

Acupressure intervention for children: A scoping review

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Abstract

Background: Acupressure is a popular form of complementary nursing among adults. It stimulates the body's self-healing processes by enhancing energy flow, or "chi," along meridian channels. Acupressure can address many health issues and is also used on children because it is painless and straightforward. Although acupressure has existed for centuries, research on its applications for children remains limited.

Objective: This review aimed to categorize and synthesize the research conducted over 30 years on acupressure in children.

Design: A scoping review

Data Source: The databases searched were PubMed, ProQuest, Scopus, ScienceDirect, Wiley, Medline EBSCO, and Google Scholar. The inclusion criteria were original peer-reviewed articles in English or Indonesian that used acupressure as an intervention for children in any setting from 1991 until March 2022 and were updated until March 2024.

Review Methods: This review followed the Joanna Briggs Institute Manual Methodologies. Subsequently, the retrieved articles were imported into the EndNote program version 20. Based on the identification results, 2924 articles were obtained, and 76 articles were retained. The review decision process was depicted in a PRISMA flow diagram.

Results: Of the 76 articles, 72% came from the Asian continent, 66% were published within the past ten years, and 59% were randomized controlled trials. Acupressure was most used (48%) by school-age children (7-12 years), with commonly targeted points being Neiguan (P6), Zusanli (ST36), Hegu (LI4), Yintang (Extra1), and auricular acupoints. Acupressure on children can be administered by acupuncturists, nurses, doctors, caregivers, and parents, offering six main benefits: alleviating nausea and vomiting, relieving pain, decreasing anxiety, relieving fatigue, increasing visual function, and increasing weight and height.

Conclusion: Acupressure offers numerous advantages for children with various conditions. Healthcare and nursing professionals should consider using it as a complementary intervention to address issues and problems in healthy and sick children. However, further studies are needed to evaluate its effectiveness.

Keywords

acupressure; children; scoping review; vomiting; nausea; pain; fatigue; anxiety

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Background

Acupressure, a traditional Chinese medicinal practice employed for centuries, involves applying pressure to specific acupoints using fingers instead of acupuncture needles (Chen et al., 2020). It falls under the umbrella of complementary medicine, alongside acupuncture, herbal remedies, massage, reiki, and other modalities (Sawni-Sikand et al., 2002). The National Center for Complementary and Alternative Medicine at the National Institutes of Health defines complementary and alternative medicine (CAM) as a collection of diverse medical systems, practices, and products group of diverse medical and healthcare systems, practices, and products that currently lie outside the realm of conventional medicine (Koithan, 2009).

Acupressure is a non-invasive therapy that focuses on the harmony of yin and yang and maintains the function of key organs through blood and energy (chi) circulation in the body. The mechanism of acupressure was based on the principle of activating acupoints along meridians to restore chi imbalances (Chen & Wang, 2014; Mehta et al., 2017). There are 14 meridians in human bodies that link acupoints, and each meridian relates to and nourishes a distinct organ (World Health Organization, 1991). Meridians are the pathways within the human body that sustain chi and, consequently, the individual's wellness (Mehta et al., 2017). The meridians are classified as Yin or Yang. The Yin meridians connect to critical organs such as the lung, heart, spleen, kidney, and liver (World Health Organization, 1991). The Yang meridians

correlate to the gallbladder, intestines, stomach, and bladder. Acupuncture's exact action method is unknown, although it is assumed to activate the central nervous system by releasing particular neurotransmitters and hormones. It is thought that different symptoms and illness states require different routes, neurotransmitters, and hormones (Harris et al., 2020; Li et al., 2013).

Acupuncture is a non-invasive therapeutic option that is well-suited for pediatric patients. This therapy has several advantages, highlighting its affordability, absence of side effects, and the fact that it does not require specialized skills to administer (Abbasoglu et al., 2015). Nurses incorporate acupuncture into their holistic approach to patient care, using it to enhance comfort, alleviate pain, and manage symptoms. This study suggests that acupuncture may be a feasible nursing intervention. From a practical standpoint, acupuncture offers several advantages: it is non-invasive, free, and simple to learn. Most significantly, because acupuncture is non-traumatic, there is no need for special equipment, making it simple to apply (Maa, 2005).

Research on acupuncture in children has been widely conducted. It has been shown to reduce nausea and vomiting in children with cancer (Jones et al., 2008), alleviate adverse reactions to chemotherapy and fatigue (Bastani et al., 2015), alleviate postoperative symptoms (Pouy et al., 2022), and alleviate interventional pain (Yildirim & Yildiz, 2021). In addition, a review demonstrates the substantial significance of acupuncture in lowering nausea and vomiting in adolescents (Khakpour et al., 2019).

Healthcare professionals have also frequently employed acupuncture to treat various adult problems. Several previous reviews have stated that acupuncture has several advantages, such as effectively enhancing the quality of sleep (Waits et al., 2018) and quality of life in the elderly (Chen et al., 2020), lowering constipation and pain (He et al., 2020; Jiang et al.,

2023), and alleviating pre-operative anxiety among adults (Xie et al., 2023). In addition, other reviews also show that acupuncture is useful for reducing pain and lowering blood sugar levels in diabetic patients and can lower blood pressure in adults (Komariah et al., 2021).

Although numerous reviews on acupuncture have been conducted in various populations, reviews focusing specifically on pediatric populations remain limited. Research exploring the benefits, acupuncture points, service providers, and conditions in children is still lacking, highlighting the need for further investigation. Thus, this scoping review aims to organize and synthesize the body of research on pediatric acupuncture from the past 30 years.

Methods

Study Design

The scoping review methodology established in the Joanna Briggs Institute Manual for Evidence Synthesis (Peters et al., 2020) guided this review, which is based on the scoping review frameworks (Arksey & O'Malley, 2005). This framework has five stages: identifying the research question, identifying relevant studies, selecting the study, charting the data, and collating, summarizing, and reporting the results. This technique allows for greater flexibility in studying and combining different sorts of research information.

Search Strategy and Selection Criteria

The search approach used the main keywords "acupuncture" AND "child" to search the online database. The six databases utilized are PubMed, ProQuest, Scopus, ScienceDirect, Wiley, and Medline EBSCO. In addition, we searched Google Scholar for articles written particularly in Indonesian. The keywords for each database are described in Table 1.

