CLINICAL REPORT Guidance for the Clinician in Rendering Pediatric Care

American Academy of Pediatrics

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Mind-Body Therapies in Children and Youth

SECTION ON INTEGRATIVE MEDICINE

Mind-body therapies are popular and are ranked among the top 10 complementary and integrative medicine practices reportedly used by adults and children in the 2007–2012 National Health Interview Survey. A growing body of evidence supports the effectiveness and safety of mind-body therapies in pediatrics. This clinical report outlines popular mind-body therapies for children and youth and examines the best-available evidence for a variety of mind-body therapies and practices, including biofeedback, clinical hypnosis, guided imagery, meditation, and yoga. The report is intended to help health care professionals guide their patients to nonpharmacologic approaches to improve concentration, help decrease pain, control discomfort, or ease anxiety.

INTRODUCTION

Mind-body therapies and practices (eg, meditation and yoga) are among the top 10 complementary therapies reportedly used by adults and children in the 2007–2012 National Health Interview Survey.[1] Mind-body therapies focus on the interaction between the mind and the body, with the intent to use the mind to influence physical functions and directly affect health. Complementary therapies, such as yoga, meditation, mindfulness-based stress reduction (MBSR), hypnotherapy, guided imagery, and biofeedback, embrace this concept. Data from the 2012 National Health Interview Survey show that 3.7% of US children 4 to 17 years of age used mind-body approaches. Mind-body therapies were used slightly more in older youth aged 13 to 17 years, more than twice as often among females versus males (5.7% vs 1.7%), and less often in the South (2.4%). Children and youth were more likely to use mind-body therapies if they experienced pain-related conditions or emotional, behavioral, or mental conditions and if they received specialty or mental health care. The most common reasons for the use of mind-body approaches were to improve overall health and feel better, to reduce stress level or relax, for general wellness or disease prevention, and to feel better emotionally.[2] Children are very capable of engaging in self-care skills such as

abstract

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mind-body therapies,[3] and there are many mind-body skills that children and adolescents can learn and apply throughout life.[4]

A growing body of evidence supports the effectiveness and safety of mind-body therapies in pediatrics. In this clinical report, relevant evidence regarding biofeedback, clinical hypnosis, guided imagery, meditation/MBSR, and yoga is reviewed so that pediatric health care providers are better prepared to answer parent questions and provide patient-centered, evidence-based care. For each therapy reviewed, recommendations regarding indications and precautions are provided. The level of evidence based on data from published clinical trials and systematic reviews is described (Table 1). Key outcomes discussed in association with mind-body therapies and practices include focused concentration, decreased pain, and reduced anxiety.

SUMMARIES OF RELEVANT EVIDENCE BY TOPIC

Biofeedback

"Every change in the physiological state is accompanied by an appropriate change in the mental-emotional state, conscious or unconscious, and conversely every change in the mental-emotional state is accompanied by a change in the physiological state."[33]

Biofeedback is defined as the use of electronic or electromechanical equipment to measure and then feed-back information about physiologic processes to an individual. These physiologic processes can then be controlled by the individual for therapeutic purposes. Feedback can be provided in auditory, visual, kinesthetic, or multimedia formats and even now in the form of "video games for the body."[34] This makes biofeedback, in its many forms, particularly relevant as an option for today's tech-savvy youth.

Although direct clinical observation can provide clues to a patient's physiologic state and level of autonomic nervous system (ANS) arousal, it is primarily subjective and, therefore, unreliable. In addition, many patients (pediatric, adolescent, or adult) may subjectively state that they "feel relaxed," but objectively they may not be relaxed at all, at least as defined by measurable physiologic phenomena, especially those that reflect the relative balance of sympathetic and parasympathetic nervous system activity. Therefore, biofeedback can be an invaluable tool for the pediatric health care provider to help gauge what topics, thoughts, and other phenomena trigger mind/body arousal in children and adolescents. The benefits for pediatric patients include allowing them to observe the immediate, convincing, objective mind-body interactions, literally seeing that a "change in the mind (thoughts and/or feelings) can immediately lead to a change in the body's physiological response."[4,35] Interested clinicians can be certified in biofeedback by the Biofeedback Certification International Alliance.[36,37] The Biofeedback Certification International Alliance certifies individuals who meet education and training standards in biofeedback and progressively recertifies those who advance their knowledge through continuing education.

