

# COMPLEMENTARY AND ALTERNATIVE MEDICINE FOR ACUTE PROCEDURAL PAIN IN CHILDREN

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Pain may cause physical and emotional distress in children experiencing medical procedures. Complementary and alternative medical (CAM) therapies have become increasingly important in treating children's painful conditions, yet it is still unclear whether CAM has a place in acute pediatric pain analgesia. This review aims to present an overview of the available published evidence. Most research has examined the efficacy of hypnosis, which has emerged as useful in alleviating acute pain associated with a number of medical procedures. Music therapy also has gained some attention and for the most part shows promise in

the pediatric acute pain setting. Acupuncture, laughter therapy, and massage also may prove beneficial. Despite the promise of many of these modalities, we conclude that further empirical research into safety and efficacy using well-designed studies and large samples is required before guidelines can be established. In addition, further work is needed in standardizing interventions, creating treatment manuals, and determining treatment efficacy as a function of the child's development, his or her individual characteristics, and the type of procedure the child is undergoing. (*Altern Ther Health Med.* 2008;14(5):52-56)

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**T**he functioning of body and mind should ideally be addressed in the search for pain remedies. As acceptance of the biopsychosocial model of pain has increased, so has our understanding of how therapies and remedies beyond conventional Western medicine may act upon the mind and the body to relieve pain. In the past decade, we have seen a corresponding increase in the popularity and acceptance of complementary and alternative medicine (CAM) for adults and children to address a range of health conditions, including pain.

CAM has been defined as those therapeutic interventions which have not been widely established for use in conventional healthcare practice nor incorporated into the standard medical curriculum.<sup>1</sup> The National Center for Complementary and Alternative Medicine groups CAM therapies into 5 categories: biologically-based therapies, manipulative and body-based therapies, energy medicine, mind-body medicine, and whole medical systems.<sup>2</sup> Biologically-based therapies include herbal remedies as well as vitamins and other dietary supplements. Manipulative and body-based methods include chiropractic, osteopathic manipulations, and massage. Energy therapies typically refer to Reiki and the unconventional use of electromagnetic fields, such as pulsed

fields that alternate current or direct current fields. Mind-body medicine relates to a variety of techniques that aim to increase the mind's capacity to enhance bodily function and reduce symptoms. These techniques include mental healing; expressive therapies such as music, art, or dance therapy; and spiritual practices such as meditation and prayer. The medical uses of hypnosis, yoga, and relaxation also are included in the mind-body category. Whole medical systems are built upon complete systems of theory and practice and may make use of therapies from the biological, body-based, mind-body, and energy modalities. Examples are homeopathic medicine, naturopathic medicine, and traditional Chinese medicine (which includes acupuncture).

A number of recent estimates place pediatric CAM use in industrialized regions such as North America, the United Kingdom, and Australia between 20% and 40%.<sup>3-6</sup> However, a single consistent estimate is difficult, as there is great variability in methodology, CAM definitions, and populations included across these studies.<sup>7</sup> Despite these discrepancies, CAM use may cross income, racial, and ethnic barriers. Although some research suggests that higher maternal education and income are linked to CAM use in children,<sup>8</sup> other work indicates that CAM use is not limited to the wealthy. One study found that as many as 70% of homeless youth used a range of CAM therapies, the most common of which were herbal supplements, special diets, massage, exercise, and acupuncture.<sup>9</sup> CAM use may be especially high in certain minority communities. For example, almost half of Latino children recently surveyed used medicinal herbs compared to a third of non-Latinos.<sup>4</sup> It appears that many children from varied backgrounds use CAM, either formally through a CAM practitioner or informally by taking herbs or dietary supplements.

## STUDY AIMS AND METHODOLOGY

Despite the growing popularity of CAM use among children, there is little consensus regarding the efficacy of these approaches. This article aims to provide a comprehensive review of existing literature regarding the efficacy of various CAM modalities for acute or procedural pain in children. For the purposes of this review, acute pain refers to discomfort associated with medical procedures or injury. Children undergo a variety of such procedures, including—but not limited to—immunizations, surgery, and care associated with accidents, injuries, or disease processes. Many infants undergo additional medical procedures such as heel sticks and circumcision, and findings from reviews on CAM treatments for infant procedural pain have been reported previously.<sup>10,11</sup> These reviews found robust evidence for the use of sucrose and non-nutritive sucking and preliminary evidence for music-based interventions, olfactory stimulation, kangaroo care, and swaddling.

