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Pain in Children

Douleur de l'enfant

1. Systematic Reviews and Meta-Analysis

1.1. Bissoto 2024

Bissoto JR, Silva Júnior JURD, Alvares GP, Santos FH, Len CA. Acupuncture for pediatric chronic pain: a systematic review. J Pediatr (Rio J). 2024 Nov-Dec;100(6):586-595. https://doi.org/10.1016/j.jped.2024.03.013

Objectives	To survey, analyze and discuss the scientific evidence supporting the use of acupuncture and related techniques in the management of chronic pain in the pediatric population.
Sources	A survey of databases (MEDLINE, Scopus and Scielo) was carried out with search strategies, following the PRISMA statement, without limits on publication dates and languages. Clinical studies (clinical trials, single-arm, and case series) were accepted for review if they included participants aged up to 22 years. Study quality was assessed by MMAT, and the randomized clinical trial was analyzed under the STRICTA criteria.
Summary of the findings	2369 articles were retrieved. After excluding repetitions, 1335 underwent the initial selection. Only 16 articles were selected for full reading, of which 5 were included in the review, being two case series, two single-arm studies, and **one randomized clinical trial**. The articles were considered of good quality by the adopted criteria.
Conclusion	The analyzed studies showed important clinical results such as the reduction of pain intensity, and improvement in school attendance and social life. However, there are many limitations in study design and sample size. Therefore, there is weak evidence to support the use of acupuncture in the context of pediatric chronic pain, but the positive results reinforce the need for further investigation of the topic with the conduct of larger and well-designed studies, to obtain more data and greater scientific conviction of the findings.

1.2. Lopes (preterm infants) 2024

Lopes TCP, da Silva Vieira AG, Cordeiro SA, Miralha AL, de Oliveira Andrade E, de Lima RL, do Valle Filho MF, Boechat AL, Gonçalves RL. Effectiveness of non-pharmacological interventions in reducing pain in preterm infants: A systematic review and network meta-analysis. Intensive Crit Care Nurs. 2024 Oct;84:103742. https://doi.org/10.1016/j.iccn.2024.103742. Epub 2024 Jun 8. PMID: 38852240.|

Objective	To identify the most effective non-pharmacological measures for pain control in preterm infants in the Neonatal Intensive Care Unit (NICU).

Methods	A Systematic review and network meta-analysis of randomized clinical trials published in English, Portuguese, and Spanish from April 2020 to December 2023. The data sources used were MedLine via PubMed, LILACS, EMBASE, The Cochrane Central Register of Controlled Trials, and Pedro. We performed the risk of bias analysis with Rob 2 and the certainty of the evidence and strength of the recommendation using the Grading of Recommendations Assessment, Development, and Evaluation system. We assessed heterogeneity using the Higgins and Thompson I2 test, the classification of interventions using the P-score, and inconsistencies using the Direct Evidence Plot.
Results	From 210 publications identified, we utilized 12 studies in analysis with 961 preterm infants, and we combined ten studies in network meta-analysis with 716 preterm infants, and 12 combinations of non-pharmacological measures. With moderate confidence, sensory saturation, sugars, non-nutritive sucking, maternal heart sound, lullaby, breast milk odor/taste, **magnetic acupuncture**, skin-to-skin contact, and facilitated tucking have been shown to reduce pain in preterm infants when compared to no intervention, placebo, proparacaine or standard NICU routine: sensory saturation [SMD 5,25 IC 95%: -8,98; -1,53], sugars [SMD 2,32 IC 95%: -3,86; -0,79], pacifier [SMD 3,74 IC 95%: -7,30; 0,19], and sugars and pacifier SMD [3,88 IC 95% -7,72; -0,04].
Conclusion	Non-pharmacological measures are strongly recommended for pain management in preterm infants in the NICU.
Implications for clinical practice	The findings of this study have important implications for policy and practice. This is the only systematic review that compared the effectiveness of non-pharmacological measures, thus making it possible to identify which measure presents the best results and could be the first choice in clinical decision making.

