


Biofeedback and Treatments for Functional Abdominal Pain

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I would like to acknowledge that I am on the traditional land of the first people of Seattle, the Duwamish People past and present and honor with gratitude the land itself and the Duwamish Tribe.

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- **Faculty Disclosure Information**
 - In the past 12 months, I have not had a significant financial interest or other relationship with the manufacturer(s) of the product(s) or provider(s) of the service(s) that will be discussed in my presentation.



Case Study

- 16 yo male with 6 month history of recurrent abdominal pain presents to your office. He was admitted to the hospital for abdominal pain last month.
- While in the hospital, gastroenterology was consulted. Labs were normal; endoscopy and colonoscopy performed, biopsies normal.



Case Study

- He was sent home on omeprazole. His symptoms are unchanged
- He has not been attending virtual school and spends most of the day in his room.

Rome IV diagnostic criteria for functional abdominal pain disorders in the child/adolescent

Universal criterion: After appropriate evaluation, the symptoms cannot be fully explained by another medical condition

Functional dyspepsia

In addition to the universal criterion, at least two months with ≥ 1 of the following bothersome symptoms on ≥ 4 days per month:

- Postprandial fullness
- Early satiation
- Epigastric pain or burning not associated with defecation

Irritable bowel syndrome

In addition to the universal criterion, ≥ 2 months with abdominal pain associated with one of the following on ≥ 4 days per month:

- Related to defecation
- Change in frequency of stool
- Change in form (appearance) of stool

In children with constipation, the pain does not resolve with the resolution of the constipation (resolution of pain indicates functional constipation)

Abdominal migraine

In addition to the universal criterion, all of the following:

- Paroxysmal episodes of intense, acute, periumbilical, midline, or diffuse abdominal pain lasting ≥ 1 hour (abdominal pain is the most severe and distressing symptom) at least twice within a six month period
- Episodes are separated by weeks or months
- The pain is incapacitating and interferes with normal activities
- Stereotypical pattern and symptoms in the individual patient
- The pain is associated with ≥ 2 of the following:
 - Anorexia
 - Nausea
 - Vomiting
 - Headache
 - Photophobia
 - Pallor

Functional abdominal pain - not otherwise specified

In addition to the universal criterion, all of the following:

- Occurs ≥ 4 times per month for ≥ 2 months
- Episodic or continuous abdominal pain that does not occur solely during physiologic events (eg, eating, menses)
- Insufficient criteria for irritable bowel syndrome, functional dyspepsia, or abdominal migraine

Functional constipation*

In addition to the universal criterion, ≥ 2 of the following occurring ≥ 1 time per week for >1 month with insufficient criteria for a diagnosis of irritable bowel syndrome:

- ≤ 2 defecations in the toilet per week in a child of a developmental age of ≥ 4 years
- ≥ 1 episode of fecal incontinence per week
- History of retentive posturing or excessive volitional stool retention
- Presence of a large fecal mass in the rectum
- History of large diameter stools that can obstruct the toilet