Research over the past 30 years has shown that children and adolescents are good at self-regulation[36] and capable of voluntarily modulating physiologic processes, including peripheral temperature, muscle activity, breathing, brain electrical activity, and certain aspects of immune function, such as salivary immunoglobulin A secretion.[35] The most common forms of biofeedback that reflect the balance of the ANS include the following: (1) peripheral temperature (measuring the temperature change in hands or fingers), (2) heart rate variability (measuring the beat-to-beat variation in heart rate patterns over time), (3) electrodermal activity (measuring sweat gland activity), (4) electromyography (measuring muscle activity), (5) EEG (measuring brain wave activity), (6) capnometry (measuring exhaled carbon dioxide), and (7) pneumography (measuring the movements of the chest and stomach associated with breathing).[34]

Biofeedback technology has evolved to the point that there are now several low-cost, portable products available that allow for training at home and school, thereby supporting greater generalization of the skill into real-life settings. Enhancing an individual's context awareness in real-life settings by using biomonitoring and providing real-time feedback is an emerging e-health trend.[38] Home biofeedback systems with multimedia game formats are available for personal computers as well as for smart phones and tablet devices.

The user-friendly technologies listed in Table 2 can make practice of these self-regulation skills more enjoyable and effective as they measure a variety of physiologic functions, such as heart rate variability, skin conductance, and peripheral temperature. Like other mind-body skills, it is important that pediatric patients use these skills on a regular basis both for prevention and for acute situational relief, as they eventually learn to control and ultimately reset their ANS response patterns and master the mind-body connection.

Conclusions

Research suggests benefits of peripheral forms of biofeedback for children and adolescents, particularly for headache (tension type and migraine), asthma, enuresis, and rehabilitation applications, as well as EEG biofeedback (neurofeedback)

TABLE 1 Evidence Summary by Topic

Study, year (design)	Sample Size, *N*	Age, y	Study Goal	Intervention	Outcomes
Biofeedback					
Knox et al, 2011 (clinical trial)[5]	24	9–17	Examined changes in anxiety and depression	Heart rate variability biofeedback based on a session-by-session protocol	Biofeedback-assisted relaxation training can be useful in decreasing anxiety and depressive symptoms
Palermo et al, 2010 (meta-analysis)[6]	1247 (25 studies)	9–17	Quantify the effects of psychological therapies for the management of chronic pain in youth	Cognitive-behavioral therapy, relaxation therapy, and biofeedback	Omnibus cognitive-behavioral therapy, relaxation therapy, and biofeedback all produced significant and positive effects on pain reduction
Monastra et al, 2005 (review)[7]	N/A	6–19	Effects of EEG biofeedback on ADHD	EEG biofeedback	EEG biofeedback was determined to be "probably efficacious" for the treatment of ADHD
Eccleston et al, 2002 (systematic review)[8]	808	6–18	Efficacy of psychological therapy of children and adolescents with chronic pain	Variety of biofeedback modalities	Treatments examined are effective in reducing the severity and frequency of chronic pain
Clinical hypnosis					
Rutten et al, 2013 (systematic review)[9]	108	5–18	Assess efficacy of HT in pediatric patients with FAP and IBS	Gut-directed HT	Therapeutic effects of HT seem superior to standard medical care in children with FAP or IBS
Accardi and Milling, 2009 (systematic review)[10]	528	3–19	Effectiveness of hypnosis in reducing procedure-related pain	Hypnosis	Hypnosis was more effective than standard medical care or control at relieving pain in children during medical procedures
Vlieger et al, 2007 (RCT)[11]	53	8–18	Effectiveness of hypnosis for FAP and IBS	6 sessions of 50 min over a 3-mo period of gut-directed HT	Gut-directed HT is highly effective in the treatment of children with longstanding FAP or IBS
Richardson et al, 2006 (systematic review)[12]	313	3–18	Effectiveness of hypnosis for procedure-related pain and distress in pediatric patients with cancer	Hypnosis	Hypnosis has the potential to reduce procedure-related pain and distress in pediatric patients with cancer
Butler et al, 2005 (RCT)[13]	44	4–15	Examine whether hypnotic relaxation could reduce distress for children who undergo VCUG	Hypnosis	Results indicate significant benefits for the hypnosis group
Calipel et al, 2005 (RCT)[14]	50	2–11	Efficacy of hypnosis on anxiety and perioperative behavioral disorders	Hypnosis	Hypnosis alleviates preoperative anxiety
Guided imagery					
Weigensberg et al, 2014 (RCT)[15]	35	14–17	Determine the effects of the mind-body modality of IGI in obese Latino adolescents	12 weekly sessions of a lifestyle education plus IGI program	The IGI group showed significant reductions in leisure sedentary behavior and increases in moderate physical activity
van Tilburg et al, 2009 (pilot study)[16]	34	6–15	Test a home-based, guided imagery treatment protocol using audio and video recordings	2-mo guided imagery treatment	Guided imagery treatment plus medical care was superior to standard medical care only for the treatment of abdominal pain
Weydert et al, 2006 (RCT)[17]	22	5–18	Evaluated the therapeutic effect of guided imagery for children with recurrent abdominal pain	4 weekly sessions of guided imagery with progressive muscle relaxation	Significantly greater decrease in the number of days with pain
Meditation and MBSR					
Britton et al, 2014 (RCT, pilot)[18]	101	11.7 (mean)	Effects of a nonelective, classroom-based, teacher-implemented, mindfulness meditation intervention on standard clinical measures of mental health and affect	6-wk program with daily mindfulness meditation practice	Both control and intervention groups decreased significantly on clinical syndrome subscales and affect but did not differ in the extent of their improvements
Sibinga et al, 2014 (RCT)[19]	43	13–21	Explore the specific effects of MBSR for urban youth	8 weekly 2-h MBSR sessions and a 3-h retreat	MBSR did not result in statistically significant differences in self-reported survey outcomes of interest but was associated with qualitative outcomes of increased calm, conflict avoidance, self-awareness, and self-regulation for urban youth