Table 1 Searching strategy

Database	Search Term Used	Filters Applied	Initial Search			Update Search		
			Searching Date	Range of Year of the Articles Retrieved	Articles Retrieved	Searching Date	Range of Year of the Articles Retrieved	Articles Retrieved
PubMed	"acupuncture" [MeSH Terms] OR "acupuncture" [All Fields] AND "child*" [All Fields]	Full text, clinical trial, RCT	March 14th 2022	1984-2022	202	Sept 23rd 2024	2022-2024	5
ProQuest	Acupuncture AND Children	Full text, English	March 14th 2022	1983-2022	998	Sept 23rd 2024	2022-2024	11
Scopus	Title-Abs-Key (Acupuncture AND Children)	Article, English.	March 15th 2022	1991-2022	540	Sept 23rd 2024	2022-2024	63
Science Direct	acupuncture AND children	Research article	March 16th 2022	1989-2022	398	Sept 23rd 2024	2022-2024	99
Wiley	"acupuncture AND children" anywhere and "children" in Title	-	March 15th 2022	1986-2022	40	Sept 23rd 2024	2022-2024	5
Medline EBSCO	acupuncture [All Text] AND children [Abstract]	Full text, peer review, all child, English language	March 14th 2022	1998-2022	550	Sept 23rd 2024	2023-2024	4
Google Scholar	Akupresur pada anak	-	March 16th 2022	2014-2022	5	Sept 24th 2024	2022-2024	4

The research question addressed was “What are the benefits, acupoint, provider, and child condition of acupressure in children?” The search approach involved tweaking the keywords in each database to achieve thorough coverage of the relevant literature.

This review selects articles that have passed peer review in their respective journals. The inclusion criteria for this article were using acupressure as an intervention given to children aged 0-18 years, published in English and Indonesia, available in full text, original research, the research was an intervention study (not an observation study), and published until March 2022. Furthermore, we have updated the search until March 31, 2024, and received an additional 191 papers for review. Gray literature, such as dissertations/theses, conference reports and proceedings, and white papers, were eliminated due to the project's breadth and the necessity for practicality. Furthermore, editorials, opinion articles, and letters to the editor were omitted since they provided little support for the study topic. Reviews and meta-analyses were also disqualified. Several studies used long life spans, so in this case, the researchers used all these age ranges in the analysis stage.

The retrieved articles are subsequently imported into the EndNote program version 20 to remove duplicates. Two independent reviewers (SR and ATI) screened titles and abstracts, we removed studies, and the final eligibility was determined through a full-text review.

Data Extraction

Two reviewers (SR and ATI) incorporated data retrieved from papers in the scoping review using a data extraction tool built by a reviewer for data charting. According to the domains of the extraction tool, the data collected consisted of details from the included studies on the country of publishing, year of publication, number of participants, age group of participants, health condition of participants, study design, the provider of acupressure and significant results related to the review aims. The data extraction tool was adapted and revised as needed during the data extraction process for each included publication. The data extraction tool was customized and altered as needed during the data extraction process for each included article. We used Microsoft Excel as our primary data extraction tool. Excel was used to capture and arrange the pertinent information gleaned from the selected articles. We created an organized table in Excel and inserted critical data elements such as article titles, authors, publication years, study aims, techniques, findings, and other relevant information.

Data Analysis

More specifically, based on the extracted data, SR and ATI identified the advantages of acupressure for children with different diseases, the acupressure point used, and the provider that performs the acupressure. It is envisaged that information concerning numerous child health issues that can be treated with acupressure will be discovered because of this identification. As part of the critical appraisal process, optional in the scoping methodology, we compiled and summarized essential factors such as study design, randomization

methods, sample size, and the comparator group to provide a comprehensive overview of potential biases.

We thoroughly analyzed and extracted important details from each article, grouped the data into proper categories, and presented the results without the need of specialist tools. This technique allowed us to interact thoroughly with the subject, ensuring that every significant component of our research was meticulously recorded and investigated.

Results

Based on the identification results from the first search and update search until March 2024, 2924 articles were obtained, and 955 duplicate articles were excluded. Next, SR and ATI independently screened 1969 by title and abstract. In the event of disagreement, FH was consulted. 179 full-text articles were reviewed to determine inclusion criteria, and 76 articles were retained. A PRISMA flow diagram depicts the review decision process (Figure 1).

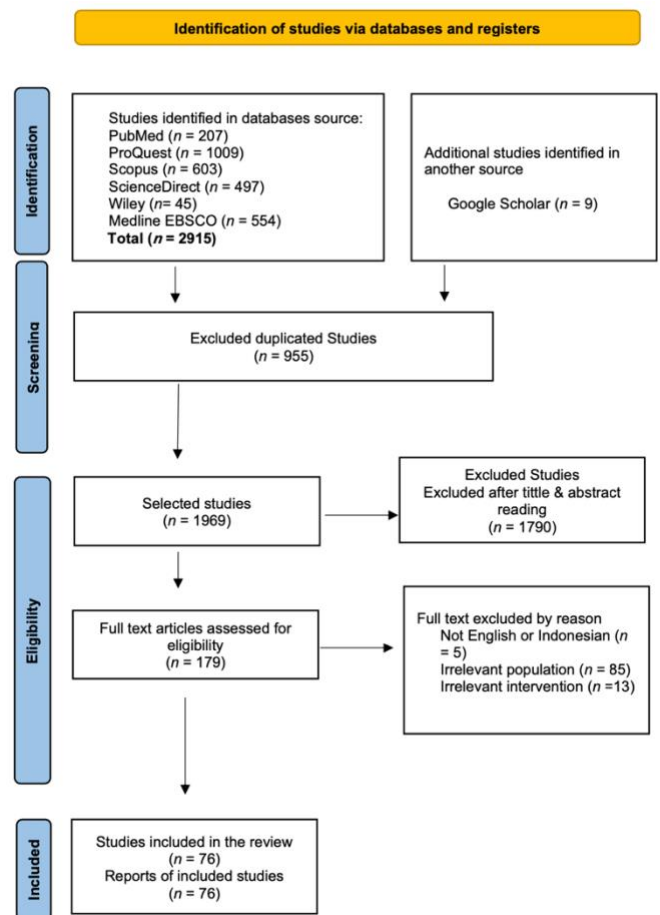


Figure 1 PRISMA Flow Chart (Page et al., 2021)

Based on the country of publication, most of the articles came from countries on the Asian continent (Iran, China, Taiwan, Indonesia, India, South Korea), followed by the Americas (USA, Canada, Brazil), Europe (Turkey, United Kingdom, Norway, Italy, Austria, Ukraine) and Africa (Egypt) (Figure 2A). This is relevant to the origins of acupressure, which is in China on the Asian continent, though it later spread to other continents worldwide. Acupressure research in children has been conducted at all ages, from infants to

adolescents, but most studies were conducted on children aged 7 to 12 (Figure 2B). Based on the year of publication, publications on acupressure in children started in 1991 and will continue until 2024. Most of the research will be conducted in

2023 (Figure 2C). The figure shows that researchers have been studying acupressure extensively since 2000. Detailed characteristics of each study can be seen in the Supplementary File.