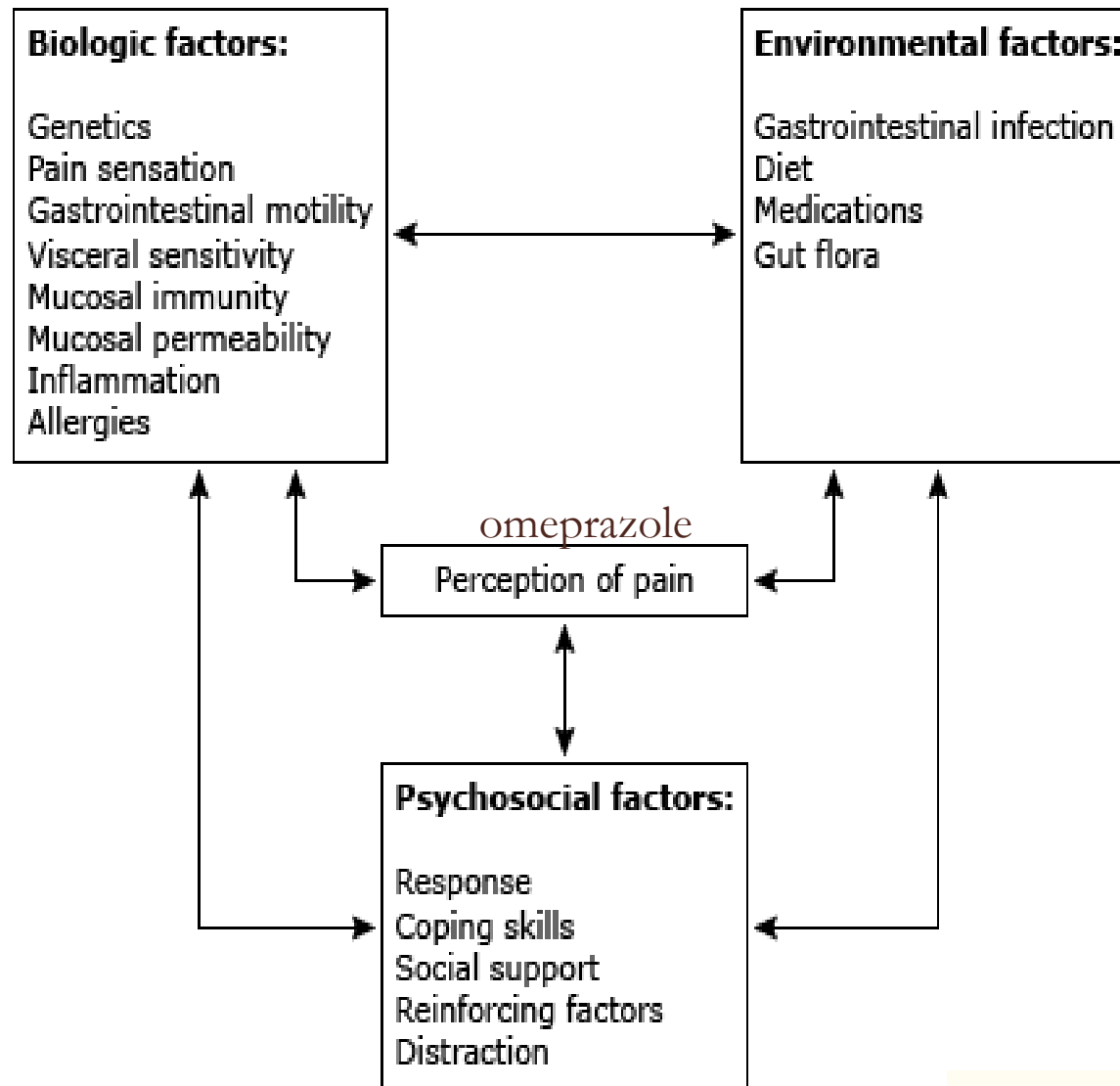
* Functional constipation is not categorized as a functional abdominal pain disorder in the Rome IV classification. However, it is included in this table as a common cause of chronic abdominal pain in children.



General Management Strategies

- Patient // Family Education
- Biopsychosocial Model
- Other Approaches
 - Herbs// Supplements
 - Aroma
 - Acupuncture
 - Hypnosis/Guided Imagery
 - Cognitive Behavioral Therapy
 - Biofeedback
 - Yoga

Biopsychosocial model of abdominal pain



Peppermint



- **Uses:** Irritable bowel syndrome, colic, nausea, decongestant, cough suppressant, anxiolytic, topical analgesic for headache and myalgia.
- **Mechanism of action:** Calcium channel blocker in GI smooth muscle, vapors stimulate sensory nerve endings in nasal mucosa, triggers cold receptors on the skin causing a sensation of coolness and analgesia
- **Clinical Studies:** Khanna R, MacDonald JK, Levesque BG. Peppermint oil for the treatment of irritable bowel syndrome: a systematic review and meta-analysis. *Clin Gastroenterol* 2014; 48(6):505-12.
- Asgarshirazi M, et al. Comparison of the Effects of pH-Dependent Peppermint Oil and Synbiotic Lactol (Bacillus coagulans + Fructooligosaccharides) on Childhood Functional Abdominal Pain: A Randomized Placebo-Controlled Study. *Iran Red Crescent Med J.* 2015;17(4):e23844.
- Cash BD. A Minty Breath of Fresh Air for Irritable Bowel Syndrome, *Gastroenterology.*2020; 158(1):36-37.
- **Dose:** One to 2 enteric-coated capsules containing 0.2 ml of peppermint oil taken 2 to 3 times a day
- **Adverse effects:** Infantile apnea when applied under/in nose, heartburn, mild rectal burning.