1.3. Palomaa 2023 (neonates)

Palomaa AK, Huhtala S, Tuomikoski AM, Pölkki T. Effectiveness of technology-based interventions compared with other non-pharmacological interventions for relieving procedural pain in hospitalized neonates: a systematic review. JBI Evid Synth. 2023 Aug 1;21(8):1549-1581. https://doi.org/10.11124/JBIES-22-00179

Objective	The objective of this review was to evaluate the effectiveness of technology-based interventions for relieving procedural pain among hospitalized neonates compared with other non-pharmacological interventions.
Introduction	Neonates who require hospital care often experience acute pain during medical procedures. The current best practice for relieving pain in neonates is the use of non-pharmacological interventions, such as oral solutions or intervention-based human touch. Technological solutions (eg, games, eHealth applications, mechanical vibrators) have become more commonplace in pediatric pain management over recent years; however, there is a sizeable knowledge gap around how effective technology-based interventions are for relieving pain in neonates.
Inclusion criteria	This review considered experimental trials that include technology-based, non-pharmacological interventions for relieving procedural pain among hospitalized neonates. The primary outcomes of interest include pain response to a procedure measured by a pain assessment scale validated for neonates, behavioral indicators, and changes in physiological indicators.

Methods	The search strategy aimed to identify both published and unpublished studies. MEDLINE (PubMed), CINAHL (EBSCOhost), Scopus, Cochrane Central Register of Controlled Trials, MedNar, and EBSCO Open Dissertations databases were searched for studies published in English, Finnish, or Swedish. Critical appraisal and data extraction were conducted by 2 independent researchers who adhered to JBI methodology. Meta-analysis could not be performed due to considerable heterogeneity in the studies; as a result, the findings are presented narratively.
Results	A total of 10 randomized controlled trials involving 618 children were included in the review. The staff members delivering the interventions and the outcome assessors were not blinded in all of the studies, which introduced a potential risk of bias. The presented technology-based interventions were diverse, including **laser acupuncture, noninvasive electrical stimulation of acupuncture points**, robot platform, vibratory stimulation, recorded maternal voice, and recorded intrauterine voice. In the studies, pain was measured using validated pain scales, behavioral indicators, and physiological variables. In the studies in which pain was assessed with a validated pain measure (N=8), technology-based pain relief was significantly more effective than the comparator in 2 studies, whereas no statistically significant differences were observed in 4 studies and the technology-based intervention was less effective than the comparator in 2 studies.
Conclusions	The effectiveness of technology-based interventions in relieving neonatal pain, either as a standalone method or in combination with another non-pharmacological method, was mixed. Further research is needed to provide reliable evidence on which technology-based, non-pharmacological pain relief intervention is most effective for hospitalized neonates.

1.4. Stadler 2019 (neonates)

Stadler J, Raith W, Mileder LP, Schmölzer GM, Urlesberger B. Invasive and non-invasive |acupuncture techniques for pain management in neonates: a systematic review. Acupuncture in Medicine. 2019;37(4):201-210. [205539]. DOI

Background	Neonatal pain is an extensive research field and there are many possibilities to treat pain in neonates. Acupuncture is one new and non-pharmacological option and a promising tool to reduce pain in neonates undergoing minor painful interventions during routine medical care.
Objectives	This review summarises trials of acupuncture for pain reduction in neonates undergoing painful interventions during routine medical care. DATA SOURCE: MEDLINE, Embase, CINAHL, electronic clinical trials registry platforms and reference lists were systematically screened for trials from their dates of inception to February 2017 (English language database search).
Methods	STUDY SELECTION. Inclusion criteria were (1) preterm or term neonates, (2) acupuncture for painful medical interventions and (3) formal pain assessment as a primary or secondary study outcome. We included only randomised controlled trials. DATA EXTRACTION: Data were extracted using a standardised protocol and individual risk of bias was assessed.
Results	The literature search revealed a total of 12 196 records. After application of inclusion criteria, five studies were included in this review. Two studies demonstrated significant pain reduction, one found equal outcomes in comparison to standard care, and two showed significantly higher pain scores with acupuncture alone.
Limitations	The main limitation of the results is the heterogeneity across trials in acupuncture modality, acupuncture point selection, control groups and pain assessment (heterogeneity: I2=87%).

Conclusion	The results of this review suggest that acupuncture may have a positive pain-relieving effect in neonates. However, due to the low number of available high-quality trials and heterogeneity across the studies it is not possible to state clear recommendations.

1.5. Special Clinical Forms

1.5.1. Procedural Pain in Children

1.5.1.1. Cabano 2025

Cabano R, Al-Abdallat H, Hamamreh R, Soll G, Oei JL, Schmölzer GM, Bruschettini M. Acupuncture for procedural pain in newborn infants. Cochrane Database Syst Rev. 2025 Apr 22;4:CD015894. https://doi.org/10.1002/14651858.CD015894.pub2