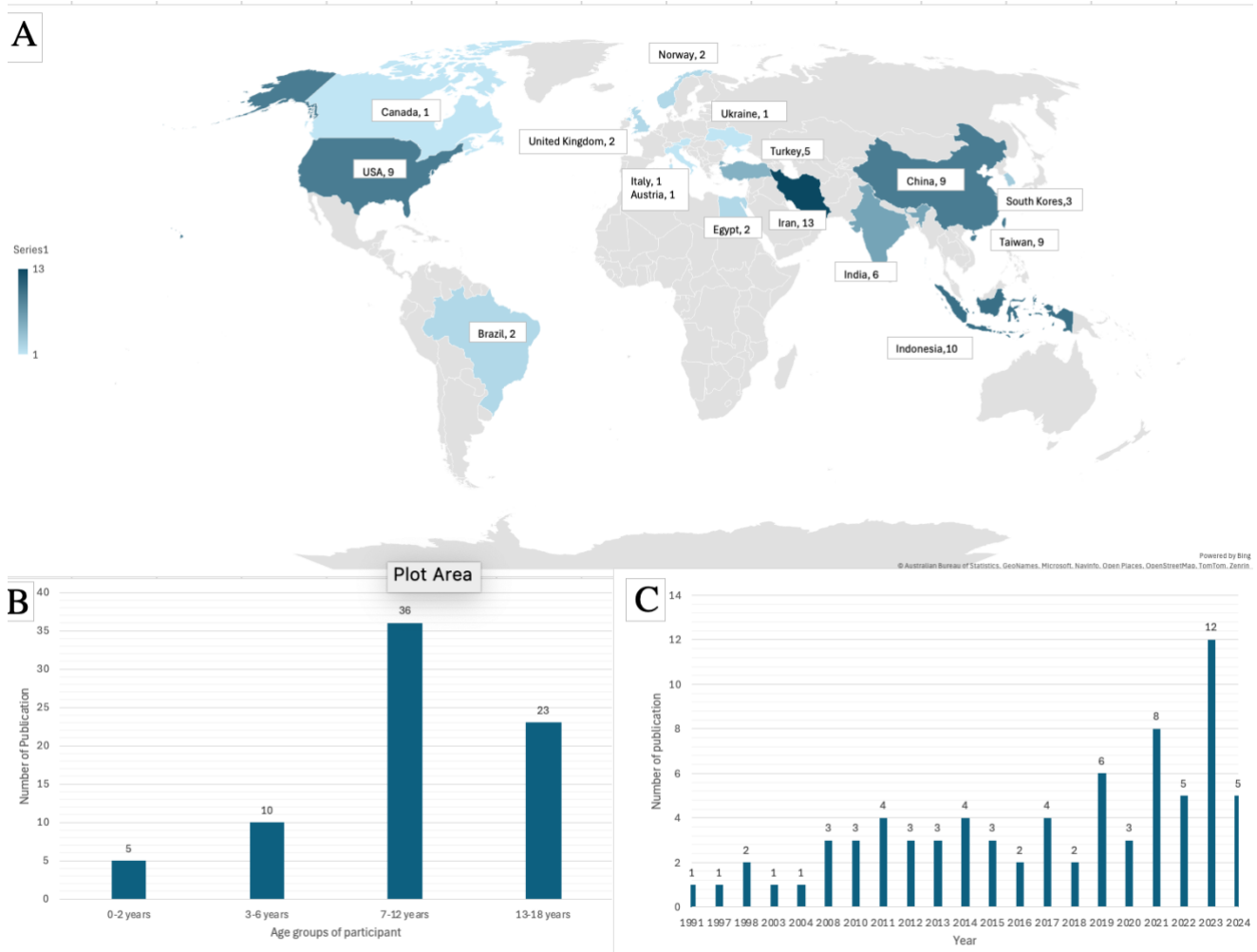


Figure 2 Summary characteristics of included studies. (A) Number of publications by country, (B) Number of publications by age group of participants, (C) Number of publications per year

Acupressure in children is performed in various conditions, including both sick and healthy children (Table 2), and performed not only by the clinical staff or acupuncturist but also by parents and patients themselves (Table 3). Besides that, as part of the scoping review, where critical appraisal is optional, we provided a summary of important characteristics such as research design, randomization procedures, number of participating sites, sample size, and comparison groups to provide a general knowledge of potential bias concerns (see Table 4).

The Benefits of Acupressure in Children

According to this review, acupressure has six significant benefits in children: pain relief, nausea and vomiting alleviation, anxiety relief, improved visual abilities, increased weight and height, and reduced fatigue. In addition, some minor benefits include improved sleep quality, respiratory function, reduced severity of attention deficit hyperactivity disorder (ADHD), and bed-wetting incidents (Figure 3). We created the map with the help of the X Mind application, which is a highly professional and popular tool for creating mind

maps. The map illustrates the benefits of acupressure in children and the acupressure points used.

Nausea and Vomiting Alleviation

Most of the studies indicate that acupressure is frequently used to treat nausea and vomiting in children. Various causes, such as chemotherapy (10 articles), surgery (8 articles), maxillary dental impressions (2 articles), and dysmenorrhea (1 article), can lead to nausea and vomiting. Ten studies measure nausea and vomiting in children with chronic conditions such as cancer and leukemia (Dupuis et al., 2016; Ghezlbash & Khosravi, 2017; Iriani & Vestabilivy, 2017; Jones et al., 2008; Rahmah & Alfiyanti, 2021; Rukayah et al., 2014; Srinatania & Carlina, 2023; Yuliar et al., 2019). Eight of the ten studies that measured nausea and vomiting produced significant results with a *p*-value of 0.001.