Chamomile



Uses: Cultivated worldwide as a sedative, anti-spasmodic, anti-inflammatory and wound healing agent

Mechanism of Action: Chamazulene: antispasmodic; Apigenin-anxiolytic; Bisabolol- anti-inflammatory

Clinical Studies: Savino F. A randomized double-blind placebo-controlled trial of a standardized extract of *Matricariae recutita*, *Foeniculum vulgare* and *Melissa officinalis* (ColiMil) in the treatment of breastfed colicky infants. *Phytother Res* 2005;19:335-40.



Chamomile

Dose: Infusion can be prepared from fresh or dried flower heads, usually 2–3 teaspoons in a cup of boiling water, infused for 10 minutes and taken orally three times a day.

Adverse Effects: People sensitive to ragweed, chrysanthemums or other members of the Compositae family are more prone to develop contact allergies to chamomile




Aromatherapy

- Aromatherapy acts upon holistic principles to awaken and strengthen energies and to promote self-healing
- Essential oils
 - Fragrant oils extracted from herbs, flowers, and trees considered to be the “essence” of the plant
 - Examples
 - Lavender, camphor, eucalyptus, citronella, patchouli
- Infused oils
 - Produced from plant materials that are extracted with heat into a carrier oil medium
 - used for plants that yield very small amounts
 - Examples: aloe vera, arnica, calendula

Aromatherapy Research


- Kim JT. Treatment with lavender aromatherapy in the post-anesthesia care unit reduces opioid requirements of morbidly obese patients undergoing laparoscopic adjustable gastric banding. *Obes Surg*. 2007 Jul;17(7):920-5.





Hines S, Steels E, Chang A, Gibbons K. Aromatherapy for treatment of postoperative nausea and vomiting. *Cochrane Database Syst Rev.* 2018 Mar 10;3:CD007598.

- 16 controlled clinical studies(2 studies in children) using aromatherapy for PONV with a total of 1036 participants.
- The studies applied aromatherapy at the first complaint of nausea in the immediate period after surgery and measured nausea for up to two days.
- Aromatherapy substances used were isopropyl alcohol (rubbing alcohol), peppermint oil, ginger, or mixtures that included ginger, spearmint, peppermint and cardamom; or lavender, peppermint, ginger, and spearmint oils.
- The studies compared aromatherapy to saline or water placebo, controlled breathing, other aromatherapy substances, anti-nausea medications, or a combination of these, with some studies having up to four groups.
- **Key results**
- Aromatherapy was not effective in reducing nausea severity at greater than three minutes after treatment in comparison to saline, water or controlled breathing placebo (6 studies with 241 participants) but more participants who received aromatherapy were nausea-free at the end of treatment (4 studies, 193 participants) and fewer participants who received aromatherapy required anti-nausea medications (7 studies with 609 participants).



Warning about long term use of topical lavender

Pubertal changes

DE GRUYTER

J Pediatr Endocrinol Metab 2016; 29(1): 103–107

Case Report

Alejandro Diaz*, Laura Luque, Zain Badar, Steve Komic and Marco Danon

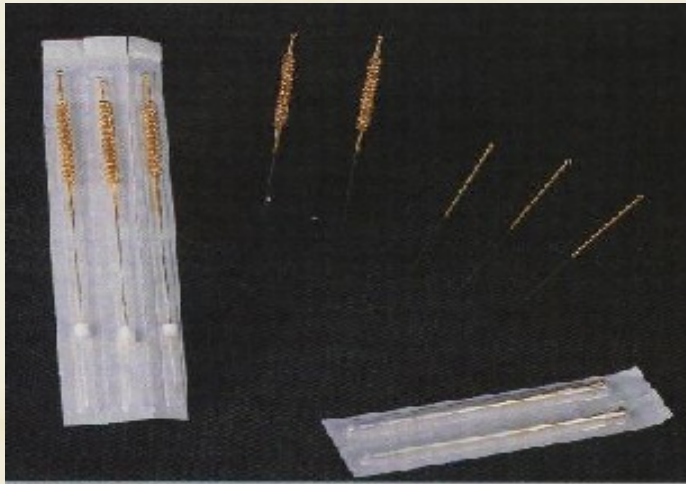
**Prepubertal gynecomastia and chronic lavender
exposure: report of three cases**