TABLE 1 Continued

Study, year (design)	Sample Size, *N*	Age, y	Study Goal	Intervention	Outcomes
Sibinga et al, 2013 (RCT)[20]	41	11–14	Effects of a school-based MBSR program for young urban males	12-session programs of MBSR	Results provide cautious support that MBSR enhances self-regulatory processes for urban male youth, including improved psychological symptoms and enhanced coping
Sibinga et al, 2016[21] (RCT)	300	12 (mean)	Ameliorate the negative effects of stress and trauma among low-income, minority, middle-school public school students	12-wk program	MBSR students had significantly lower levels of somatization, depression, negative affect, negative coping, rumination, self-hostility, and posttraumatic symptom severity
Barnes et al, 2012 (RCT)[22]	62	15–17	Impact of TM on LVM in African-American youth at increased risk of development of cardiovascular disease	15-min TM sessions twice/day for 4 mo	TM decreased LVM index in prehypertensive African-American adolescents
Wright et al, 2011 (RCT)[19]	121	14–15	Impact on ABP in African-American patients at increased risk of development of essential hypertension	BAM each weekday, 10-min sessions for 3 mo	BAM participants showed significant reductions in self-reported hostility and 24-h systolic ABP
Flook et al 2010 (RCT)[23]	64	7–9	Evaluate school-based program of MAPs	30-min MAPs, twice/ week for 8 wk	Stronger effect of MAPs on children with executive function difficulties
Biegel et al 2009 (RCT)[24]	102	14–18	Assess the effect of the MBSR program for adolescents with heterogeneous diagnoses in an outpatient psychiatric facility	8 weekly MBSR classes, meeting 2 h/wk	MBSR may be a beneficial adjunct to outpatient mental health treatment of adolescents
Barnes et al, 2004 (RCT)[25]	100	15–17	Determine the impact of stress reduction on blood pressure in adolescents by the TM program	15-min TM sessions, twice/day for 4 mo	Beneficial impact of the TM program in youth at risk of the development of hypertension
Barnes et al, 2003 (RCT)[26]	45	15–18	Determine the effect of stress reduction via the TM program on school rule infractions in adolescents	15-min TM sessions, twice/day for 4 mo	TM program conducted in the school setting has a beneficial effect on absenteeism, rule infractions, and suspension rates
Yoga					
Hagins et al, 2013 (RCT)[27]	30	10–11	Effects of yoga on physiologic response to behavioral stressor tasks	50 min yoga, 3 times/ wk for 15 wk	No significant differences in physiologic responses to behavioral stressors between groups
Telles et al, 2013 (RCT)[28]	98	8–13	Effects of yoga on physical fitness, cognitive performance, self-esteem	45 min yoga, 5 d/wk for 3 mo	Social self-esteem higher in control versus yoga group, whereas general and parental self-esteem improved
Khalsa et al, 2012 (RCT)[29]	121	15–19	Evaluate potential mental health benefits of yoga for adolescents in secondary school	30–40 min yoga, 2–3 times/wk for 11 wk	Measures of anger, resilience and fatigue/ inertia significantly improved
Nidhi et al, 2012 (RCT)[30]	72	15–18	Efficacy of yoga on glucose metabolism and blood lipid values in adolescent girls with PCOS	60 min yoga, 7 d/wk for 12 wk	Fasting insulin, fasting blood glucose, and insulin resistance were significantly improved
White, 2012 (RCT)[31]	155	8–11	Efficacy of yoga to reduce perceived stress, enhance coping abilities, self-esteem, and self-regulation	60 min yoga, 1 d/wk for 8 wk, as well as 10 min yoga homework 6 d/wk	Self-esteem and self-regulation increased in both groups, whereas the yoga group reported greater appraisal of stress and greater frequency of coping
Mendelson et al, 2010 (RCT)[32]	97	9.7 and 10.6 (mean)	Improve adjustment among chronically stressed and disadvantaged youth	45 min yoga, 4 d/wk for 12 wk	Significant improvement in the RSQ Involuntary Engagement Scale and component subscales for rumination, intrusive thoughts, and emotional arousal