The neiguan point or pericardium 6 is the most commonly used acupressure point in children to relieve nausea and vomiting (Chate, 1997, 1998; Dupuis et al., 2016; Lewis et al., 1991) (Ali Reza Ebrahim et al., 2011; Altuntas & Dalgic, 2022; Basuony et al., 2022; Liodden et al., 2011; Norheim et al.,

2010; Pouy et al., 2022; Srinatania & Carlina, 2023; Yuliar et al., 2019). This Pericardium 6 or P6 point is located three fingers above the patient's wrist, between the two muscular protuberances visible when the hand is tightly gripped. Researchers manually pressed this point, and three studies using acupressure bracelets were conducted (Jones et al., 2008; Lewis et al., 1991; Liodden et al., 2011). This is an elastic bracelet that is worn around the wrist. A plastic bulge inside the bracelet will press on point P6. This bracelet is worn during chemotherapy or after surgery. Four of the 14 studies that used acupressure at point P6 failed to significantly reduce nausea and vomiting, specifically in children with maxillary

dental impressions (Chate, 1998) and leukemic children (Dupuis et al., 2016; Yuliar et al., 2019).

In addition to point P6, several articles on nausea and vomiting in leukemia patients emphasize point ST 36 or point Zusanli (Iriani & Vestabiliv, 2017; Rukayah et al., 2014; Srinatania & Carlina, 2023) or use point ST 36 only (Ghezlbash & Khosravi, 2017). The ST 36 point is on the foot, or more precisely on the anterior side of the lower leg, near the lower lateral edge of the patella. This point is emphasized for 3 minutes every 6 hours after chemotherapy for 24 hours. The findings of this study show that it can help reduce nausea and vomiting.

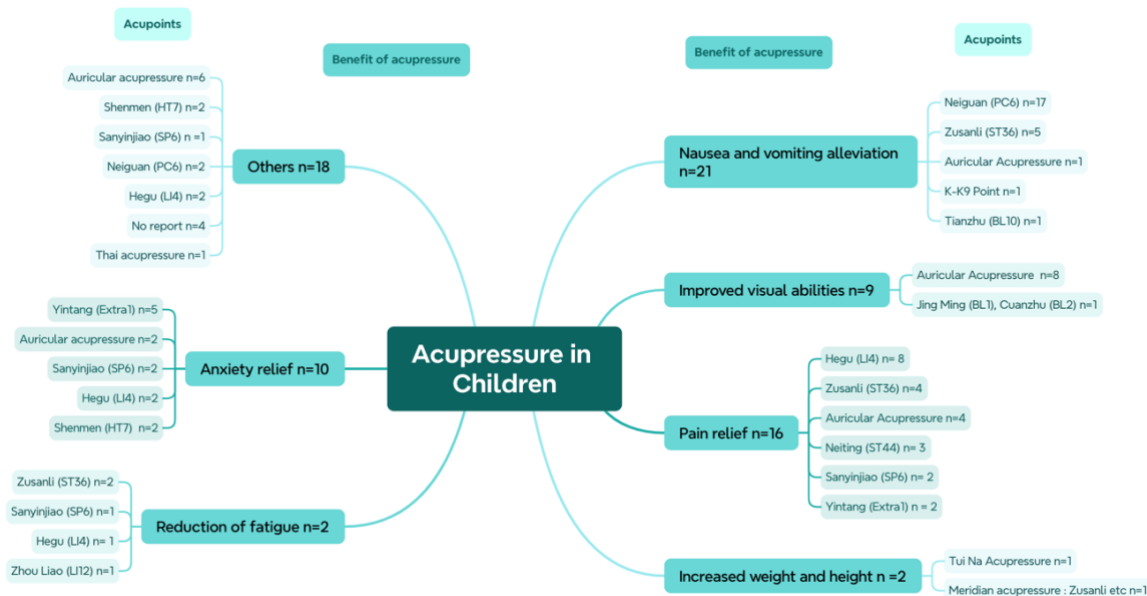


Figure 3 Mapping of acupressure in children by benefit and acupoint

This review also discovered the use of K-K9 points in children undergoing strabismus surgery. This point is precisely in the middle of the middle knuckles on each ring finger on both hands. In their study, the researchers used a small disc to press that firmly adhered to the K-K9 points with adhesive. This effort was carried out 30 minutes before anesthesia was administered and continued for the next 24 hours, and the results showed that acupressure at points K-K9 could reduce nausea and vomiting in children after strabismus surgery (Schlager et al., 2000). Besides K-K9, acupressure on BL 10 (Tianzhu), BL 11(Dazu) and GB 34 (Yanliquan) also significantly reduces vomiting after strabismus correction (Chu et al., 1998). Another study on patients with strabismus focused on reducing nausea and vomiting by emphasizing PC 6 points. The findings indicated it reduced patient nausea and vomiting (Nasrabadi et al., 2011).

Nausea and vomiting are also common in children undergoing or recently completed chemotherapy. Based on this, Yeh et al. (2013a) attempted to identify the use of auricular acupressure (ear acupressure) to reduce nausea and vomiting. Shenmen, sympathetic, cardia, stomach, and digestive subcortex points are pressed on the auricle. During the research, all children were instructed to press each acupoint for 3 minutes, three times per day for seven days (Yeh et al., 2013a). The research findings revealed that there was no notable distinction in the occurrence of nausea and vomiting among the treatment and control groups of children.

Pain Relief

In this review, pain in children that can be treated with acupressure includes pain associated with dysmenorrhea (5 articles), tonsillectomy (3 articles), venipunctures (4 articles), injection (2 articles), abdominal pain (1 article) and heel lancing on premature babies (1 article). Dysmenorrhea, or menstrual pain, is a common problem in adolescents and young adults (Yeh et al., 2013b). Reducing pain in adolescents who experience dysmenorrhea is done by doing auricular acupressure (Cha & Sok, 2016) and auricular acupressure combined with internet intervention (Yeh et al., 2013a). Six points are pressed in this auricular acupressure: shen men, kidney, liver, internal genitals, central rim, and endocrine. For the first two days of pain, pressure is applied for at least one minute, four times per day (Yeh et al., 2013a), whereas Cha and Sok (2016) use Jagung, Sinmun, Gyogam, and Naebunbi as acupoint for three days main period of dysmenorrhea.