Acupuncture



- ~38,000 acupuncturists in 2018
- ~10 million visits/year
- 62 accredited acupuncture schools
- Acupuncture is recognized in 47 states including the District of Columbia
- 1/3 are MDs (300 hours) vs. non-MD (1000-3000 hours, 3-4 yr Master's program)
- 40-80% insurers pay for some treatments

Acupuncture: Needles (US)



- Metallic
- Solid
- 36-38 gauge
- Disposable



J Type features a new easy release comfort grip handle with soft-touch top. Only a gentle tap is needed for insertion.

What is acupuncture?



- Acupuncture is one of the key components of traditional Chinese medicine (TCM).
- In TCM, the body is seen as a delicate balance of two opposing and inseparable forces: yin and yang.
- Yin represents cold, slow, or passive aspects of the person, while yang represents hot, excited, or active aspects.
- A major theory is that health is achieved through balancing yin and yang.



What is acupuncture?

- Disease is caused by an imbalance leading to a blockage in the flow of qi along pathways known as meridians.
- Qi can be unblocked by using acupuncture at certain points on the body that connect with these meridians.
- Meridians (14-20 pathways) can include up to 20,000 acupuncture points in a weblike interconnecting matrix.



Acupuncture Pediatrics

- Lin YC, Perez S, Tung C. Acupuncture for pediatric pain: The trend of evidence-based research. *J Tradit Complement Med.* 2019 Aug 17;10(4):315-319.
- Golianu B, Yeh AM, Brooks M. Acupuncture for Pediatric Pain. *Children (Basel).* 2014 Aug 21;1(2):134-48.



Acupuncture Safety

- Yang C, Hao Z, Zhang LL, Guo Q. Efficacy and safety of acupuncture in children: an overview of systematic reviews. *Pediatr Res.* 2015 Aug;78(2):112-9.
- Adams D, Cheng F, Jou H, Aung S, Yasui Y, Vohra S. The Safety of Pediatric Acupuncture: A Systematic Review. *Pediatrics.*2011.128(6):e1575-87.



Medical Acupuncture Training

- <http://www.medicalacupuncture.org/For-Physicians/Education>
- <https://hmieducation.com/course-description>





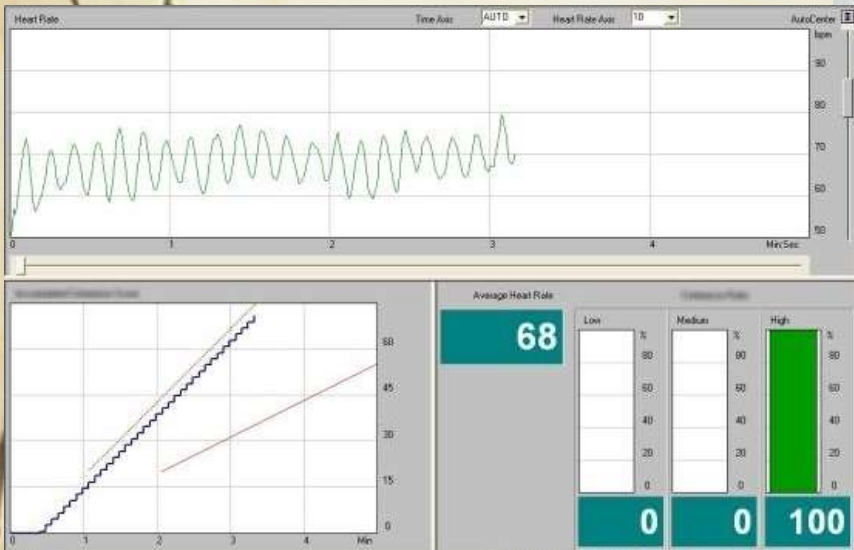
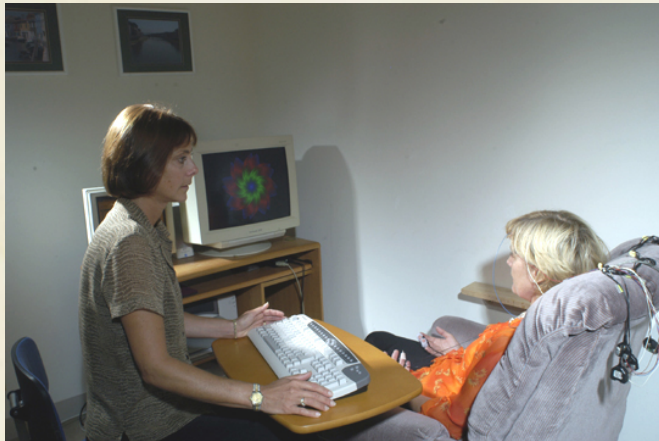
Biofeedback