ABP, ambulatory blood pressure; ADHD, attention-deficit/ hyperactivity disorder; BAM, breathing awareness meditation; HT, hypnotherapy; IGI, Interactive Guided Imagery; LVM, left ventricular mass; MAP, mindful awareness practice; N/A, not available; PCOS, polycystic ovary syndrome; RSQ, Responses to Stress Questionnaire; VCUG, voiding cystourethrography.

for attention-deficit/hyperactivity disorder. Positive evidence for other indications (eg, insomnia, chronic pain syndromes, and anxiety disorders) exists but is not conclusive. Biofeedback applications for the treatment of functional gastrointestinal tract disorders is an area of particular promise.[54] Biofeedback offers a particularly attractive form of self-regulation for today's youth, given their interest in and comfort with technology. There are no significant contraindications to the use of biofeedback, and the

TABLE 2 Demonstrated Safety and Efficacy of Biofeedback-Based Treatments in a Variety of Childhood Conditions

Biofeedback-Based Treatment Technique	Condition	Reference
sEMG and peripheral temperature	Migraine, muscle tension, headache	Andrasik and Schwartz, 2006[39]; Nestoriuc et al, 2008[40]
Variety of biofeedback modalities	Chronic pain syndromes	Eccleston et al, 2002[8]; Palermo et al, 2010[6]
sEMG pelvic floor biofeedback; anorectal EMG biofeedback; manometric feedback	Functional disorders of elimination	Culbert and Banez 2007,[41] 2008[42]; Palsson et al, 2004[43]; Weydert et al, 2003[44]
Sophisticated multichannel sEMG biofeedback	Developmental disabilities and neuromuscular challenges	Bolek, 2006[45]; Brütsch et al, 2011[46]; Wang and Reid, 2011[47];
EEG biofeedback (also termed neurofeedback)	Attention-deficit/hyperactivity disorder	Wang and Reid, 2011[47]; Monastra et al, 2005[7]; Vernon et al, 2004[48]
Heart rate variability biofeedback	Performance anxiety	Knox et al, 2011[5]
Bifrontal sEMG biofeedback	Asthma	Lehrer et al, 2002[49]
sEMG biofeedback	Various learning disorders	Carter and Russell, 1985[50]; Hoy et al 2011[51]
Specific biofeedback training targeting lowered sympathetic nervous system arousal	Sleep disorders	Barowsky et al, 1990[52]; Morin et al, 2006[53]

sEMG, surface electromyography.

only barrier may be financial in that both home and professional health care biofeedback hardware/software packages can be somewhat expensive and third-party health care insurance payers do not consistently cover biofeedback treatment. A selection of resources for pediatric health care providers is provided in Table 3.

Clinical Hypnosis

Clinical hypnosis in children and adolescents has seen a surge in both research and clinical application in the past 30 years, although its use in children dates back >200 years.[55] Hypnosis is defined variably by several professional societies.[56] Perhaps best stated, "when we are in hypnosis, we intensify our attention, decrease our peripheral awareness and become more receptive to new ideas and associations whenever we reinforce, rewire, reframe or otherwise alter the neurophysiological networks we call 'experience.' Trance is what happens when we engage in changing our minds…. Hypnosis is a skill set involving interpersonal communication designed to facilitate therapeutic change in maladaptive psycho-physiological reflexes."[56] Pediatric health care providers should understand that hypnotherapy in children is a well-established therapeutic modality, and it should not be confused with or misperceived as the inappropriate practice of hypnosis by entertainers.