It is unclear whether CAM treatments are beneficial for children aged 2 years and older. Hypnosis and music therapy have received the most attention in the literature and provide the focus of the review. We also discuss potentially promising interventions that have not yet undergone substantial empirical investigation.

A key consideration is the great variation in the number, type, and quality of trials for each CAM approach discussed. As noted previously, some CAM modalities such as hypnosis and music therapy have been the subject of extensive study, whereas others have been studied very little. Moreover, there is a lack of standardization in the application of CAM approaches across studies. In light of the inherent inconsistencies in the literature, the aim of this article is to provide a broad overview of the evidence for a variety of CAM interventions that have been applied to the management of acute pain in children in order to highlight areas for future study and to provide general guidelines for clinicians.

It should be noted that this review is intended to be comprehensive but not systematic. Because of differences across trials in the application of CAM modalities, the variety of measures employed to assess pain, and variations in study definitions of pain, formal meta-analyses were precluded. Because the aim of this article is to provide a synthesis of the relevant and representative summary of the evidence-based literature, existing reviews of CAM approaches are included. Therefore, specific criteria that are typically used to evaluate the methodological quality of individual trials (eg, Jadad scores) were not incorporated. The rationale for this decision was based on the consideration that the various reviews included in this article used different rating systems for evaluating the quality of the trials, and it is unclear how these different rating systems could be reconciled.

Identification of relevant literature examining CAM for children's procedural pain proceeded as follows. The PubMed, PsycInfo, CINAHL, and Cochrane Library databases were searched up to March 2008 using the keywords *pain, child, pediatric, complementary, alternative, hypnosis, acupuncture, music, yoga, meditation, energy, and laughter*. Only literature related to the use of CAM for pediatric pain associated with medical proce-

dures, not for chronic pain, was included. Studies examining children aged 2 to 18 years were included. Studies were included if they possessed a control group or a comparison condition (eg, at least 1 other intervention). Findings from relevant reviews also were considered. The evidence for each CAM intervention is grouped together in separate sections below.

## HYPNOSIS

Hypnosis involves a state characterized by increased suggestibility, attention, and relaxation. During hypnosis, modification or enhancement of sensation and perception often occurs, and therefore it may be useful for adults and children undergoing painful procedures. Hypnosis is known to be effective for adults experiencing acute and chronic pain,<sup>12</sup> including surgery.<sup>13</sup> A recent review indicated that hypnosis may be even more effective for use in children<sup>14</sup>; susceptibility to hypnosis is generally greater in children than adults, possibly because of children's readiness to engage in make-believe play and fantasy.<sup>15</sup> Although the exact mechanism of action is not well understood, work with neuroimaging techniques shows that hypnosis is associated with activation of brain areas consistent with decreased arousal, increased visual imagery, and possible reinterpretation of perceptual experiences.<sup>16,17</sup>

Hypnosis has been used in children to alleviate a number of painful medical procedures. A randomized controlled trial (RCT) of 30 children aged 5 to 15 years undergoing bone marrow aspirations found reduced pain in the hypnosis group compared to controls.<sup>18</sup> Other studies using hypnosis for bone marrow aspiration also have reported positive results.<sup>19</sup> One study with children aged 3 to 6 years found that hypnotized children did not rate themselves as having less pain, yet external observers noted significantly decreased pain, anxiety, and distress in the hypnotized group.<sup>20</sup> This discrepancy between self-reporting and others' reports of children's pain underscores potential limitations in self-report pain instruments for young children. The results also might indicate that hypnosis is less effective for younger children.