- Biofeedback is a technique intended to teach patients self-regulation of certain physiologic processes not normally considered to be under regulatory control.
- Patients are taught modify physiologic functions by being connected through electrical sensors to a computer .
- A typical program consists of 6- 10 training sessions of 30 – 60 minutes each. Through learning specific techniques patients learn to control their heart rate, breathing , muscle tension, galvanic skin response and skin temperature.



BIOFEEDBACK MODALITIES


- EMG
- Skin Temperature
- GSR
- Respiratory rate
- Cardiac rate
- Heart Rate Variability
- Neurofeedback






Blume HK, Brockman LN, Breuner CC. Biofeedback therapy for pediatric headache: factors associated with response. Headache. 2012 Oct;52(9):1377-86.

- 132 children who attended ≥ 2 biofeedback sessions.
- Median headache frequency dropped from 3.5 to 2 headache days/week between the first and last visits.
- Response-58% overall; 48% for chronic headaches and 73% episodic headaches.
- In multivariate analysis, ability to raise hand temperature by $>3^{\circ}\text{F}$ at the last visit associated with a positive response, and preventive medication use was associated with nonresponse.



Nestoriuc, Y, Rief, W, Martin, A. Meta-analysis of biofeedback for tension-type headache: Efficacy, specificity, and treatment moderators. *Journal of Consulting and Clinical Psychology*. 2008 : 76(3): 379-96.

- 74 outcome studies, of which 53 were selected according to predefined inclusion criteria.
- Biofeedback was more effective than headache monitoring, placebo, and relaxation therapies with decrease in frequency of headache episodes.



Dobbin A. Randomized controlled trial of brief intervention with biofeedback and hypnotherapy in patients with refractory irritable bowel syndrome. J R Coll Physicians Edinb. 2013;43(1):15-23.

- 97 patients randomized into the study, 61 completed study
- Biofeedback group had greater decrease in symptom severity scores.
- Both interventions had a decrease total non-gastrointestinal symptom scores including anxiety and depression ratings during 24 weeks follow-up.

<http://www.bcia.org>



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- [Sample Mentoring Log Book](#)
- [Practical Skills List](#)
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- [Blueprint of Knowledge](#)
- [Core Reading List](#)
- [Professional Standards and Ethical Principles of Biofeedback](#)
- [Exam Registration Form \(Dates\)](#)
- [Special Exam Form](#)
- [Special Review](#)

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About Biofeedback

[Biofeedback Glossary](#)

Biofeedback has evolved from a fascination in the 1960s and 70s to a mainstream methodology today for treating certain medical conditions and improving human performance. This evolution has been driven by years of scientific research demonstrating that the mind and body are connected, and that people can be taught to harness the power of this connection to change physical activity and improve health and function. Public interest in biofeedback is growing, and with it the need for a clear answer to the question, "what is biofeedback?" The leading professional organizations representing the field have answered with the following standard definition.

"Biofeedback is a process that enables an individual to learn how to change physiological activity for the purposes of improving health and performance. Precise instruments measure physiological activity such as brainwaves, heart function, breathing, muscle activity, and skin temperature. These instruments rapidly and accurately "feed back" information to the user. The presentation of this information — often in conjunction with changes in thinking, emotions, and behavior — supports desired physiological changes. Over time, these changes can endure without continued use of an instrument."

