*

Conclusion

The American Academy of Pediatrics has acknowledged the importance of appropriate management of pain in pediatric patients.[44–56] They have made a number of recommendations, which are listed in Table 6.[57]

Untreated pain has harmful physiologic and psychologic effects. Appropriate and effective pain management in children relies on a therapeutic alliance among the child, his or her parent, nurses, physicians, and other health care professionals. Pain must be assessed in the context of the child's culture, beliefs, and developmental stage. Mind-body therapies such as breathing techniques, guided imagery, progressive muscle relaxation, biofeedback, hypnosis, cognitive-behavioral training, and music therapy provide a useful tool for the attenuation or relief of pain.

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