Aside from ear acupressure, two studies on dysmenorrheal adolescents have used various acupressure points. The acupoint used is sanyijiao or SP6 (Chen & Chen, 2004) and zusanli (ST 36), hegu, and also hegu sanyaijiao (Chen & Chen, 2010). Sanjiyijiao point or SP 6 point is located on the tibia bone 4 fingers above the ankle. Meanwhile, he (LI 4) is located between the base of the thumb and forefinger, right in the muscle area. Pressure is done in 2 cycles for each leg; each cycle has a duration of 5 minutes, so the total time is 20 minutes. The thumb is used to apply pressure on SP6 for 6

seconds, followed by a release of pressure for 2 seconds. This cycle is repeated for 5 minutes on each leg, and the entire activity is repeated four times, resulting in a total activity time of 20 minutes.

Acupressure is also used to relieve pain in children undergoing tonsillectomy. The acupressure points used are LI 4 (Hegu), ST 44 (Neiting), and ST 36 (Zusanli). Neiting's point is located between the second and 3rd toes, in the distal indentation of the second metatarsophalangeal joint on skin color differences. The pressure is applied to each point for 2

minutes, each with a circular massage, so the total massage time is 12 minutes for the left and right legs. Time of pressure is 1 hour after surgery, 2-4 hours after surgery, and 6-8 hours after surgery (Pouy et al., 2022). Acupressure at these points can also reduce pain indicators such as reduced heart rate, respiratory rate, and oxygen saturation (Yaghibi & Pouy, 2019). Another article mentions the use of acupressure at point P6 for 1 minute at a time 1 hour after the tonsillectomy procedure (Pouy et al., 2018).

Table 2 The health condition of children in 76 included articles

Health Condition	N (%)	
Dental Problem	8 (10.5)	
Undergoing scaling		1 (12.5)
Maxillary dental impression		2 (25.0)
Dental procedures		5 (62.5)
Oncology Diseases	13 (17.1)	
Acute lymphoblastic leukemia		6 (46.2)
Cancer		6 (46.2)
Medulloblastoma		1 (7.6)
Visual Problem	13 (17.1)	
Myopia and pseudo myopia		4 (30.8)
Strabismus		4 (30.8)
Amblyopia		1 (7.7)
Visual Impairment		3 (23.0)
Computer vision syndrome		1 (7.7)
Psychological Problem	9 (11.8)	
ADHD		3 (33.3)
Insomnia		1 (11.1)
Autism		1 (11.1)
Obesity		1 (11.1)
Nocturnal Enuresis		2 (22.3)
Children with nail-biter		1 (11.1)
Children in Medical Procedures	14 (18.4)	
Tonsillectomy		7 (50.0)
Children with vein punctures		3 (21.6)
Children in endoscopic procedures		1 (7.1)
Post-surgery gastrointestinal		1 (7.1)
Pre inguinal hernia surgery		1 (7.1)
Injection of inferior alveolar nerve block		1 (7.1)
Neonates	4 (5.4)	
Premature		1 (25.0)
Neonates opioid withdrawal syndrome		2 (50.0)
Narcotic abstinent syndrome		1 (25.0)
Others	15 (19.7)	
Healthy children		3 (20.0)
Respiratory problem		2 (13.3)
Dysmenorrhea		6 (40.0)
Functional abdominal pain		1 (6.7)
Autonomic dysfunction syndrome		1 (6.7)
Appetite problem & weight issues		2 (13.3)
Total	76 (100)	

Apart from postoperative pain and dysmenorrhea, pain during venipuncture in children can also be reduced by acupressure (Daihimfar et al., 2024; Koç Özkan & Balci, 2020; Saeidi et al., 2023). Daihimfar et al. (2024) compared acupressure at the LI4 point or Hugo point for 5 minutes with music and the results showed that both were able to reduce pain intensity compared to the control group. Meanwhile, Koç Özkan and Balci (2020) conducted research on 90 children aged 9-12 years who would receive an infusion. Acupressure was applied to three points, LI 4, LI 11, and HT 7, for 30-40 seconds each for ten minutes. This action was carried out 10 minutes before inserting the needle. The Yintang (extra 1) and laogong (P 8) points are also used to relieve pain during needle insertion. Laogong is located on the surface of the palms, while Yintang is located between the brows on the

bridge of the nose. The pressure is applied for 20 seconds for 1 press and is repeated for 5 minutes. Following the completion of the acupressure, the needle is immediately inserted (Pour et al., 2017). In this article, the researchers compared acupressure with local anesthetics and a control group that did not receive any intervention. The results showed that the pain level in children who received local anesthesia and acupressure was lower than in children in the control group. The other study explains that acupressure at LI4 for 5 minutes before intravenous cannulation compared with virtual reality (VR) has the same significant effect in reducing pain (Saeidi et al., 2023).

Pain reduction due to acupressure also occurs in premature babies who will be taken for peripheral blood (heel lancing). Acupressure was performed at BL 60 (Kunlun) and K

3 points. Kunlun is in a depressed area between the midpoint of the lateral malleolus (external ankle bone) and the outer edge of the Achilles tendon. On the other hand, the K3 point (Taixi) is positioned just behind (posterior to) the inner ankle bone. In the group receiving acupressure, before the heel prick, a three-minute acupressure was administered at UB 60 and K 3 points. The findings indicate that the average duration

of the procedure and the average duration of crying were reduced in the acupressure group (with a P-value of 0.001) administer (Abbasoglu et al., 2015). Not different from this research, children who experience pain when injecting drugs for dental problems can also be reduced with acupressure at the hugo point (Pushpasanthy et al., 2023) and yintang point (Gurharikar et al., 2023).

Table 3 The acupressure provider* in the intervention

Acupressure Provider	N (%)	
Clinical Staff	40 (44.4)	
Nurses		15 (37.5)
Medical doctors (including surgeons and anesthesiologists)		5 (12.5)
Pediatric Dentist		2 (5.0)
Unspecified health care professional (including researcher)		17 (42.5)
Physiotherapist		1 (2.5)
Training Profession	13 (14.4)	
Auricular therapist		2 (15.4)
Acupuncturist/acupressurist		10 (76.9)
Traditional Chinese medicine (TCM) trainer		1 (7.7)
Other Profession	1 (1.2)	
Teacher		
Family Member	30 (33.3)	
Parents		16 (53.3)
Children (patient themselves)		14 (46.7)
Not Reported	6 (6.7)	
Total	90 (100)	

*More than one provider can be involved in one intervention

Anxiety Relief

Ten articles contain research that chooses anxiety as an outcome, specifically anxiety caused by dental procedure (Avisa et al., 2018; Sisodia et al., 2024; Wang et al., 2022), pre-tonsillectomy procedures (Borji et al., 2021), pre inguinal hernia surgery (Ebrahimsoltani et al., 2024), secondary dysmenorrhea (Chen & Chen, 2010), endoscopic (S.-M. Wang et al., 2008) and children who habitually bite their nails (Sun et al., 2019).

