EVIDENCE BASED

ACUPUNCTURE

EVIDENCE SUMMARY - PEDIATRIC ACUPUNCTURE

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PEDIATRIC ACUPUNCTURE

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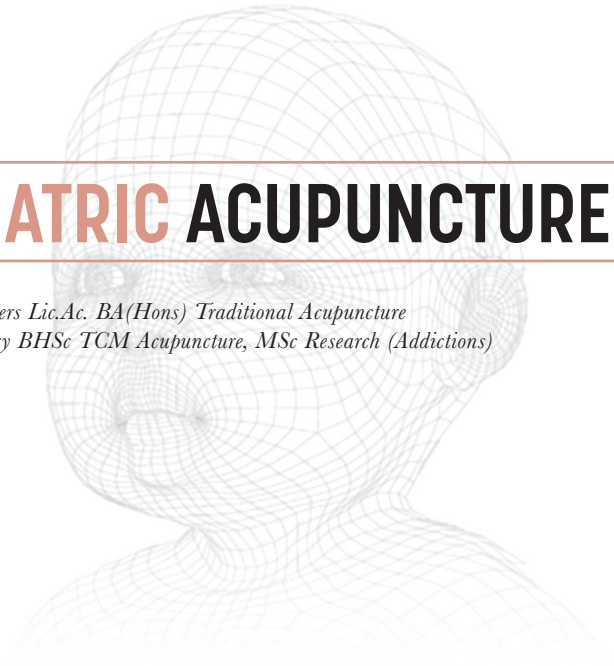


INTRODUCTION

The prevalence of chronic childhood conditions is increasing with 13-27% of children now being affected by chronic conditions. [1] These conditions may last into adulthood and can have a significant impact on the whole family as well as the affected child. Therefore, it is unsurprising that many families are now seeking complementary and alternative medicine (CAM) therapies and integrative medicine including acupuncture and related therapies for their children's conditions. [2] [3]

Acupuncture-related therapies include the non-invasive stimulation of acupoints with moxibustion and manual pressure (tui na), lasers, TENS machines, and similar devices.

Various reviews have found acupuncture and acupuncture-related therapies to show particular promise in the treatment of pediatric pain, cerebral palsy, nocturnal enuresis, tic disorders, amblyopia, nausea and vomiting, digestive disorders, autistic spectrum disorder (ASD), and respiratory disorders. [4] [5] [6]

Furthermore, acupuncture is considered safe and well-tolerated [7] [8] with a very low risk of serious adverse effects.

PEDIATRIC ACUPUNCTURE: THE EVIDENCE

PAIN

One of the conditions most commonly treated with acupuncture in people of all ages is pain. According to a 2014 review [9], an estimated 30.8% of children suffer from chronic pain and acupuncture may be effective in the relief of migraines and tension type headaches, abdominal pain, acute post-operative pain, and dysmenorrhea in adolescent girls.

A retrospective review [10] found that children attending an outpatient service experienced significant improvements in various types of pain including headaches and migraines, back pain, and painful extremities following acupuncture. When children rated their pain on a scale of 1-10 (VAS), they reported average reductions in pain from 5.5 to 2.2 points, and 40% of patients reported a complete resolution of symptoms.

Further studies suggest that acupuncture may also be helpful in the treatment of costochondritis [11] and acute pain due to appendicitis. [12]

NAUSEA AND VOMITING

Another promising area in pediatric acupuncture is the relief of nausea and vomiting, specifically post-operative nausea and vomiting and chemotherapy-induced nausea and vomiting.

A double-blind prospective study on laser acupuncture for nausea and vomiting following eye surgery [13] found that genuine laser acupuncture significantly reduced vomiting compared with sham treatment, with symptoms occurring in just 5/20 patients compared with 17/20 in the control group. Furthermore, just two patients in the genuine acupuncture group required rescue antiemetic therapy compared with 14 in the control group.

These results are supported by a review conducted in 2015 [14] which concluded that acupuncture was effective in the relief of post-operative conditions including nausea and vomiting and delirium following general anesthetic.