Clinical hypnosis, when provided by appropriately trained individuals, is an adjunctive therapy that can be used by pediatric health care providers to assist in managing conditions that they are already otherwise licensed to treat. For example, a pediatrician may use clinical hypnosis to help a child dealing with enuresis, irritable bowel syndrome (IBS), or anxiety. A licensed mental health practitioner may use clinical hypnosis to help children with anxiety, depression, or posttraumatic stress disorder (PTSD). However, a mental health practitioner should not use clinical hypnosis for a child with IBS without physician comanagement, and pediatricians should not use this technique for PTSD without collaborating with a mental health practitioner.

Case series and clinical trials of clinical hypnosis first appeared in the 1970s and 1980s. Since then, the literature has grown and includes clinical trials, Cochrane reviews, and neuroimaging studies.[55–59] However, high-quality randomized controlled trials (RCTs) with clear methodologies remain lacking. Clinical hypnosis involves establishing a strong rapport with patients and individualizing the therapy to the specific goals and characteristics of the patient. This situation precludes a standardized approach, and large randomized studies of individualized approaches are difficult to conduct.

Functional Abdominal Pain

A few studies have evaluated the effectiveness of hypnosis for functional abdominal pain (FAP) and IBS. Vlieger et al[11] randomly assigned 52 children to either hypnosis with an experienced clinician or standard care, which included dietary guidance, medication as needed, and supportive counseling. Twelve sessions over 3 months led to marked improvement in pain frequency and severity in patients in the hypnosis group compared with control patients at the end of the intervention and at 1-year follow-up.[11] A later follow-up study at 5 years showed a significantly higher remission rate in the hypnosis group compared with the control group (68% vs 20%; $P = .005$).[60] A systematic review of 3 trials for FAP and IBS in children and adolescents showed superior efficacy over standard care.[9]

Pain Management

Numerous small trials have shown the efficacy of clinical hypnosis for procedural as well as for chronic pain. Butler et al[13] compared hypnosis with breathing and relaxation techniques for procedure-related pain and anxiety during

TABLE 3 Resources by Topic

Resources	Web Sites, Books, DVDs, etc
Biofeedback	
Biofeedback Certification International Alliance	www.bcia.org
Inner Balance	www.heartmath.com
Interactive games (Healing Rhythms, Journey to Wild Divine)	www.wilddivine.com
"eSense" temperature and sweat gland activity (electrodermal activity) sensors	http://www.mindfield.de/en/biofeedback/products/esense/esense-skin-response
Tinke	http://www.zensorium.com/tinke/
Hypnosis	
Video: "magic glove" technique, performed by Dr Leora Kuttner[a]	http://www.youtube.com/watch?v=cyApK8Z_SQQ
Dr Laurence Sugarman's 70-minute DVD[a]	Sugarman L. *Hypnosis in Pediatric Practice: Imaginative Medicine in Action* [DVD and booklet]. Carmarthen, United Kingdom: Crown House Publishing; 2006
National Pediatric Hypnosis Training Institute	www.nphti.org
American Society of Clinical Hypnosis	www.asch.net
Society for Clinical and Experimental Hypnosis	www.sceh.us
Guided imagery	
Health Journeys: Guided Meditation and Imagery	http://www.healthjourneys.com
Kaiser Permanente: Guided Imagery (podcasts)	https://healthy.kaiserpermanente.org/health/care/!ut/p/a0/FchBDoMgEADAt_iAzYZEYfFmhH6hhdsGiZIIGELt99seZ9DjC33h0-3cUy18_uxCLD22md9bqnCnLVZ8okd_Nd4zoysVAocj_o9bT-GM6lzVap2MBamIBCGsgEWPBohoUkKp8UErXjnTZxmGL2IKPpI!/
Shambala Kids: Guided Imagery and Relaxation Audio CDs	http://shambalakids.com/index.php?option=com_content&view=category&id=40&Itemid=419&lang=us
Stress Free Kids Indigo Dreams Audio CDs	http://www.stressfreekids.com/category/cds/children-cds
Academy for Guided Imagery	http://acadgi.com
Meditation and MBSR	
For health professionals:	
Mind-Body STREAM program	https://mind-bodyhealth.osu.edu
For parents:	
Everyday Blessings: The Inner Work of Mindful Parenting	Kabat-Zinn M, Kabat-Zinn J. *Everyday Blessings: The Inner Work of Mindful Parenting.* New York, NY: Hyperion; 1998
Growing Happiness	http://growing-happiness.com/mindfulness-training-for-parents/
Meditation for children	http://www.freemeditation.com/online-meditation/meditation-for-children/
For teens:	
Mindfulness for Teens	http://mindfulnessforteens.com
Mindfulness Retreats	http://ibme.info/
Learning to Breathe	http://learning2breathe.org/
UCSD Center for Mindfulness Professional Training	http://mbpti.org/
UCSD Center for Mindfulness blog	https://ucsdcfm.wordpress.com/tag/ron-epstein/
UMass Medical School Center for Mindfulness	http://www.umassmed.edu/cfm/training/
UCLA Mindful Awareness Research Center	http://marc.ucla.edu/
Yoga	
Global Family Yoga	http://globalfamilyyoga.com/
International Association of Yoga Therapists	http://iayt.org/
Kripalu Yoga in the Schools	http://nccam.nih.gov/health/yoga
Yoga Alliance	http://www.yogaalliance.org/
Yoga Calm	http://www.yogacalm.org/
Yoga for the Special Child	http://www.specialyoga.com/
Yoga in Schools	http://yogainschools.org
YogaKids	http://yogakids.com/