Research examining hypnosis for lumbar punctures in oncology patients aged 6 to 16 years found that the presence of a therapist may be important.<sup>21</sup> In this study, direct hypnosis involving direct hypnotic suggestions, such as request for numbness, and indirect hypnosis involving indirect suggestions, such as the setting sun metaphor (plus standard treatment for both conditions), were found to be effective in reducing pain and anxiety compared to 2 control groups (attention with standard treatment and standard treatment alone). When children were taught self-hypnosis, however, therapeutic benefits decreased substantially compared to therapist-directed hypnosis. A 2006 study conducted by Lioffi et al may demonstrate these findings.<sup>22</sup> In this RCT of 45 cancer patients aged 6 to 16 years undergoing lumbar punctures, hypnotizability was tested before instruction in self-hypnosis. Children in the self-hypnosis plus local anesthesia group had significantly reduced anticipatory anxiety, procedure-related pain, and anxiety compared to the local anesthesia only control group. However, the level of hypnotizability

was significantly related to the treatment benefits, so that children scoring high on hypnotizability showed greater benefits. This study demonstrates the importance of assessing hypnotizability before treatment, especially if self-hypnosis is intended with children. An additional insight is the possible reduction of anticipatory anxiety with hypnosis. The application of a local anesthetic can become a conditioned stimulus, resulting in significant anxiety for children before the procedure is performed. It appears that hypnosis can alleviate acute pain as well as anxiety before and during procedures.

A number of other studies support the efficacy of hypnosis for pediatric procedural pain. Hypnosis appears to be superior to distraction in reducing pain and anxiety of venipuncture, bone marrow aspiration, and lumbar puncture in highly hypnotizable children aged 3 to 8 years.<sup>23</sup> Treatment benefits also have been shown for pain from angulated forearm fractures<sup>24</sup> and postsurgical pain and anxiety.<sup>25</sup> A review of psychological interventions for needle-related procedural pain reported hypnosis was a promising intervention for self-reported pain in children and adolescents.<sup>26</sup> However, one of the difficulties in the existing literature concerns the lack of agreement over operational definitions of *hypnosis*. A wide variety of terms have been used (such as hypnotherapy, guided imagery, imagery) to describe hypnotic procedures, and it is not clear whether these techniques are comparable.

Hypnosis has been consistently effective in reducing the pain and anxiety of children during acute pain procedures.<sup>27</sup> We recommend use of hypnosis alongside standard medical procedures to reduce pain and anxiety in relation to painful medical procedures in children. However, not every child will be a candidate; the success of hypnosis appears to be contingent on age (children older than 5 years of age) and degree of hypnotizability. Further research is required to establish standardized treatment manuals and to understand efficacy as a function of child age and type of procedure.

## MUSIC THERAPY

Music has been used for centuries by many cultures to reduce physical and mental pain. Despite this, research examining music as treatment for pain in children is still limited. Acute pediatric pain conditions that have gained some empirical attention include injection pain, venipuncture, circumcision, burn dressings, and surgery pain. However, much of this literature lacks a clear reference to music therapy, which is a clinical and evidence-based systematic intervention. In this discipline, therapists are trained to aid patients' recovery through an active musical experience in which the patient is typically engaged in the music-making process. The effects of music therapy are thought to be more active, pronounced, and therapeutic than simply listening to music. Due to the small number of studies that have used trained therapists to administer music therapy, literature that involves any musical intervention will be presented here. Interventions involving therapy as opposed to passively listening will be referred to as active music therapy.

The largest number of studies using music for children's

acute pain has involved injections and blood draws, with a number of positive findings. A variety of therapeutic delivery methods have been used, including recorded lullabies played on speakers or through headphones and live music. A 2007 RCT using active music therapy for 108 children aged 4 to 13 years undergoing venipuncture found lower distress and pain scores in the music group compared to a control group receiving support from parents.<sup>28</sup> Studies using passive listening have reported more limited therapeutic results. One study found lowered distress but not pain in preschoolers undergoing immunizations.<sup>29</sup> Another large RCT of 200 children aged 4.5 to 6.5 years found music distraction superior to control conditions.<sup>30</sup> In another study, infants and children younger than 7 years listened to live music while undergoing intravenous starts, venipunctures, injections, and heel sticks.<sup>31</sup> The music group showed less behavioral distress than a no-intervention control group both before and after the procedures; however, both groups exhibited the same level of distress when the needle was inserted. It is possible that the attentional demands of passive listening were not sufficient to ameliorate the painful event, highlighting the importance of studying active music therapy. Yet another trial found no significant differences between children in a musical story, spoken story, or standard care control group until the number of injections was taken into account.<sup>32</sup> Control children who received more shots reported greater pain; however, there was no significant difference in pain scores for treatment children who received 4 or more shots compared to those who received fewer shots. This study's primary strength was the inclusion of an active music therapy condition conducted by trained music therapists; however, the small sample size makes for limited conclusions.