A further 2016 review [15] of seven different pediatric trials comprising 727 patients concluded that acupuncture may reduce the risk of nausea and vomiting and decrease the need for anti-emetic medication. Side effects were found to be mild and self-limiting and included skin irritation, blistering, redness, and pain. However, the quality of the evidence in most trials was deemed to be of low-quality with a high risk of bias.

Trials on acupuncture for chemotherapy-induced nausea and vomiting found that acupuncture reduced the severity and duration of symptoms [16] and also increased alertness among patients. [17]

STRENGTH OF EVIDENCE

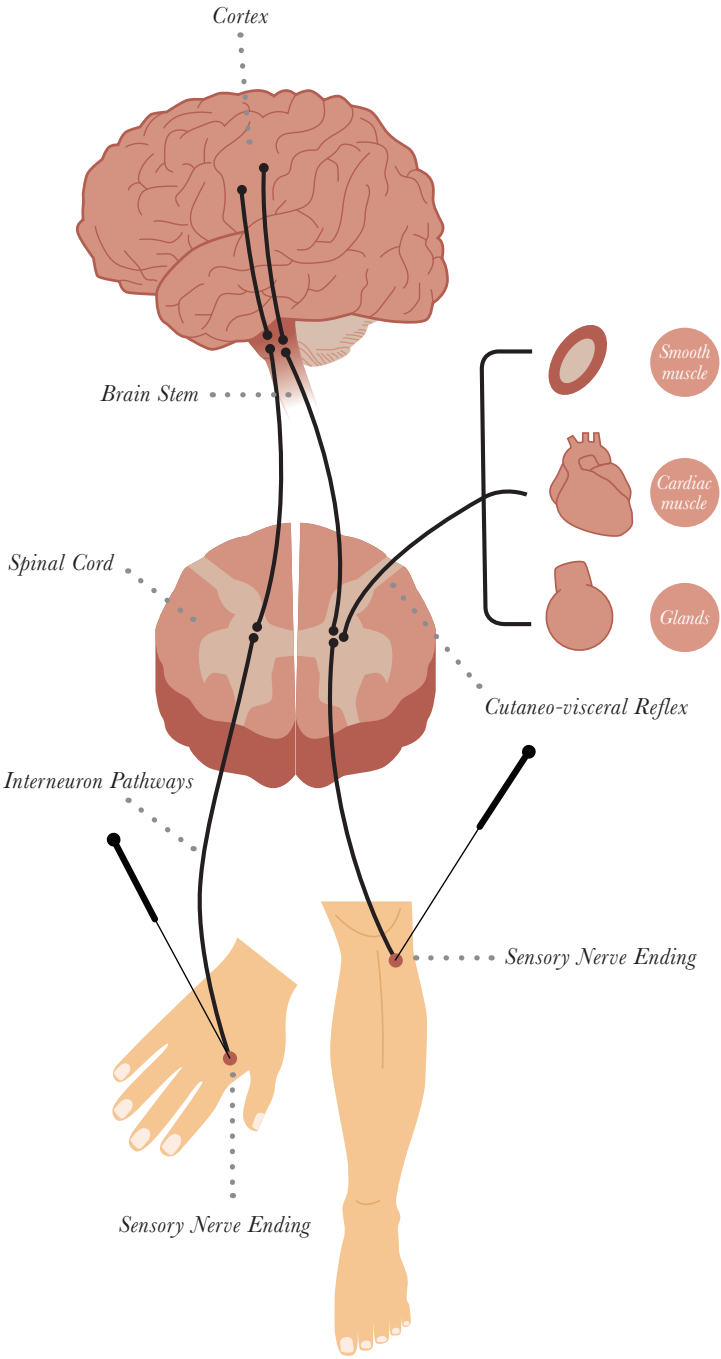
REVIEWS & META-ANALYSES

RANDOMISED CONTROLLED TRIALS

MANY REPORTS

SINGLE REPORTS

ANIMAL MODELS (Mechanisms)



THE CENTRAL NERVOUS SYSTEM

COLIC

A large study of 913 infants [18] aged 0-12 weeks found that acupuncture significantly improved symptoms such as inflated stomach and defecation rates in 690 of its subjects, while 201 subjects saw more subtle improvements. However, other symptoms such as regurgitation actually increased following acupuncture treatment.