STREAM, Skills Training for Resilience, Effectiveness, and Mindfulness; UCLA, University of California, Los Angeles; UCSD, University of California, San Diego; UMass, University of Massachusetts.

[a] The technique should never be used for entertainment, should only be used by appropriately trained providers, and should only be used in clinical situations for which the provider already has competence in treating.

voiding cystourethrography. Moderate effect sizes for symptom reduction were noted by parents, medical staff, and research observers; and procedure length was reduced by 14 minutes in the hypnosis group. A trial comparing preprocedure hypnosis with midazolam for anesthesia for abdominal surgery showed reduced anxiety at the time of induction as well as improved behavior outcomes at 1 and 7 days after surgery for the hypnosis group.[14] Two systematic reviews concluded that there is promising evidence for hypnosis for acute procedure-related pain.[10,12]

Conclusions

Research suggests benefits of clinical hypnosis for children and

adolescents, particularly for FAP, IBS, and pain management. Promising evidence for its application for other indications (eg, enuresis, tics/Tourette syndrome, migraine, and anxiety) exists but is not conclusive. There are few absolute contraindications to the use of hypnosis. The technique should be used only by appropriately trained providers and in clinical situations in which the provider already is competent managing without the inclusion of hypnosis. A selection of practical resources (eg, videos) for pediatric health care providers is provided in Table 3.

Guided Imagery

Guided imagery is a powerful mind-body technique that invokes all of the senses (sight, sound, taste, touch, smell, and movement). Imagery has a rich history in healing traditions throughout the world. Guided imagery and clinical hypnosis have significant overlap, and many studies combine these modalities. Strengths of guided imagery treatment include that it is not invasive and has flexibility of use in different age ranges (preschool-aged through adolescents and adults) and in various settings (outpatient, inpatient, and acute care). The use of guided imagery has been shown to produce measurable physiologic changes in stress and immune biomarkers.[61] Challenges in the use of imagery include variable training, acceptance of a novel therapy by patient and practitioner, familiarity with and access to high-quality resources, and relative lack of randomized controlled outcome studies in children. Due caution is indicated in patients with a history of physical, sexual, or emotional abuse or those with PTSD, in which case coordination of care with a qualified mental health expert is strongly advisable.

An evidence base for the use of guided imagery in adults is present, and an evidence base in children is growing. In 1 adult RCT, guided imagery in 96 patients with newly diagnosed breast cancer showed significant correlation with improved mood and quality of life.[62] For example, a second adult RCT that used guided imagery was correlated with an increase in numbers and activity of beneficial immune function (T helper cells, natural killer cells, lymphokine-activated killer cells, and favorable interleukin-1β levels) in 80 patients with breast cancer in active treatment.[63] An example of a pediatric RCT that used guided imagery involved a 12-week lifestyle intervention trial in 29 Latino adolescents with obesity, in which weekly interactive guided imagery sessions were associated with a statistically significant reduction in salivary cortisol, improved physical activity, and promotion of health behavior change in the treatment group.[15] A second RCT combined guided imagery with progressive muscle relaxation in 22 children ages 5 to 18 years with a diagnosis of recurrent abdominal pain. Guided imagery with progressive muscle relaxation in 4 weekly sessions was associated with a statistically significant reduction in days with pain throughout the 2-month follow-up period.[17] Home-based audio-recorded guided imagery also has been shown to be effective in the reduction of recurrent abdominal pain in a treatment group of 34 children ages 6 to 15 years who were randomly assigned to receive guided imagery versus standard care. Results were maintained throughout the 6-month follow-up period.[16]