Music appears to have less analgesic effect on infants. In a study of music distraction compared to other auditory stimuli, 121 neonates were randomly assigned to noise, music, and pacifier conditions during unanesthetized circumcision.<sup>33</sup> There were no significant differences between groups in behavioral or physiological measures of pain. It is possible that music is more efficacious for older children (who are likely to possess increased cognitive skills to redirect their attention toward the music process) or for less painful procedures.

Recent applications have included music for burn patients and postoperative pain. The little burn treatment literature that is available shows promise. A mixed-method study involving active music therapy for 9 burn patients aged 7 to 16 years showed few quantitative differences between the music therapy and control groups but a number of revealing qualitative results.<sup>34</sup> Patients, nurses, and parents reported that the therapy helped children's pain, anxiety, mood, compliance, and relaxation. Nurses and parents reported music therapy also helped them to feel relaxed. Another small study employing a repeated-measures design of children undergoing debridement reported significant pain reductions after music.<sup>35</sup> An RCT examining music therapy following cardiac surgery in 84 patients aged 1 day to 16 years found that children administered recorded classical music had significantly reduced postoperative pain and stronger vital signs

compared to a control group listening to a blank CD.<sup>36</sup> Given the inclusion of adolescents in this study, it is possible that even greater compliance and effects would have resulted had children chosen their own music. This possibility raises the notion that greater analgesic effects may occur for liked or favored music, again highlighting the importance of tailored active music therapy interventions.

It is likely that music exerts its analgesic effect through distraction, either by distraction of attention from the pain or in facilitating habituation.<sup>37</sup> When attention is occupied with another strong stimulus (ie, music) the experience of pain is less salient. The specific mechanisms behind the therapeutic effects of music remain unclear, however. Theories include its action upon the autonomic nervous system, whereby music involvement stimulates the pituitary and a release of endorphins. Another explanation includes an increase in catecholamines and resulting heart rate and blood pressure reduction.<sup>38,39</sup> A number of methodological issues common to much of the existing research limits conclusions regarding efficacy. Small sample sizes, lack of randomized controlled designs, or blinding of pain assessors mean that music therapy remains a promising but not established treatment.

#### OTHER PROMISING INTERVENTIONS

Although there has been limited research examining other CAM interventions for acute pediatric pain, the potential efficacy of a number of modalities can be extrapolated from the adult literature and a small body of existing pediatric studies.

Acupuncture has been used with many adult populations experiencing acute and chronic pain. A number of systematic reviews of acupuncture have found it to be effective for specific pain conditions. In particular, there is evidence for the efficacy of acupuncture for adult postoperative pain, nausea and vomiting in adults and children, and postoperative dental pain in adults.<sup>40</sup> The National Institutes of Health concluded that evidence exists for the efficacy of acupuncture in a number of clinical acute and chronic pain settings<sup>41</sup>; however, specific guidelines for use with children do not exist. Only 1 study for pediatric acute pain is available, although traditional acupuncture was not used. In this study, 108 children aged 4 months to 9 years undergoing hernia repair were randomized to receive capsicum plaster at designated acupoints or to control groups (sham capsicum plaster and placebo tape).<sup>42</sup> There were no differences between groups for the first 6 hours, after which the acupoint group showed significantly less pain and opioid consumption. The results are promising and warrant further well-designed studies employing acupressure and acupuncture. It is possible that pediatric acupuncture research in this area has been limited due to reservations about children's fear of needles. However, Kemper et al found that 67% of children referred to an acupuncturist for chronic pain problems and 60% of their parents thought acupuncture was a positive experience.<sup>43</sup> In addition, reduced pain and anxiety were reported in a group of children aged 6 to 18 years with chronic pain in a single arm-designed pilot study.<sup>44</sup> It is not known whether acupuncture for

children's acute pain would be similarly acceptable.