Anxiety is common in children who will be undergoing dental and surgical procedures. This article applies acupressure to children undergoing tonsillectomy and inguinal surgery at the yintang point (extra 1), which is located directly between the two brows. The thumb and forefinger apply deep pressure (deep massage) in a circular motion. The level of anxiety was measured after 15 minutes of action (Borji et al., 2021; Ebrahimsoltani et al., 2024). Acupressure to reduce anxiety also uses the yintang point, and shen men point, which are located at the apex of the triangular fossa of the ear (Wang et al., 2022).

Studies have explored the potential of acupressure in alleviating menstrual anxiety and distress along with its pain-relieving effects. The acupoint used in this article is the sanjiyiao or SP6 point, and pressure is applied for 5 minutes on each leg for 20 minutes. The findings indicate that acupressure can reduce anxiety in adolescents suffering from dysmenorrhea (Chen & Chen, 2004). One article uses the same points but with minor changes in other studies that measure anxiety. Hegu, Zusanli, and Hegu sanjiyiao are the points used. The findings indicate that emphasizing that point can reduce anxiety and distress in children with dysmenorrhea (Chen & Chen, 2010).

Reduced anxiety is also observed in children who bite their nails (Sun et al., 2019). Nail biting is a bad habit that frequently occurs when children are anxious. These habits can lead to

malocclusion, tooth abrasion, and nail bed loss. The magnetic seeds used in the study (manufactured by Suzhou Gusu Acupuncture & Moxibustion Appliance Co) were equipped with an adhesive backing. A highly experienced acupuncturist/acupressurist with over ten years of expertise applied these seeds by attaching them to the ears of the individuals who habitually bit their nails. After 7 days, the seeds were removed from one ear and replaced with five new seeds positioned on the same acupressure point on the opposite ear were stuck on the same points of the opposite ear. Under parental supervision, the participants pressed these acupressure points with the seeds three times a day, each time for 20 seconds.

Acupressure can also help children cope with anxiety during endoscopy procedures (Wang et al., 2008). The yintang or extra I point between the left and proper eyebrows is the acupressure point that is pressed. In this study, acupressure interventions were administered utilizing an acupressure bead called Acu-pellet, manufactured by Helio in San Jose, CA. The Accu-pellet was affixed to a self-adhesive tape to ensure its stability and provide a consistent pressure of 1.3 psi, as measured by a tonometer. This method uses a self-adhesive pressure bead to maintain continuous acupressure without requiring additional adjustment once the beads are in place.

Improved Visual Abilities

Several researchers attempted to use acupressure to treat problems that arise in children with visual impairments, such as myopia, pseudo myopia and amblyopia. Myopia is the inability of a person to see distant objects. This condition typically begins in elementary school and stabilizes in adolescence. Acupressure applied to the ear (ear acupressure) for 15 weeks can significantly improve visual acuity compared to children in the control group who received no intervention (Yeh et al., 2008). Furthermore, acupressure

was used in children with myopia, but only for one year, and the results for visual acuity were still significant (Yeh et al., 2012). The same happened in other studies using auricular acupressure in children with myopia. However, this study added 0.125% topical atropine, which showed reduced myopia development (Cheng & Hsieh, 2014). The researchers choose five acupoints for this study: Shen men, Xin, Mu1, Mu2, and Yan. In studies using auricular acupressure at seven acupoints combined with a 0.01% atropine drop, myopia development in children was also significantly reduced (Kong et al., 2021). Auricular acupressure can also be combined with several interventions that have proven useful for improving visual abilities, such as acupuncture (Zhu et al., 2023) or electroacupuncture (Han et al., 2022).

Amblyopia is a developmental brain condition characterized by aberrant visual input early in life, resulting in reduced vision in an otherwise physically normal eye. Amblyopia is the most common cause of monocular vision impairment in children and adults, accounting for 2-3% of cases (Wu et al., 2023). Auricular acupressure was performed at seven points in this study: Yan (Eye), Gan (Liver), Shen (Kidney), Xin (Heart), Mu 1 (Eye-1), Mu 2 (Eye-2), and Pi (Spleen) for six months and was shown to improve visual acuity compared to control patients who only used herbs (Han & Qiu, 2015).

Other researchers used acupressure at points BL2, EXHN-4, EXHN-5, BL1, SJ 3, and ST1 to reduce computer vision syndrome symptoms such as dry eyes, eye stiffness, and blurred vision (Harahap et al., 2023).

Table 4 Characteristics of study design and comparator group according to the benefit of acupressure

Study Characteristics	Benefits						
	Nausea & Vomiting Alleviation	Pain Relief	Anxiety Relief	Improved Visual Abilities	Reduction of Fatigue	Increasing Weight & Height	Other
Sample Size	1297	1519	796	831	136	269	893
Number of Studies, N (%)	21 (100%)	16 (100%)	10 (100%)	9 (100%)	2 (100%)	2 (100%)	18 (100%)
Study Design							
Randomized controlled trial, n (%)	13 (61.9%)	12(75.0%)	8(80.0%)	5 (55.5%)	1 (50.0%)	0 (0.0%)	8 (44.4%)
Quasi-randomized clinical studies, n (%)	3 (14.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Quasi-non randomized clinical studies, n (%)	2 (9.5%)	4(25.0%)	2 (20%)	3 (33.3%)	0 (0.0%)	2 (100%)	3 (16.7%)
Quasi with no comparator, n (%)	2 (9.5%)	0 (0.0%)	0 (0.0%)	1 (11.2%)	1 (50.0%)	0 (0.0%)	4 (22.2%)
Other study designs, n (%)*	1 (4.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (16.7%)
Comparator Group							
Standard care, n (%)	6 (28.6%)	3 (18.7%)	1 (10.0%)	0 (0.0%)	0 (0.0%)	1 (50.0%)	4 (22.2%)
Sham acupressure, n (%)	9 (42.8%)	5 (31.3%)	6 (60.0%)	3 (33.3%)	1 (50.0%)	0 (0.0%)	3 (16.7%)
Non- acupressure, n (%)	2 (9.5%)	4 (25.0%)	0 (0.0%)	2 (22.2%)	0 (0.0%)	0 (0.0%)	3 (16.7%)
No intervention, n (%)	1 (4.8%)	3 (18.7%)	3 (30.0%)	3 (33.3%)	0 (0.0%)	1 (50.0%)	1 (5.6%)
No comparator, n (%)	3 (14.3%)	0 (0.0%)	0 (0.0%)	1 (11.2%)	1 (50.0%)	0 (0.0%)	7 (38.8%)
Healthy control, n (%)	0(0.0%)	1 (6.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