Background	Procedural pain management in newborn infants, particularly those hospitalized in neonatal intensive care units (NICUs), remains a major challenge due to limited safe and effective analgesic options. Acupuncture, derived from Traditional Chinese Medicine, has emerged as a potential non-pharmacological intervention for neonatal pain relief.
Objective	To assess the benefits and harms of acupuncture for reducing procedural pain in newborn infants.
Methods	Databases searched included CENTRAL, PubMed, Embase, and clinical trial registries up to August 2023. Parallel and cross-over randomized controlled trials (RCTs) were eligible if they compared acupuncture with no treatment, sham acupuncture, non-pharmacological treatments (e.g., oral sucrose, glucose), pharmacological treatments, or other acupuncture modalities. Primary outcomes: pain scores during procedures. Secondary outcomes: harms, caregiver satisfaction, use of additional analgesia, adverse cardiorespiratory events, mortality, and neurodevelopmental outcomes. Risk of bias was assessed with Cochrane RoB 1. Meta-analyses used fixed-effect models to compute risk ratios (RR), risk differences (RD), and standardized mean differences (SMDs) with 95% confidence intervals (CIs). Certainty of evidence was rated with GRADE.
Results	Eleven RCTs including 852 infants were analyzed. Comparisons included acupuncture vs. no/sham treatment (5 studies), vs. non-pharmacological interventions (4 studies), and vs. other Traditional Chinese Medicine techniques such as foot massage or reflexology (2 studies). No studies compared acupuncture with pharmacological analgesia. Acupuncture compared with no treatment or sham reduced procedural pain (SMD = −0.56, 95% CI −0.75 to −0.37; 7 studies, 471 infants; low-certainty evidence) and showed little to no difference in harms (RR = 0.35, 95% CI 0.01–8.31; 2 studies). Compared with non-pharmacological treatments, results were uncertain (SMD = 0.29, 95% CI 0.04–0.54; 4 studies; very low-certainty evidence). Acupressure versus reflexology showed no clear difference in pain (SMD = 0.05, 95% CI −0.26 to 0.36; 2 studies; very low-certainty evidence).
Conclusion	Acupuncture may modestly reduce procedural pain in newborn infants compared with no intervention or sham treatment, with minimal associated harms. However, evidence remains very uncertain when compared with other non-pharmacological therapies or reflexology-type interventions. Further high-quality, adequately powered RCTs are needed to clarify efficacy and safety in neonatal populations.

1.5.1.2. Ogul 2023 (acupressure)

Ogul T, Yildiz S. Effect of Acupressure on Procedural Pain in Children: A Systematic Review. J Perianesth Nurs. 2023 Dec;38(6):930-937.e1. https://doi.org/10.1016/j.jopan.2023.01.023. Epub 2023 Sep 22. https://pubmed.ncbi.nlm.nih.gov/37737786.

Purpose	Acupressure is a complementary treatment method performed using fingers and hands to maintain the body's energy balance by stimulating acupuncture points. In recent studies, acupressure has been widely used for minimally invasive procedural (venous assess, intravenous (IV) cannulation, intramuscular injection, heel lancing) pain management in children. This study aims to systematically review the studies that evaluate the effectiveness of acupressure on minimally invasive procedural pain in children.
Design	This study is a systematic review of literature.
Methods	Studies were obtained by screening literature on this topic using the databases PubMed, EBSCO, Scopus, Google Scholar and Cochrane Central Register of Controlled Trials. The keywords “Acupressure,” “Child,” “Pain,” and “Procedural” were used when screening the literature. The studies selected were those published from January 1, 2000 to January 1, 2022 that met the inclusion and exclusion criteria. The PRISMA checklist was used when performing this systematic review. The Oxford Center for Evidence-Based Medicine Levels of Evidence Working Group (2011) table was used to assess the level of evidence. The procedures for this systematic review were preregistered in the PROSPERO (CRD42022320155) database.
Findings	Of the 12,624 records identified, **10 nursing studies** that met the research selection criteria were included in the advanced analysis. These papers were further reviewed for their study design, adequacy of randomization and concealment of allocation, blinding of participants, interventions, and outcome measurements.
Conclusions	Acupressure has been shown to be effective in relieving minimally invasive procedural pain in children. This review begins to establish a credible evidence base for the use of acupressure in minimally invasive procedural pain relief in pediatric age groups. The implication for nurses includes incorporating acupressure into their practice as an alternative therapy for children who suffer from minimally invasive procedural pain.

1.5.1.3. Tou 2023

Tou SI, Huang CY, Yen HR. Effect of Acupoint Stimulation on Controlling Pain from Heel Lance in Neonates: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Children (Basel). 2023 Jun 7;10(6):1024. https://doi.org/10.3390/children10061024|

Objective/ Methods	To evaluate the effect of acupoint stimulation compared to other interventions on pain control in neonates who underwent heel lance, we searched for randomized controlled trials across six databases (CINAHL, Cochrane Library, EMBASE, Medline, PubMed, and Web of Science) published up to January 2023. Studies comparing acupoint stimulation and other interventions for controlling heel lance pain in neonates were included. These reports measured at least one of the following variables: pain score, crying time, oxygenation saturation, heart rate, respiration rate, and duration of the procedure. The data were independently extracted by two authors, and the PRISMA guidelines for study selection were followed.