In addition to these RCTs, other small studies that showed efficacy of guided imagery have been conducted for a variety of medical conditions, including asthma,[64] sickle cell disease,[65] procedural anxiety,[66] and posttraumatic stress.[67] Both imagery and hypnosis may be combined successfully with other mind-body therapies, such as biofeedback, to enhance relaxation.[68] Regulated training for guided imagery does not exist at this time.

Conclusions

Guided imagery appears to be a promising complementary therapy for children and adolescents, with very low reports of adverse effects. Guided imagery as a therapeutic intervention has been shown to have positive effects on psychological functioning, stress reduction, and pain management. Caution is advised in patients with a history of previous emotional, sexual, or physical abuse to avoid an unintended triggering of posttraumatic stress symptoms. Consultation with a mental health practitioner is advised if questions about appropriateness of use exist in this context. More RCTs in children are needed for this noninvasive therapy in the pediatric clinical setting. A selection of guided imagery Web resources is provided in Table 3.

Meditation and MBSR

Meditation

Meditation practices for children and youth have become increasingly popular in schools and medical settings alike. Meditation is the practice of intentional attention training and consists of a number of different specific approaches. Research on meditation in children and youth consists primarily of 2 types of meditation: mindfulness meditation and concentration meditation.

Research on meditation in diverse populations of adults has accumulated sufficiently to provide convincing high-level evidence for reproducible benefits of meditation in mental health and pain management.[69–71] In addition, data suggest that greater levels of mindfulness in adulthood may mitigate some of the negative health effects of adverse childhood experiences.[72] The literature in

children and youth, however, is less developed and, although suggestive of benefit, is just beginning to emerge.[73–76] To provide the highest level of available evidence regarding the specific effect(s) attributable to meditation instruction for children and youth, conclusions in this report are based on findings from RCTs with active control conditions.

Mindfulness Meditation

Mindfulness meditation is aimed at enhancing individuals' innate capacity to be purposefully aware of their present-moment emotional, cognitive, and sensory experiences. Through instruction in formal and informal meditation techniques, this capacity for purposeful, moment-by-moment, nonjudgmental awareness develops, along with the ability to shift attention. Several RCTs in youth have evaluated the MBSR program, which has established instructor training through the University of Massachusetts School of Medicine's Center for Mindfulness and has been well researched in adults.[77] Youth-adapted MBSR programs have been found to be beneficial in improving mental health symptoms, coping, and self-regulatory processes and decreasing blood pressure when used in both primary prevention[18–21,78,79] and treatment settings.[80] In children 7 to 9 years of age, an RCT of school-based mindful awareness practice instruction versus a reading program did not show differences by treatment group overall but did reveal improvements in mindful awareness practice participants in executive function among children with lower executive function skills at baseline.[24]

Concentration Meditation

Concentration meditation involves focusing attention on 1 specific thing, such as a word, phrase, or object.[23] A Cochrane review found current research inadequate to suggest meditation for attention-deficit/hyperactivity disorder and suggested additional trials.[81] Active-controlled RCTs and active-control programs of concentration meditation in children and youth have included both transcendental meditation (TM) and the relaxation response. Compared with active-control programs, TM has been shown to lead to decreases in blood pressure and left ventricular hypertrophy among African-American adolescents with prehypertension[22,25] as well as fewer negative school behaviors, such as absenteeism.[26] Relaxation response has been associated with improvements in self-esteem.[82]

Conclusions

Research on structured meditation programs for children and youth is suggestive of benefits, particularly related to improvements in mental health, coping, and self-regulation as well as decreasing hypertension and negative school behaviors. Although there are structured training and certification programs for a number of meditation programs (including MBSR, TM, and mindfulness-based cognitive therapy), there is no formal credentialing or licensure for meditation instruction. Costs vary depending on the format of instruction and are increasingly, but not universally, covered by insurance. Although these results are encouraging, careful attention should be paid to elements of implementation and dissemination to maintain high-quality, effective meditation instruction for children and youth.

