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NON-PHARMACOLOGICAL THERAPY TO REDUCE CHILDREN'S FEAR OF INVASIVE PROCEDURES: SCOPING REVIEW

Terapi Non-Farmakologis untuk Mengurangi Ketakutan Anak-Anak terhadap Prosedur Invasif: Scoping Review

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ABSTRAK

Prosedur invasif seperti kateterisasi intravena, injeksi intramuskular, dan pengambilan sampel darah sering kali menimbulkan rasa takut dan nyeri pada anak-anak, sehingga berdampak negatif pada pengalaman mereka dan memicu fobia jarum. Oleh karena itu, intervensi non-farmakologis seperti teknik distraksi dianggap efektif untuk mengurangi rasa takut dan nyeri selama prosedur tersebut. Ulasan ini bertujuan untuk mengidentifikasi dan menganalisis berbagai teknik distraksi non-farmakologis yang efektif dalam mengurangi rasa takut anak selama prosedur invasif di rumah sakit. Tinjauan cakupan ini dilakukan dengan mengikuti kerangka kerja PRISMA-ScR. Pencarian literatur dilakukan di database PubMed, ScienceDirect, Scopus, EBSCO-host, dan Google Scholar dengan menggunakan kata kunci yang relevan. Artikel yang memenuhi kriteria inklusi (RCT dan studi kuasi-eksperimental, diterbitkan antara tahun 2020 dan 2025, dalam bahasa Inggris) dinilai kualitasnya dengan menggunakan alat JBI. Data diekstraksi dan dianalisis secara tematik. Dari 1.620 artikel, 15 penelitian memenuhi kriteria inklusi. Teknik distraksi dikategorikan menjadi dua kelompok: (1) distraksi pasif (misalnya, Buzzy, mendengarkan musik, menonton kartun, virtual reality) dan (2) distraksi aktif (misalnya, TICK-B, meniup balon, berinteraksi dengan hewan, permainan drama). Kedua teknik tersebut terbukti efektif dalam mengurangi rasa takut, nyeri, dan kecemasan anak, dengan Buzzy dan TICK-B sebagai intervensi yang paling sering digunakan. Teknik distraksi aktif dan pasif sama efektifnya dalam mengurangi rasa takut anak selama prosedur invasif. Temuan ini memberikan panduan bagi para profesional kesehatan dalam memilih intervensi yang sesuai dengan kebutuhan anak dan konteks klinis. Penelitian lebih lanjut diperlukan untuk mengeksplorasi keefektifan teknik-teknik ini di berbagai kelompok usia dan wilayah geografis.

***Kata kunci**: Anak (usia 4-12 tahun), distraksi, rasa takut, prosedur invasif, terapi non-farmakologis*

ABSTRACT

Invasive procedures, such as intravenous catheterization, intramuscular injection, and blood sampling, often induce fear and pain in children, thus negatively impacting their experience and triggering needle phobia. Therefore, non-pharmacological interventions, such as distraction techniques, are considered effective in reducing fear and pain during such procedures. This review aims to identify and analyze various effective non-pharmacological distraction techniques for reducing children's fear during invasive procedures in hospitals. This scoping review was conducted according to the PRISMA-ScR framework. Literature searches were conducted in the PubMed, ScienceDirect, Scopus, EBSCO-host, and Google Scholar databases using the relevant keywords. Articles meeting the inclusion criteria (RCTs and quasi-experimental studies, published between 2020 and 2025, in English) were assessed for quality using the JBI tool. Data were extracted and analyzed thematically. Of the 1,620 articles, 15 studies met the

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inclusion criteria. Distraction techniques were categorized into two groups: (1) passive distraction (e.g., Buzzy, listening to music, watching cartoons, and virtual reality) and (2) active distraction (e.g., TICK-B, blowing balloons, interacting with animals, and drama games). Both techniques were effective in reducing children's fear, pain, and anxiety, with Buzzy and TICK-B being the most commonly used interventions. Both active and passive distraction techniques are equally effective in reducing children's fear of invasive procedures. These findings provide guidance for healthcare professionals in selecting interventions appropriate to a child's needs and clinical context. Further research is needed to explore the effectiveness of these techniques in different age groups and geographical regions.