The Association for Applied Psychophysiology and Biofeedback (AAPB), the Biofeedback Certification International Alliance (BCIA), and International Society for Neurofeedback and Research (ISNR) convened a task force of renowned scientists and clinicians in late 2007 who worked together to craft the standard definition. "It is important for people to have good information from sources they can trust when making decisions about what health care and performance improving methods to choose," commented AAPB President, Aubrey Ewing, Ph.D. "We felt strongly that with more about biofeedback and its efficacy appearing in the media, and the potential for confusion arising from inaccurate use of the term, that a standard definition was necessary," he added.

Biofeedback and has been shown to be an effective treatment for migraine and tension type headache, urinary incontinence, high blood pressure, anxiety, and a number of other conditions. A growing body of research indicates that neurofeedback, (also known as EEG biofeedback) is an effective treatment for attention deficit hyperactivity disorder and can help manage the symptoms of autistic spectrum disorders, brain injury, posttraumatic stress, seizures, and depression. Corporate executives, musicians, artists, and athletes, including some of the medal winners in this year's Beijing Olympics, use biofeedback and neurofeedback to reach their peaks in competition and performance.


The mainstream of biofeedback and neurofeedback practitioners, as represented by AAPB, BCIA, and ISNR, follow a standard of care based on scientific evidence that supports the use of particular biofeedback and neurofeedback methods, instruments, and claims of efficacy. The standard definition is intended to help consumers and the media in recognizing legitimate practitioners and methods, and insurance companies and government agencies in making decisions about biofeedback and neurofeedback coverage and regulation.

To learn more about the efficacy of biofeedback and neurofeedback in the treatment of certain disorders and their usefulness in promoting health and optimum performance, explore the content of this section through the links on




Hypnosis

- Altered state of consciousness or awareness.
- Resembles various meditative states.
- A heightened concentration on a particular idea or image.
- Guided imagery used most often used where, specific images, sounds and smells are suggested for the purpose of altering some symptom.
- NIH Technology Assessment Panel on Integration of Behavioral and Relaxation Approaches Into the Treatment of Chronic Pain and Insomnia. JAMA.1996.



Sawni A, Breuner CC. Clinical Hypnosis,
an Effective Mind-Body Modality for
Adolescents with Behavioral and Physical
Complaints. Children. 2017 Mar 24;4(4).
E19



Rutten J. Gut-directed hypnotherapy for functional abdominal pain or irritable bowel syndrome in children: a systematic review. Arch Dis Child. 2013; 98(4):252-7.

- 3 RCT comparing HT to a control treatment were included with sample sizes ranging from 22 to 52 children.
- All showed statistically significantly greater improvement in abdominal pain scores among children receiving HT.
- 1 trial reported beneficial effects sustained after 1 year of follow-up.
- 1 trial reported statistically significant improvement in quality of life in the HT group.
- 2 trials reported significant reductions in school absenteeism after HT.



Training in Hypnosis

- Society for Developmental & Behavioral Pediatrics: <http://www.sdbp.org>
703-556-9222
- Society for Clinical & Experimental Hypnosis: <http://www.sceh.us>
617-469-1981
- American Society for Clinical Hypnosis:
www.asch.net



Case Study

8 yo girl has been diagnosed with functional abdominal pain whose family wants to use a holistic integrative approach in her management.

What can you recommend?

Massage



- **Swedish massage:** long strokes are used to knead and apply friction to the muscles and move the joints to aid flexibility.
- **Deep tissue massage:** patterns of strokes and deep finger pressure on parts of the body where muscles are tight or knotted, focusing on layers of muscle deep under the skin.
- **Trigger point massage** (pressure point massage): a variety of strokes applied deeper with more focused pressure on myofascial trigger points
- **Shiatsu massage:** the therapist applies varying, rhythmic pressure from the fingers on parts of the body that are believed to be important for the flow of a vital energy called qi.