Results	A total of 79 articles were screened, and **10 studie**s, with results on 813 neonates, were included in the final selection. The pain scores recorded during the heel lance procedure were not significantly different between the acupoint stimulation cohort and the control cohort (SMD of -0.26, 95% confidence interval (CI) from -0.52 to 0.01; p = 0.06; I2 = 68%). After processing the subgroup analyses, significant differences were found in the comparisons of acupuncture vs. usual care (SMD of -1.25, 95% CI from -2.23 to 0.27) and acupressure vs. usual care (SMD of -0.62, 95% CI from -0.96 to -0.28); nonsignificant differences were found in other comparisons.
Conclusions	Our results demonstrate that acupoint stimulation may improve pain score during the heel lance procedure.

2. Overviews of systematic reviews

2.1. Lord 2026 (Neonatal Blood Sampling)

Lord LG, Harding JE, Crowther CA, Lin L. Pain Management During Neonatal Blood Sampling: An Overview of Systematic Reviews. Paediatr Neonatal Pain. 2026;8(3). https://doi.org/10.1002/pne2.70044

Background	This overview of systematic reviews aimed to identify effective pain management strategies for neonatal blood sampling.
Methods	Searches were conducted in four databases from 2014 to April 2026. Eligible studies were systematic reviews including randomized or quasi-randomized controlled trials assessing pain management in neonates during blood sampling. Reviews were required to have searched at least two databases within the past 10 years, reported their search strategy, and conducted a risk-of-bias assessment.
Results	The search identified 2463 records; 22 reviews (13 Cochrane and two non-Cochrane pairwise reviews, and seven network meta-analyses) met inclusion criteria. Interventions evaluated included opioids, paracetamol, topical anesthetics, breastfeeding or breastmilk, sucrose, music medicine, **acupuncture**, and other non-pharmacological methods. Sucrose with or without non-nutritive sucking was effective in reducing pain scores during heel pricks in preterm and term neonates (mean difference -1.74, 95% confidence interval [-2.11, -1.37], moderate-certainty). Skin-to-skin contact also reduced pain scores compared with control (mean difference -3.47 [-5.55, -1.38], moderate-certainty). Recent network meta-analyses generally supported parent-led interventions and oral sweet solutions as the most effective strategies. Breastfeeding, supplemental breastmilk, **acupuncture**, and light reduction were promising but require further evidence. For other interventions, evidence was insufficient to draw conclusions.
Conclusion	Evidence from systematic reviews and network meta-analyses indicates that sucrose and skin-to-skin contact effectively reduce procedural pain in neonates. Parent-led and other non-pharmacological interventions, including breastfeeding, also appear beneficial and should increasingly be considered part of family-centred neonatal pain care where feasible.

3. Clinical Practice Guidelines

⊕ positive recommendation (regardless of the level of evidence reported) Ø negative recommendation (or lack of evidence)

3.1. National Health Service, Scottish Government (Scotland) 2018 ⊕

Management of Chronic Pain in Children and Young People. A National Clinical Guideline. NHS, Scottish Government. 2018;:69p. [196021].

Acupuncture may be considered for managing chronic pain in children and young people, for back pain and headache. If used, efficacy should be formally assessed.

3.2. Austrian Society for Anesthesiology, Resuscitation and Intensive Care Medicine [douleur post-opératoire] (ÖGARI, Autriche) 2014 ⊕

Messerer B, Krauss-Stoisser B, Urlesberger B. [Non-pharmaceutical measures, topical analgesics and oral administration of glucose in pain management: austrian interdisciplinary recommendations on pediatric perioperative pain management]. Schmerz. 2014;28(1):31-42. [170629].

Acupuncture and hypnosis are also a meaningful addition within the framework of multimodal pain therapy.

3.3. Agence Nationale d'Accréditation et d'Évaluation en Santé (ANAES, France) 2000 Ø

ANAES. Évaluation et stratégies de prise en charge de la douleur aiguë en ambulatoire chez l'enfant de 1 mois à 15 ans Paris: Agence Nationale d'Accréditation et d'Évaluation en Santé (ANAES). 2000; : 324P. [167289].

L’acupuncture n’a pas fait l’objet d’études identifiées par nos recherches bibliographiques

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