*Case study and case report

Reduction of Fatigue

Fatigue is a common issue in children with cancer. According to the findings of this review, two research articles show that acupressure in children can be used to reduce fatigue with a p-value of 0.001 (Bastani et al., 2015; Oktaghina, 2022). The ST 36 point was used as the acupoint in both studies' acupressure interventions. On the second day of chemotherapy, emphasis was applied for 3 minutes (Bastani et al., 2015), while in Oktaghina (2022), in addition to the ST 36 point, the LI 4 and SP 6 points are emphasized, and this is done twice a day for five days. Stimulation at these points can increase the flow of "chi" and release neurotransmitters and neurohormones, reducing children's perception of fatigue (Bastani et al., 2015)

Improving the Weight and Height

The last benefit of acupressure for children is its ability to increase body weight and height, especially in babies aged 6 weeks (Chou et al., 2022) and children aged between 24 months and 59 months with Tui na massage (Suharsanto et al., 2023). The acupressure points used in the research were points on the main meridian line, namely 28 acupoints (K-1, B-

40, B-57, SP-10, Neaslan, S-36, B-2, L-20, GV -20, G-20, CV-22, CV-17, CV-12, S-25, CV-4, G-21, L-15, TE-14, H-3, L-11, P-6, TE-5, L-4, P-8, P-7, SI-3 and G-30) which are done for 15 minutes 2 times a day for 6 weeks. Meanwhile, Tui na acupressure is a type of acupressure that is also done on the line with certain meridians; it is carried out once a day for 1 month by the parents who have been given training.

Others

Despite the few articles in this review, some discuss acupressure in children to alleviate other problems. The result is that it improves respiratory function (Alsac & Polat, 2019), decreases bed-wetting incidents and enuresis (Lestariningsih & Wijayanti, 2022), increases mouth opening in triskus patients (Ferreira et al., 2014), decreases the severity of ADHD (Mahdavi et al., 2024), and increases the tolerance of autistic children (Warren et al., 2017). However, acupressure was not significantly able to reduce the length of stay in neonates with narcotic abstinence syndrome (NAS) (Schwartz et al., 2011).

Discussion

Acupressure developed in ancient China. It demonstrated superior therapeutic potential against a wide range of disease conditions. According to traditional Chinese medicine (TCM), Acupressure uses pressure to stimulate specific acupoints for therapeutic purposes. Stimulating these points can correct chi imbalances through channels and thus treat diseases field (Mehta et al., 2017). As previously stated, acupressure is especially beneficial in children for reducing pain, nausea, vomiting, and fatigue, improving visual abilities, and reducing anxiety. In this case, acupressure is beneficial not only for physical problems but also for overcoming psychological problems.

The first advantage of acupressure in children is that it relieves nausea and vomiting. According to the findings of this search, the neiguan point (P6), when combined with the zusanli point (ST36), is intended to reduce nausea and vomiting in children with cancer or leukemia. In more detail, the pressure area at point P6 is three fingers above the patient's wrist, between the two muscular protuberances visible when gripping the hand tightly. In contrast, the pressure area at point ST 36 is three B-cun inferior to point ST35 (lower edge of the patella laterally) and is in the gastric tract. The stomach meridian begins at the end of the large intestine meridian, which has several branches, one of which enters the spleen and stomach. Because they improve the flow of energy originating from the spleen and stomach, points P6 and ST36 can reduce nausea and vomiting in pediatric patients undergoing chemotherapy (Shiro et al., 2014). This will strengthen the digestive tract cells against chemotherapy, reducing the stimulation of nausea and vomiting to the vomiting center. Emphasis on points P6 and ST36 can also stimulate pituitary beta-endorphin release. Endorphin beta cells are natural antiemetics that can reduce nausea and vomiting impulses in the Chemoreceptor Trigger Zone (CTZ) and vomiting center (Khakpour et al., 2019). Dibble et al. (2007) also stated that putting pressure on points P6 and ST36 can help improve the flow of "chi" energy in the stomach, reducing nausea and vomiting.

Aside from nausea and vomiting, the second advantage of acupressure in children is pain relief. This is also consistent with the findings of another acupressure review, which explains that acupressure can be used to reduce pain, particularly pain caused by dysmenorrhea, labor pain, low back pain, chronic headache, and other traumatic pain (Chen & Wang, 2014). The mechanism of pain relief caused by acupressure is consistent with the gateway theory. Based on Melzack and Wall's Gate Control Theory, applying acupressure on specific points triggers pleasurable signals to the brain, which are transmitted four times faster than painful stimuli. The Continuous transmission of these signals effectively closes the neural 'GATES,' blocking slower pain messages from reaching the brain, thereby improving or strengthening the body's pain perception threshold (Mehta et al., 2017).

Concerning the third benefit of acupressure, namely fatigue reduction, the findings of this review show that acupressure can alleviate most of the fatigue experienced by pediatric cancer patients receiving chemotherapy. This is consistent with a review of 15 research articles on fatigue in

cancer patients conducted in China (cancer-related fatigue). Based on the results of this systematic review, the application of acupressure on specific body acupoints such as Hegu (LI4), Zusanli (ST36), and Sanyinjiao (SP6) for 1-3 minutes per acupoint, as well as on auricular acupoints shenmen and subcortex, for 3 minutes each, has been shown to reduce cancer-related fatigue effectively (Chou et al., 2022). Stimulation at these points can increase the flow of "chi" and release neurotransmitters and neurohormones, reducing children's perception of fatigue (Bastani et al., 2015). Pediatric cancer patients frequently experience cancer-related fatigue (CRF), which is recognized as the most prevalent symptom in this population, affecting 36% to 93% of cases, with a higher level of fatigue among chemotherapy patients, affecting 70% to 100% of cases (Silva et al., 2016). CRF pathogenesis is not fully understood, and multiple mechanisms can play a role in its development. Among these mechanisms, certain factors emerge prominently. These include the dysregulation of pro-inflammatory and anti-inflammatory cytokine levels, activity in the hypothalamic axis, monoamine system functioning, circadian rhythm disturbances, and changes in adenosine triphosphate levels and muscle energy metabolism (Saligan et al., 2015).