Keywords: Children (4-12 years old), distraction, fear, invasive procedures, non-pharmacological therapy

INTRODUCTION

Health decline in children ages 4-12 years may result in hospitalization, usually for invasive procedures. However, healthy children ages 4-12 years may also require invasive procedures for prevention or promotion. These include IV insertions, intramuscular injections, immunizations/vaccinations, and blood draws. In children, such invasive procedures are a major source of pain.[1] The use of invasive procedures, usually involving needles, can cause fear and pain in children.[2] The negative impact, if the child's fear is not handled properly, will result in unwanted painful experiences and a phobia of needles in subsequent invasive procedures.[3]

Fear is a normal emotion that individuals experience as a self-defense response to the threat of danger.[4] Research reveals that 73.7% of children admitted to hospital experience very high levels of fear.[5] In children, fear is more intense than in adults because of their active imagination about painful things.[6] Symptoms of fear in children include aggressive behavior, panic, escape attempts, crying, and screaming. Hospitalization can have negative effects on children, such as difficulty eating, restlessness, anxiety, and resistance to medical treatment, which can hinder the healing process [7]

Nurses as providers of nursing care in hospitals are responsible for reducing the negative effects of invasive procedures.[1] Non-pharmacological interventions from the philosophy of atraumatic care, such as distraction methods, are needed to reduce medical fears in children.[8] In addition, there is play therapy so that children are able to express their feelings and reduce their fear.[9] Florence Nightingale, a pioneer of modern nursing, mentioned the importance of play for children's well-being even when the child was in the hospital.[10] Several previous studies have concluded that interventions using play therapy, distraction techniques such as buzzy, virtual reality, toys, and picture books can significantly reduce children's fear of hospitalization. [11]

Based on the results of a literature search, there has been little discussion of the non-pharmacological management of children's fear during invasive procedures. Previous reviews that addressed children's fear focused solely on dental care.[12] Thus, this study examines non-pharmacological interventions to reduce children's fear of invasive procedures, providing guidance. This comprehensive guideline provides health workers and policymakers with an effective approach for selecting effective methods. These findings are crucial for developing appropriate health education programs to improve children’s well-being.

METHODS

Design

This study used a scoping review design to explore a rapidly evolving topic, following a five-step framework of formulating questions, identifying literature, selecting studies, extracting data, and reporting results.[12, 13]This

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review applied PRISMA-ScR to identify effective non-pharmacological therapies for reducing children's fear of invasive procedures, as per the PRISMA-ScR guidelines. This review was conducted in accordance with the PRISMA-ScR guidelines (Figure 1).

Eligibility Criteria

The articles selected for this review were based on the PRISMA Extension Guidelines for Scoping Reviews (PRISMA-ScR). The research questions and eligibility criteria for the research articles used the Population, Concept, Context (PCC) approach.

- P (Population): Children undergoing invasive procedures
- C (Concept): Non-pharmacological therapy
- C (Context): Fear, hospital

Articles that were not fully accessible, secondary studies, and non-English articles were excluded. Inclusion criteria for this review included articles published in English, using an experimental design (test

The criteria for invasive actions in this review were intravenous infusion, blood draw, phlebotomy, IM injection, and vaccination.