Yoga

The word yoga is derived from the Sanskrit word *yuj* meaning "union." An ancient Indian practice, yoga has been classified by the National Center for Complementary and Integrative Health as a mind-body medicine modality.[83] According to the 2007 National Health Interview Survey,[84] yoga was the fifth most commonly used complementary therapy practice among all children ages 2 to 17 years, with ~1.5 million children practicing yoga in the previous year. In a survey of children and adolescents with chronic pain, yoga was preferred by 32% as their first choice of complementary therapy.[85] Therapeutic yoga is the practice of uniting the mind, the body, and the spirit through mindfulness of breathing and body postures to improve stress coping, lessen pain, and improve specific health conditions. Although not completely understood, yoga effects changes in the parasympathetic nervous system, positively affecting heart rate variability.[86]

Fourteen controlled studies[27–32,87–94] and 4 systematic reviews[95–98] were identified, and all uncontrolled trials and those in which yoga was not the sole treatment intervention[99] were eliminated from consideration. The conclusions of the systematic reviews can be summarized as follows: yoga appears to be a promising complementary therapy for children and adolescents, especially for those with pain and emotional, mental, and behavioral conditions, with very few reported adverse effects. However, a lack of methodologic and statistical rigor, including small sample sizes, absence of randomization, and a high degree of variability between intervention methods, limits the ability to recommend yoga as a primary intervention for any particular population. On the basis of the 14 individual controlled studies, yoga appears to be a promising complementary therapy and stress-management tool for children and adolescents, with very low reports of adverse effects. Yoga as a therapeutic intervention has positive effects on psychological functioning, especially in children coping with emotional, mental, and behavioral health problems. Specifically, research has shown that educational

curricula incorporating stress-management programs improve academic performance, self-esteem, classroom behaviors, concentration, and emotional balance,[98] suggesting that schools may be an ideal setting to bring yoga to a heterogeneous, socioeconomically diverse sample of children. In addition, in 4 controlled trials, yoga was shown to positively influence metabolic and hormonal variables. Given the increasing prevalence of obesity and metabolic dysfunction in children, coupled with the relative safety and cost-effectiveness of yoga as an intervention, more research in this population is needed. Limitations of reviewed studies include small sample sizes, high attrition rates, lack of evaluator blinding, reliance on self-report measures, and heterogeneity of intervention and control designs. Well-designed controlled trials of yoga for conditions with strong stress-modulated components are warranted. Excellent candidate conditions include asthma, IBS, inflammatory bowel diseases, juvenile idiopathic arthritis, and fibromyalgia. Given the preference for yoga in studies in children with chronic pain, coupled with biological plausibility for response, limited potential for adverse effects, and promising pilot data, there is a great need for controlled studies in this population.

Conclusions

Yoga appears to be a promising complementary therapy and stress-management tool for children and adolescents, with very low reports of adverse effects. Yoga, as a therapeutic intervention, has positive effects on psychological functioning, especially in children coping with emotional, mental, and behavioral health problems. Yoga generally is not billed for and reimbursed as an insurance-covered therapy. Yoga instructors and centers establish a fee for service (per session or as a package for a set number of classes) on the basis of community-established standards. The Yoga Alliance[100] sets guidelines for yoga teacher certification in the United States. A selection of yoga Web resources is provided in Table 3.

CONCLUSIONS AND RECOMMENDATIONS

This report examines the best-available evidence for a variety of mind-body therapies and practices in children and youth, including biofeedback, clinical hypnosis, guided imagery, meditation, and yoga. The evidence varies in terms of quantity and quality but generally is supportive of mind-body therapies and practices as safe and potentially effective in common and debilitating conditions, including pain and anxiety. Additional potential benefits for school-aged children include improved concentration and self-esteem. Pediatric health care providers are encouraged to facilitate an open dialog with their patients about their use of complementary therapies and to become familiar with mind-body therapies and practices as nonpharmacologic options to improve mood, behavior, and quality of life, which are of great interest and relevance to children, youth, and their parents/caregivers.

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ABBREVIATIONS

ANS: autonomic nervous system
FAP: functional abdominal pain
IBS: irritable bowel syndrome
MBSR: mindfulness-based stress reduction
PTSD: posttraumatic stress disorder
RCT: randomized controlled trial
TM: transcendental meditation

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