Massage or touch has been used for centuries to promote emotional and physical healing. A recent meta-analysis of massage therapy (MT) found significant benefits for anxiety and depression in adults.<sup>45</sup> There is at least moderate support for the use of massage therapy for low back pain, fibromyalgia, and other chronic pain conditions in adults.<sup>46</sup> A review of RCTs of pediatric massage found children may benefit through reduced anxiety and arthritis pain and increased muscle tone, although the literature is replete with weaknesses such as low power, inappropriate use of statistics, and unclear procedures.<sup>47</sup> In addition, limited research exists for treatment of acute pediatric pain. One study found massage (to unaffected body parts) was effective in reducing children's distress during burn treatment.<sup>48</sup> In addition, research linking MT with weight gain in preterm/low-birth weight infants and the possibility that this weight gain occurs through a reduction in stress reactions<sup>49</sup> point to possible relief for children undergoing procedural pain and stress.

A number of other CAM interventions also may prove beneficial in reducing children's pain and distress during procedural pain. Laughter or humor therapy holds potential. Laughter and humor have been linked to pain control in adults and children and have potential positive effects on immune function.<sup>50</sup> Although untested, meditation, energy therapies, art therapy, and therapeutic yoga also may hold promise in alleviating children's stress responses during procedural pain.

#### CONCLUSIONS

Health professionals dealing with children's acute or procedural pain may wish to pursue non-pharmacologic, safe, and easy-to-administer alternatives to current treatments. Many painful procedures in childhood, including immunizations, do not have established analgesia protocols. Pain relief using CAM can augment existing analgesia efforts. Existing literature suggests that the use of hypnotherapy is warranted; music therapy may also prove beneficial, although further RCTs administering clearly defined music therapy by qualified professionals are needed. Acupuncture, massage, and laughter therapy (which can be administered through the use of screened comedy or live performances) also may prove therapeutic. However, further validation studies for CAM interventions in the acute pediatric pain setting are required before definitive guidelines can be established regarding efficacious and safe CAM analgesia.

Given the wide range in research methodology used in the current CAM literature, including the use of qualitative work, the selection of specific evaluative criteria such as Jadad scores is challenging. Previous CAM reviews and meta-analyses have used different rating systems and as yet, there does not appear to be a consensus with respect to incorporating specific criteria for evaluating the methodological quality of CAM studies.<sup>51</sup> Nevertheless, informal recommendations as to the efficacy of CAM use in children undergoing acute pain cannot be made until the literature is of sufficient quality to make formal and specific recommendations.

Large, well-designed studies assessing the feasibility, efficacy, and safety of CAM interventions for children's acute pain are sorely needed. The first step for such large-scale, randomized studies is to compare the CAM modality to "care as usual" or to no intervention. Only when the intervention has been demonstrated as superior to no treatment or standard care should researchers attempt to establish the CAM treatment as superior to existing or well-established treatments. Additional recommendations for future research include standardization of procedures through the use of treatment manuals; increased attention to methodological considerations, including randomized assignment, blinding of participants and raters, appropriate control groups, and other parameters of good trial design; and a greater understanding of the potential mechanisms of analgesia action. Interventions might address physiological as well as psychological factors in reducing pain. In order to understand and replicate the action of these CAM modalities on children's pain, attention to the activation of physiological systems and psychological processes is required. Thus, both physiological and psychological outcomes should be assessed using established, well-validated measures. Finally, research must document appropriate ages and procedures for which treatments are suitable.

### Acknowledgments

This study was supported by 2R01DE012754, awarded by the National Institute of Dental and Craniofacial Research and by UCLA General Clinical Research Center Grant MO1-RR-00865 (principal investigator: Lonnie K. Zeltzer).

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