The fourth advantage of acupressure in children is that it can improve visual abilities, particularly in children with myopia. Previous reviews have provided additional support for this review by highlighting that auricular acupressure alone demonstrated superior effectiveness compared to eye drops, eye exercises, and needle acupuncture. These reviews also concluded that auricular acupressure might be beneficial in slowing down the progression of myopia in children and adolescents (Gao et al., 2020). According to the theory of TCM, myopia is primarily attributed to an imbalance in the functioning of the heart, liver, spleen, and kidney. This imbalance leads to a deficiency in the transformation of source energy into essence and chi, resulting in insufficient nourishment reaching the eyes and compromising their physiological function. TCM theory suggests that since the liver and kidney share a common origin, the acupoints corresponding to the liver (CO12) and kidney (CO10) can regulate and strengthen these organs. This approach helps nourish yin, supplement essence, maintain healthy blood circulation, and enhance visual clarity.

Similarly, the heart (CO15) acupoint can be used to adjust heart chi and promote mental tranquility, complementing the effect of other acupoints in regulating and reinforcing the organs, nourishing yin, supplementing essence, and benefiting the eyes. Additionally, the shenmen (TF4) acupoint functions to calm the mind, making it suitable with the liver (CO12), kidney (CO10), heart (CO15), and spleen (CO13) acupoint to strengthen the mental aspect further. Collectively, these acupoints work in synergy to regulate the internal organs, promote blood circulation, and clear obstructions in the meridians, facilitating the optimal nourishment of chi and blood to improve vision (Han et al., 2021).

Another advantage of acupressure in children is that it reduces anxiety. According to this review, acupressure can reduce anxiety in children undergoing tonsillectomy and endoscopy, scaling procedures, dysmenorrhea, veinpuncture and nail biting. Several recent studies have reached the same conclusion as this review. A pilot study for RCT was conducted

on 14 children aged 7 to 10 years who experienced anxiety during dental procedures. The findings indicate that children's anxiety levels have decreased following the procedure (Kumar et al., 2021). Anxiety is common in children as they prepare to perform the treatment. The fundamental principle of traditional Chinese medicine revolves around vital energy (chi) circulating unidirectionally through a complex network of channels called meridians, which are located beneath the skin and within blood vessels. It permeates organs and tissues and is the foundation for all physiological processes. Optimal health is achieved through the harmonious and uninterrupted flow of chi, while disease arises when this flow is disrupted. Various factors, including emotional states (such as anxiety, stress, anger, fear, or grief), inadequate nutrition, weather conditions, hereditary factors, infections, and trauma, can all influence the flow of chi. Acupuncturists employ needle insertion to restore balance, balancing Yin and Yang's opposing and dynamic qualities in an individual's physical, emotional, and spiritual aspects and enhancing energy flow and balance. The primary mechanisms behind the effects of acupuncture and acupressure involve stimulating the nervous system, altering the processing of pain signals, and triggering the release of natural pain-relieving substances like serotonin and endorphins (Kumar et al., 2021).

Our review also revealed evidence of other benefits of acupressure, such as boosting body weight and height in children under five. Acupressure meridian massage and Tui na are the acupressure techniques employed. Tui Na Acupressure is a massage technique in which the hands apply pressure to meridian points to relieve symptoms, cure disease, or restore the patient's health. Tui Na acupressure is a completely hand-based therapeutic method that does not involve sedation or anesthesia. The acupressure spots will be pushed with more power to relieve blockages and promote blood flow so that it flows easily (Ikhsan, 2019). The findings of one study on the efficiency of Tui Na Acupressure revealed that by focusing on meridian sites, the acupressure technique can help children with feeding issues by boosting blood circulation in the spleen and digestive tract (Munjidah, 2018). Physiologically, tactile stimulation by massage can impact brain wave systems, particularly the hypothalamus, which is the key and core of the response to hunger and appetite. The hypothalamus will also generate hormones, including the hormone that regulates hunger, called ghrelin (Barakat et al., 2024). In addition to this explanation, acupressure performed on the stomach meridian, such as Zusanli (ST 36), will stimulate gastric emptying, which is responsible for serotonergic pathways. Serotonin pathways are thought to be involved in the regulation of mood, feeding behavior, sleep/wakefulness, control of sensory pathways including nociception, control of body temperature, vomiting, and emotional behaviors such as aggression (Cho et al., 2012).

This review's findings underline that acupressure has multiple advantages and may be used on various acupoints. It can be carried out by healthcare workers such as nurses and physicians, trained people, family members, and even professionals from other professions, such as teachers. Acupressure may be used on children with a variety of problems, whether they are well or sick, making it a versatile, non-invasive alternative for dealing with both physical and psychological concerns. In pediatric nursing, nurses might use

acupressure as a supplemental solution when children arrive with various diseases. This study adds new information by identifying particular acupoints and the range of acupressure therapists to deliver this therapy. Unlike traditional needle-based acupuncture, acupressure involves applying pressure to certain areas with fingers or a hard-pointed device, which provides similar benefits but is easier to administer and does not require specialist training (Kumar et al., 2021). Furthermore, this review expands the understanding of acupressure beyond pain management, showing its efficacy in treating nausea, vomiting, fatigue, and anxiety. Previous studies primarily focused on its use for pain relief (Chen & Wang, 2014) and managing myopia (Gao et al., 2020). Based on these findings, nurses can incorporate acupressure into their care plans for children with specific health issues.

Limitations

We only reviewed articles in English and Indonesian and did not include gray literature or review references. We might exclude important studies from the review.

Conclusion

Finally, acupressure can help children with pain, nausea, vomiting, fatigue, and anxiety, improve visual function, and increase the weight and height of children under five years. Acupressure has several advantages over acupuncture, including the fact that it does not cause pain or trauma to children and does not require special training to perform. As a result, acupressure has many benefits for children with various conditions, so nurses can use acupressure as a complementary nursing intervention for sick children.

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Authors' Contributions

SR and ATI conducted the literature search, screening, and data synthesis. MNS and FH supervised the project. SR prepared the initial draft. ATI conceived and wrote the review. All authors reviewed and substantially contributed to the final version of the manuscript.

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Data Availability

The data that support the findings of this study on acupressure for children are available from the corresponding author upon reasonable request.

Declaration of Use of AI in Scientific Writing

There is nothing to declare.

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