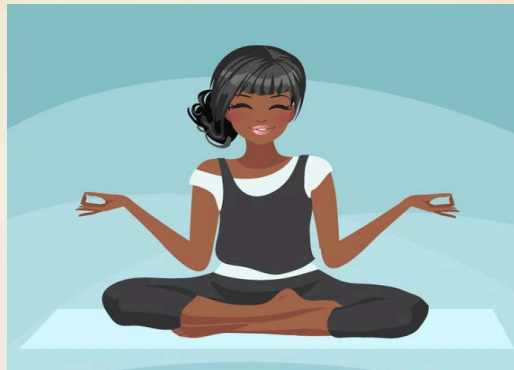


Massage Research

- Jennie C.I. Tsao. Evid Based Complement Alternat Med. Effectiveness of Massage Therapy for Chronic, Non-malignant Pain: A Review. 2007 ; 4(2): 165–179.
- Beider S. Randomized controlled trials of pediatric massage: a review. Complement Alternat Med. 2007;4(1):23-34.

Yoga Therapy

- Increasingly popular as an adjunctive treatment to conventional medicine practices.
- Nanthakumar C. The benefits of yoga in children. J Integr Med. 2018 Jan;16(1):14-19.



Clinical Studies

- Carei, T, Fyfe- Johnson A, Breuner CC. Randomized Controlled Clinical Trial of Yoga in the Treatment of Eating Disorders Mar2010 Journal of Adolescent Health
- Evans S, Moieni M, Sternlieb B, Tsao JC, Zeltzer LK. Yoga for youth in pain: the UCLA pediatric pain program model. *Holist Nurs Pract.* 2012;26(5):262-271. doi:10.1097/HNP.0b013e318263f2ed Gurjeet S. Birdee,. Clinical Applications of Yoga for the Pediatric Population: A Systematic Review. *Acad Pediatr.* 2009 Jul–Aug; 9(4): 212–220.e1-9.



Music Therapy




- Caprilli S et al. Interactive Music as a Treatment for Pain and Stress in Children During Venipuncture: A Randomized Prospective Study. *Journal of Developmental & Behavioral Pediatrics*. 2007;28(5): 399-403.
- Stouffer JW. Practice guidelines for music interventions with hospitalized pediatric patients. *J Pediatr Nurs*. 2007;22(6):448-56.
- Karline Treurnicht .The Effectiveness of Music in Pediatric Healthcare: A Systematic Review of Randomized Controlled Trials. *Evid Based Complement Alternat Med*. 2011

Animal Therapy

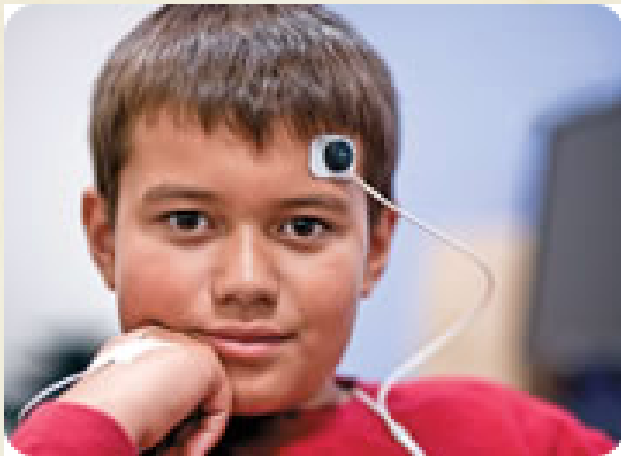


- Wohlfarth R . Dogs motivate obese children for physical activity: key elements of a motivational theory of animal-assisted interventions. *Frontiers in Psychology*. 2013. 1-7.
- Nahm N. Therapy Dogs in the Emergency Department. *West J Emerg Med*. 2012; 13(4): 363–365.





Valeria Calcaterra et al. Post-Operative
Benefits of Animal-Assisted Therapy in
Pediatric Surgery: A Randomised Study.
PLoS One. 2015; 10(6): e0125813.
Published online 2015 Jun 3.





AAP Section Complementary, Holistic and Integrative Medicine (SOIM)

- **Mission:** to support the mission of the AAP "to attain optimal physical, mental, and social health and well being for all infants, children, adolescents, and young adults" by:
- promote policies to enhance patient-centered care;
- integrate evidence-based, safe and effective complementary therapies into high quality pediatric practice;
- educate clinicians and families; advocating for appropriated payment for safe and effective services; and
- respectfully collaborate with diverse health professionals dedicated to enhancing the health of infants, children, and adolescents.