A further 2016 study [19] found that acupuncture reduced crying time in infants with colic, with more of its subjects crying for less than three hours a day (one of the diagnostic criteria for colic) following acupuncture.

A 2018 systematic review [20] of three randomized controlled trials and 307 patients found that while there were no differences after treatment, during treatment babies treated with acupuncture had a 27 minute reduction in crying and that the results were statistically significant.

NOCTURNAL ENURESIS (BEDWETTING)

A 2017 study [21] of 20 patients aged 6-22 years found that acupuncture benefited nocturnal enuresis symptoms, as well as improving sleep and quality of life.

These results were supported by a 2015 review [22] of 21 studies and 1590 patients, which showed encouraging results for acupuncture as a treatment for nocturnal enuresis. Outcome measures included number of weekly wet nights, and maximum voided volume. However, only one study was deemed to be high-quality.

A further 2017 review [23] of seven studies conducted on children aged 7-15 years concluded that acupuncture was more effective for nocturnal enuresis than either placebo or drug therapy.

CEREBRAL PALSY

A 2018 meta-analysis of randomized controlled trials (24) looked at 21 studies and 1718 patients comparing acupuncture plus rehabilitation with rehabilitation alone. The meta-analysis found that acupuncture provided improvements in gross motor function and fine motor function with improvements in scales measuring muscle tone and spasticity. Furthermore, there was a high total effective rate, with only mild adverse effects reported. Of the 21 studies included in the analysis, three were classed as grade A for quality, while the remainder were classed as grade B.

AUTISTIC SPECTRUM DISORDER

A 2009 systematic review [25] of new and emerging treatments for ASD ranked acupuncture as a grade C treatment, meaning that its use is supported by at least one non-randomized controlled trial or two case series.

Additionally, a 2011 review [26] including 10 trials and 390 children aged 3-18 years suggests that acupuncture may improve functioning in children with ASD. Six of the reviewed trials indicated improvements in both cognitive and global function, while a further two suggested improvements in communication, linguistic skills, cognitive and global function.

A 2010 study [27] found significant improvements in language comprehension and self-care following genuine electro-acupuncture compared with sham treatment. Parents also reported improvements in sociability, receptive language, motor skills, coordination, and attention span.

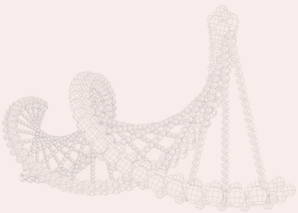
A 2018 review [28] found improvements in CARS and ABC scores when acupuncture was combined with behavioral and educational interventions, with an 'acceptable' risk of adverse effects.

A further 2018 study [29] found that the greatest improvements were in verbal communication. The latter study also suggests that the efficacy of acupuncture for ASD may reduce with increased age.

ASTHMA

A 2013 study [30] of 52 children aged 6 months to 6 years found significant improvements in asthma symptoms following acupuncture treatment. However, these were not maintained following the cessation of treatment, suggesting long-term acupuncture therapy could be necessary.

These results are supported by a 2015 systematic review of seven studies and 410 patients [31] Two of the reviewed studies found improvements in peak expiratory flow (PEF) following treatment, while another showed a reduction in asthma-related anxiety.



NEONATAL CARE

Neonates are often subjected to painful procedures [32] for which acupuncture may offer relief. [33] Another condition for which acupuncture may be useful is neonatal abstinence syndrome (NAS), a group of symptoms experienced by babies withdrawing from fetal exposure to illicit drugs or prescription medications such as opioids and benzodiazepines.

One 2015 randomized, controlled, blinded trial [34] found that infants with NAS required a reduced duration of morphine therapy and had a reduced length of hospital stay compared with control subjects, resulting in reduced costs to the hospital of around 26.4%. A retrospective review [35] found that infants with NAS showed improved feeding following acupuncture treatment, and were calmer and slept better during and immediately after treatment.