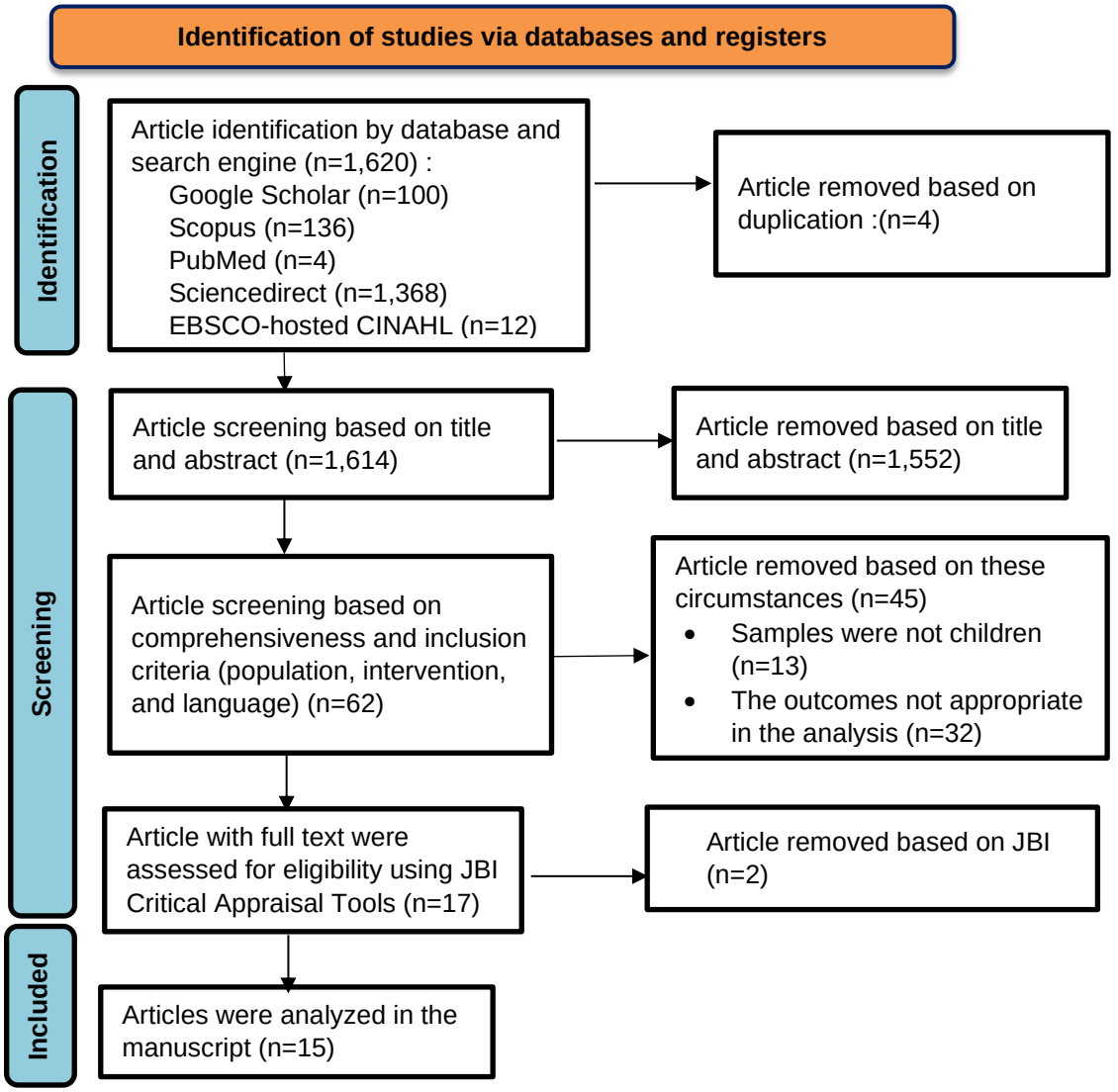

Figure 1. Flowchart of the Article Selection Process According to the PRISMA Statement
Note: Adapted from Page MJ, McKenzie JE, Bossuyt PM, et al. PRISMA Statement 2020: Updated Guidelines for Reporting Systematic Reviews. BMJ. 2021;372:n71. Creative Commons License[14]

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Data Collection and Analysis
Search Strategy

Article searches were conducted in PubMed, ScienceDirect, Scopus, EBSCO-host, and Google Scholar using Boolean operators ("AND"/"OR") with keywords such as "children," "invasive procedures," "therapy," and "fear." The terms were confirmed using MeSH and expanded with synonyms to ensure coverage of the relevant literature.

Study Selection and Quality Assessment

Researchers conducted a rigorous study-selection process. First, duplications were identified and removed using Mendeley in the initial stage. Next, titles, abstracts, and full texts were reviewed to assess relevance to the research subject and to apply inclusion/exclusion criteria. Eligible studies were then assessed for quality using the Joanna Briggs Institute (JBI) critical appraisal tool tailored to the study design (13 questions for RCTs and 1 for quasi-experimental studies). Each question was scored as follows: yes (score 1), No, Not Applicable, or Unclear (all scores 0). Only studies that achieved a total JBI score of at least 75% were selected as the final articles for this study. The articles listed in Table 1 were selected as the final articles for this study.