Questions?


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Websites

- www.consumerlab.com
- www.naturalmedicines.therapeuticresearch.com
- www.nccih.nih.gov
- www.herbmed.org
- www.herbs.org

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- Dezfouli SMM, Khosravi S. Pain in child patients: A review on managements. Eur J Transl Myol. 2020 Jan 9;30(2):8712.



The effectiveness of hypnosis for reducing procedure-related pain in children and adolescents: a comprehensive methodological review. Accardi MC, Milling LS. J Behav Med. 2009;32(4):328-39.

- Review of studies looking at the effectiveness of hypnosis for reducing procedure-related pain in children and adolescents (<19 years).
- Hypnosis was compared with a control condition or an alternative intervention in reducing the procedure-related pain.
- Conclusion: Hypnosis found to be more effective than control conditions in alleviating discomfort associated with bone marrow aspirations, lumbar punctures, voiding cysto-urethograms, pectus excavatum surgery and post-surgical pain




School Attendance

Allison MA, Attisha E. COUNCIL ON SCHOOL HEALTH

The Link Between School Attendance and Good Health.

Pediatrics. 2019;143(2)

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- SECTION ON INTEGRATIVE MEDICINE. Mind-Body Therapies in Children and Youth. Pediatrics, 2016 Sep;138(3). 2016 Aug 22.



Pediatric Integrative Medicine

Hilary McClaflerty, MD, FAAP,^a Sunita Vohra, MD, FAAP,^b Michelle Bailey, MD, FAAP,^c Melanie Brown, MD, MSE, FAAP,^d Anna Esparham, MD, FAAP,^e Dana Gerstbacher, MD, FAAP,^f Brenda Golianu, MD, FAAP,^g Anna-Kaisa Niemi, MD, PhD, FAAP, FACMG,^h Erica Sibinga, MD, FAAP,ⁱ Joy Weydert, MD, FAAP,^e SECTION ON INTEGRATIVE MEDICINE

The American Academy of Pediatrics is dedicated to optimizing the well-being of children and advancing family-centered health care. Related to this mission, the American Academy of Pediatrics recognizes the increasing use of complementary and integrative therapies for children and the subsequent need to provide reliable information and high-quality clinical resources to support pediatricians. This Clinical Report serves as an update to the original 2008 statement on complementary medicine. The range of complementary therapies is both extensive and diverse. Therefore, in-depth discussion of each therapy or product is beyond the scope of this report. Instead, our intentions are to define terms; describe epidemiology of use; outline common types of complementary therapies; review medicolegal, ethical, and research implications; review education and training for select providers of complementary therapies; provide educational resources; and suggest communication strategies for discussing complementary therapies with patients and families.

The National Center for Complementary and Integrative Health (NCCIH) of the National Institutes of Health (NIH)¹ defines complementary therapies as evidence-based health care approaches developed outside of conventional Western medicine that are used in conjunction with conventional care. Examples of complementary care include the use of acupuncture to treat migraine headache² and clinical hypnosis to improve symptoms of irritable bowel syndrome (IBS).³ The term integrative health describes the blending of complementary and conventional therapies by the practitioner to include all appropriate therapies in a patient-centered and evidence-informed fashion. In an integrative approach, evidence-based complementary therapies may be used as primary treatments or used in combination with conventional therapies. In contrast, alternative therapies are not evidence-based, are used in place of conventional care, and are not covered in this report.

Interest in the field of pediatric integrative medicine is driven by a number of factors, including the prevalence of use in children living with chronic illness,^{4,5} the desire to reduce frequency and duration of pediatric

abstract

FREE

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Dr McClaflerty was a lead author and medical editor of the report, developed the initial draft, and led the coordination of the contributing authors; Dr Vohra was a lead author and medical editor of the report, and Drs Bailey, Brown, Esparham, Gerstbacher, Golianu, Niemi, Sibinga, and Weydert researched, updated, and authored individual sections of the paper.

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The guidance in this report does not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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