These findings are supported by a 2015 pilot study of 20 infants with NAS [36] which recommended acupuncture as a safe, feasible, and effective treatment. Another review conducted in 2018 [37] also confirms these results.

TREATMENT OPTIONS FOR CHILDREN: APPROACHES AND CONCERNS

One major concern regarding pediatric medicine is that off-label prescribing is a common practice, with approximately half of all medicines insufficiently labelled for pediatric use as of 2012. [56] Although using drugs off-label does not necessarily mean that they are dangerous, it does mean that there is insufficient evidence regarding their safety and efficacy. This reality presents large and complex issues, especially regarding neonates, infants under two years of age, and children with rare or chronic conditions. [57] Conversely, acupuncture has been tried and tested over the course of many centuries and has proven safe and effective, even for very young children.

BIOLOGICAL MECHANISMS OF PEDIATRIC ACUPUNCTURE

There are a number of different mechanisms underlying acupuncture's physiological effects. The most thoroughly researched area is pain. Numerous nerve pathways and biochemicals have been identified as being involved in acupuncture's analgesic effects. These include Aδ, Aβ and C nerve fibers, opioid neuropeptides including enkephalins, endorphins, dynorphins, endomorphins, and nociceptin, and non-opioid neuropeptides including substance P (SP), vasoactive intestinal peptide (VIP) and calcitonin gene-related peptide (CGRP). Several neurotransmitters are also involved including serotonin, norepinephrine, dopamine, cytokines, glutamate, nitric oxide, and gamma-amino-butyric-acid (GABA). [38] [39]

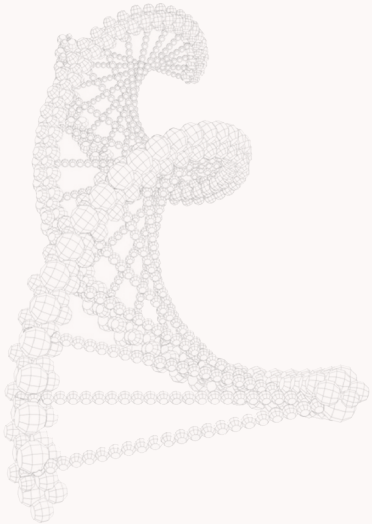
Many other pathways have been identified which help to explain how acupuncture has such a diverse range of effects. Perhaps the most central of these is known as purinergic signaling, a system in which adenosine triphosphate (ATP) plays a role in signaling and regulation of all tissues and organs. [40] [41] ATP is required for nerve transmission, and animal studies found that mice bred with an inability to bind to adenosine did not experience analgesia from acupuncture, while normal mice did. [42] [43] This effect has also been replicated in human studies. [44]

Purinergic signaling has been found to play a role in diverse clinical areas including migraines and headaches [45] immunity and inflammation [46] cancer, [47] autism, [48] Alzheimer's, [49] cardiovascular disease, [50] [51], and endocrine function. [52]

While pharmaceutical companies are currently attempting to develop drugs in these areas which inhibit or enhance purinergic signaling, [53] safety is an area of concern. As these compounds exist in a delicate balance at the cellular level, both too much and too little adenosine and ATP may be associated with disease. However, self-regulation of purinergic signaling as is promoted by acupuncture treatment is likely to be both effective and safe.

In addition to biochemical actions, studies also demonstrate the direct effects of acupuncture on the central nervous system. These influence spinal reflexes, where acupuncture induces muscle relaxation and changes in visceral organs. In the brain, acupuncture has been shown to alter functional connectivity and decrease activity in limbic structures associated with stress and illness.

Acupuncture simultaneously improves regulation of the hypothalamus, pituitary, adrenal (HPA) axis, the primary system that the body uses for regulating hormones and the physiological stress response. [54] Additionally, acupuncture modulates activity in the parasympathetic nervous system which is associated with rest, relaxation, digestion and healing. [55]



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EDITION 1