Data Extraction and Data Analysis

Experimental data analysis (RCT and quasi-experimental) was conducted thematically and descriptively, including tabulated study characteristics. The focus was on non-pharmacological interventions to reduce children's fear during invasive procedures, which were divided into: (1) active distraction (e.g., drawing, playing music) and (2) passive distraction (e.g., music, virtual reality). Strict verification was performed for data accuracy (Table 1 & Table 2). Article Selection

The initial search yielded 1,620 articles, and selection based on the title and abstract resulted in 1,614 articles. After rigorous screening, 62 articles were reviewed in full text, and 45 were excluded (due to population/outcome discrepancies), leaving 15 articles for the final analysis. Quality assessment using the JBI tool indicated that most studies were of high quality (scores >75%). Ultimately, 15 studies were included in the review, with the selection process shown in the PRISMA diagram (Figure 1).

Characteristics of the article

The review included 16 studies (15 RCTs, 1 quasi-experimental) on children undergoing invasive procedures, mostly from Asia (Turkey=12, Iraq=2, India=1). The total number of participants was 1,554 (IG=961, CG=563), mostly preschool to school age. Most RCTs did not specify blinding, whereas the quasi-experimental studies did not conduct follow-up.

RESULT

Intervention Method

There are two categories of interventions performed in the hospitals. The table shows that the most frequently used medium is a buzzer device used 15-30 seconds before and during an invasive procedure. However, two studies did not specify the timing of the intervention.[19,17] Two articles mention that the buzzy device used was shaped like a bee.[24.26] In this review, the authors categorized 24 interventions into two categories: active and passive distraction techniques.

Passive Diversion Technique

Buzzy is the most widely used passive distraction device, using cold compresses and vibrations to reduce pain and anxiety during invasive procedures. The device is placed 5 cm above the puncture site 15-30 seconds before the procedure and remains in place throughout.[24]

Meanwhile, active distraction techniques include finger pressure (30 seconds of thumb pressure pre-injection) and the Helfer technique (stimulation of muscle fibers through rhythmic "V" tapping before injection), both of which are

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effective in relaxing muscles during intramuscular procedures.[17,19]

Listening to music is an auditory distraction technique. The songs are chosen based on the children's preferences, and they are encouraged to listen to music from the beginning of the cannulation/infusion procedure until the procedure is complete.[20] In Goktas and Avci's study, they found that children listened to their chosen song for about three minutes before and after an invasive procedure (deltoid vaccination, venipuncture/phlebotomy) was performed until the song finished.[16]

Effective visual distractions included cartoons (before and after the procedure) and a kaleidoscope (3 min before, during, and after the procedure). Other techniques include hand puppets (requires a trained therapist) and virtual reality with audiovisual stimulation (3 minutes before and after the procedure), creating an immersive experience to reduce the child's anxiety.[6,11,16,10]

Table 1. Research Characteristics

Author, Year, and Title	JBI Critical Appraisal Tool	Design	Sampling and Testing Techniques	Results
(Uzsen et al., 2024). The effects of vibration and pressure interventions on children's pain, fear and anxiety: A randomized controlled trial[3]	11/13 (84%)	RCT	Random sampling. 114 children aged 5-10 years. VIG = (n=38), PIG (n=38), CG (n=38)	Significant differences in pain scores in VIG, PIG, and CG during the procedure ($p < 0.000$). Anxiety and fear scores between VIG, PIG, and CG pre and post intervention ($p = < 0.000$)
(Suleman et al., 2023). Comparison of Trace Image Colors for Kids-Book With Two Active Distractions in Reducing Pain and Fear of Children During the Venipuncture Procedure[4]	12/13 (92%)	RCT	Stratified random sampling. 160 children aged 6-12 years. TBG (n=40), BIG (n=40), CTG (n=40), CG (n=40)	Results showed significant differences in pain and fear during and after the procedure (p=0.001). The TICK-B group consistently had the lowest scores (p=0.001), with a significant difference in fear (p=0.001-0.015).
(Benazeera et al., 2024). Play Intervention Applied to Hospitalized Children: Effects on Anxiety and Medical Fear[5]	8/9 (88.8%)	Quasi-experiment	Convenience sampling (non-random). 60 children aged 6-12 years PIG (n=30) CG (n=30)	A 3-day play intervention effectively reduced children's procedural anxiety ($p<0.001$), especially for IV insertion/blood draw, with a strong correlation between anxiety and fear ($r=0.48$, $p<0.001$).
(Suleman et al., 2024) Comparing the use of colored Trace Images in Kids' Books with passive distractions to decrease pain and fear during cannulation in children: A randomized clinical trial.[6]	13/13 (100%)	RCT	Block randomization. 176 children aged 6-12 years. MLG (n=40) CWG (n= 41) TICK-B (n= 42) CG (n= 44)	All interventions (TICK-B, MLG, CWG) significantly reduced pain and fear compared to control. TICK-B was most effective: pain=-4.65, fear=-4.10 (cannulation) and pain=-4.10, fear=-1.89 (post). MLG and CWG had limited effects.
(Koç & Alemdar, 2024). Effect of a musical toy used during peripheral venous access on children's pain, fear and parental satisfaction: Randomized controlled trial21	12/13 (92%)	RCT	Simple random sampling. 70 children aged 3-6 years. MTG (n=35), CG (n=35)	The MTG group showed lower CEMS and CFS scores ($p<0.05$), but no significant difference in pain compared to the CG ($p>0.05$). Patient-nurse cooperation was also better in the MTG ($p<0.05$).
(Girgin & Göl, 2020). Reducing Pain and Fear in Children During Venipuncture: A Randomized Controlled Study[8]	10/13 (77%)	RCT	Cluster randomization. 120 children aged 7-12 years. BSG (n=30), BIG (n=30), COG (n=30), CG (n=30)	BSG, BIG, and COG all reduced post-procedure pain and fear (p=0.001), with no significant differences between groups, although COG achieved the lowest scores.

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(Sarman & Tuncay, 2024). Goldfish or aquatic turtle? Impact of two animal assisted interventions on children's pain, anxiety, and fear during IV catheterization: A randomized controlled trial[9]	11/13 (84%)	RCT	Random sampling. 98 children aged 5-6 years. GG (n= 32), ATG (n= 33), CG (n= 32)	GG & ATG showed lower pain, anxiety, and fear scores vs CG ($p<0.05$) during catheterization, with similar initial scores but lowest final outcomes.
(Yaz et al., 2024). The effect of vibrating cold application and puppet use on pain and fear during phlebotomy in children: A randomized controlled study[10]	11/13 (84%)	RCT	Consecutive sampling. 105 children aged 3-6 years BG (n=35), PG (n=35), CG (n=35)	Significant differences between BG, PG, and CG ($p<0.05$). Pain scores were lower in BG compared to CG and PG. Fear scores were lower in BG and PG ($p<0.05$).
(Ugucu et al., 2022). Effects of cartoon watching and bubble-blowing during venipuncture on pain, fear, and anxiety in children aged 6–8 years: A randomized experimental study[11]	11/13 (84%)	RCT	Purposive sampling. 49 children aged 6-8 years, requiring venipuncture. BG (n=25), CG (n=24)	The levels of pain, anxiety, and fear experienced during the procedure were significantly lower in the control group (CG) compared to the group (BG) ($p=0.013$, $p=0.023$, $p=0.008$).
(Sapçi et al., 2021). Effects of applying external cold and vibration to children during vaccination on pain, fear and anxiety[12]	11/13 (84%)	RCT	Systematic random sampling. 90 elementary school children. EG (n=45), CG (n=45)	EG and CG differed significantly in children's pain & anxiety and nurses' pain & fear ($p<0.05$), but not in children's fear ($p>0.05$).
(Kurt et al., 2024). Effect of the Helfer skin tap technique on pain, anxiety, and fear in children undergoing intramuscular injection: An open-label randomized controlled study[24]	11/13 (84%)	RCT	Random sampling. 64 children aged 4-10 years, IM injection. HG (n=32), CG (n=32)	After IM injection, the treatment group (HG) showed lower levels of pain, anxiety, and fear compared to the control group (CG) ($p<0.001$).
(Turgut & Türkmen, 2023). The effect of lighted toy on reducing pain and fear during blood collection in children between 3 and 6 years: A randomized control trial[13]	11/13 (84%)	RCT	Convenience sampling. 116 children aged 3-6 years. EG (n=58), CG (n=58)	The pain level in the experimental group (EG) was lower than the control group (CG) ($p<0.05$). The difference between EG and CG ($p<0.05$)
(Tuncay & Sarman, 2024). Ventriloquist intervention prepared with drama technique in reducing pain, anxiety and fear in children during invasive procedures[14]	12/13 (92%)	RCT	Stratified random sampling. 72 children aged 5-10 years. VG (n=36), CG (n=36)	During painful procedures, increases in pain, anxiety, and fear were lower in the VG group compared to the CG group ($p<0.05$).
(Goktas & Avci, 2023). The effect of visual and/or auditory distraction techniques on children's pain, anxiety and medical fear in invasive procedures: A randomized controlled trial[16]	11/13 (84%)	RCT	Random sampling. 144 children aged 7-12 years. KG n=36). MG (n=36), VG (n=36), CG (n=36)	KG, MG, VG all reduced pain and fear (VG was the most effective for anxiety), with no significant differences between groups.
(Tuncay et al., 2023). SuperKid: Effect of an intervention prepared with cognitive behavioral technique on reducing fear and pain of children during intravenous insertion[15]	11/13 (84%)	RCT	Random sampling. 96 children aged 5-7 years. SG (n=48) CG (n=48)	The SG group showed lower levels of fear and pain than the CG group, both during and after the infusion procedure.

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Table 2. Characteristics of Distraction Techniques

Study	Intervention Method	Action	Child's age	Media	Time
Uzsen et al., (2024)[3]	• Vibration • Pressure	IM injection	5-10 years	• Vibration tool • Pressure with the thumb	During the procedure
Suleman et al., (2023)[4]	Trace Image Colors for Kids-Book (TICK-B)	Venipuncture	6-12 years	Picture book	During the procedure
Benazeera et al., (2024)[5]	Buzzy	Infusion installation	6-12 years	Buzzy.	Done for 3 days: buzzy device during IV insertion
Suleman et al., (2024)[6]	Trace Image Colors for Kids - Book. Listening to music. Watching cartoons.	Infusion installation	6-12 years	• TICK-B • Ipad-mini: songs and cartoons	TICK-B. Listening to music. Watching cartoons
Koç & Alemdar, (2024)[21]	Musical toys	Insertion IV	3-6 years	Xylophone	5 minutes before, after the procedure.
Girgin & Göl, (2020)[8]	Blowing up balloons, squeezing balls, and coughing		7 years	• Latex balloons • soft ball	3 minutes before and during the procedure.
Sarman & Tuncay, (2024)[9]	Animal assistance intervention of goldfish and water turtles	Insertion IV	5-6 years	Goldfish and water turtles in an aquarium	3 minutes before and after.
Yaz et al., (2024)[10]	• Vibration and cold • Hand puppets	Phlebotomy / venipuncture	3-6 years	• Bee Buzzy • “Zuzu” hand puppet	Buzzy 15 seconds. Hand puppet
Ugucu et al., (2022)[11]	Blowing bubbles and watching cartoons	venipuncture	6-8 years	Bubble blowing toy. iPad Mini	3 minutes before and during the procedure.
Sapçi et al., (2021)[12]	Cold vibrations	Vaccination/ IM injection	6-12 years	Bee Buzzy	30 seconds before and during the procedure
Kurt et al., (2024)[24]	Helfer's skin tap technique	IM injection	4-10 years	Examiner's hands	Before and after the procedure
Turgut & Türkmen, (2023)[13]	Playing with bright toys	phlebotomy	3-6 years	Bright toys	Before and during the procedure.
Tuncay & Sarman, (2024)[14]	Drama and ventriloquist	Insertion IV	5-10 years	Doll	Before the procedure
Goktas & Avci, (2023)[16]	• Looking at the kaleidoscope • Listening to music • Virtual Reality	Invasive: deltoi vaccination, venipuncture/ phlebotomy	7-12 years	Kaleidoscope. S16 Wireless Over-Ear Bluetooth Headphones. 3D Virtual Reality Glasses	3 minutes before, during, and 3 minutes after the procedure
Tuncay et al., (2023)[15]	SuperKid	Insertion IV	5-7 years	Cards and posters	3-5 minutes before the procedure

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Active Diversion Technique

The TICK-B drawing distraction technique was mentioned in two studies to reduce fear in children.[4,6] The TICK-B contains images that require coloring. Children are asked to draw or color images during the venipuncture procedure. Suleman's study reported that drawing or coloring on the TICK-B occurred both before and during the procedure.[6] Besides drawing, the distraction technique of playing music such as xylophone, can help reduce the fear of children undergoing IV insertion.[8] This xylophone toy features eight different colors and tones, which can be played by striking the keys. Suitable for preschool-aged children, the xylophone should be played by the child and parent together for 5 minutes before the procedure, and for 5 minutes during and after the procedure.

Some distraction techniques involve breathing activities such as blowing up balloons, using a bubble blower, and directed coughing. In Girgin and Göl's study, children were asked to blow up a latex balloon during a venipuncture procedure, with the injection administered while the child exhaled to inflate the balloon until the procedure was completed.[8]Ugucu's study used a special bubble blowing toy tool that had a container filled with diluted liquid soap with different cartoon characters.[11]Children began blowing bubbles 3 minutes before the procedure, and the procedure and the bubble-blowing intervention were stopped simultaneously. For the coughing technique, children were instructed to take a deep breath and cough just before the needle was inserted, although specific coughing guidelines were not detailed in the study.[8]

The animal distraction method involved yellow, red, and orange goldfish and red-cheeked turtles from America and Mexico.[13] The fish were housed in a shatterproof, transparent plastic aquarium measuring 29 x 20 x 33 cm, while the turtle habitat was equipped with a ramp for resting. Before the IV drip, the child was invited to interact with the animals for three minutes and was asked to name them. During the procedure, the aquarium was placed at the child's eye level (about one meter).[8]

Another distraction technique is light-up toys. Children are asked to hold the toys for a few seconds before phlebotomy or venipuncture. These toys feature animal figures in three colors: pink, orange, and green. Two lights are attached to each toy. The lights light up when shaken, and a noise-making material is attached to the bottom to attract the child's attention. This study did not detail the children's playtime before the procedure.[11] Another distraction technique, holding a soft ball, begins before the venous blood draw. The soft ball is held in the right hand opposite the arm to be injected, and the patient is asked to squeeze it repeatedly throughout the procedure. The ball used is 10 cm in diameter and elastic, returning to its original shape after being squeezed.[8]

Dramatic play using ventriloquism is conducted by a psychotherapist and a pediatric nurse. Ventriloquism therapy using two puppets (80x38 cm) by a psychotherapist and a nurse helps children overcome fears through affirmations, relaxation, and thought modification during the 5-minute pre-procedure period, while also providing education on disease prevention.[14]

SuperKid is an active distraction technique using superhero stories through a poster (75x100 cm) and six cards (21x30 cm) featuring a superhero character in a red costume. Applied 3-5 minutes before IV insertion, this intervention was developed by a multidisciplinary team (psychologists, psychotherapists, nurses) based on a cognitive-behavioral approach.[15]

DISCUSSION

This study is a scoping review examining distraction techniques to reduce children's fear of invasive procedures, particularly in hospitals. The

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study involved children aged 4–12, primarily in Asia, and identified 18 distraction techniques grouped into two categories: active and passive.

Passive distraction techniques have been widely used and proven effective in reducing children's fear of invasive procedures.[5] Based on research, this passive distraction technique can provide various therapies, such as vibration and cold compresses, listening to music, watching cartoons, virtual reality, skin pressure, watching hand puppets, and kaleidoscopes. This method can be used when children are hospitalized and undergoing invasive procedures such as IV insertions and IM injections/vaccinations.

Several passive distraction techniques can not only reduce children's fear during invasive procedures but also reduce pain and anxiety. Previous research has shown that vibration distraction techniques using Buzzy and skin pressure can reduce pain and anxiety in children during injections.[3] Other studies have shown that watching cartoons, hand puppets, listening to music, watching cartoons, kaleidoscopes, and using virtual reality can reduce pain and anxiety in children undergoing invasive procedures, such as deltoid vaccination, venipuncture, and IV insertion.[2]

The effectiveness of distraction techniques in reducing pain and anxiety is generally measured using age-appropriate instruments. For pain, children who are able to communicate use a picture scale such as the Wong-Baker FACES (ages 3 years and older), while younger children are assessed through behavioral observation (FLACC Scale). Anxiety/fear is measured using the Child Fear Scale (face pictures) or observation (mYPAS). Some studies combine child reports and observations for greater accuracy, especially in children who have difficulty expressing their feelings. This instrument was chosen to evaluate the success of distraction interventions.[15]

This review shows that vibration and cold compresses with Buzzy are the most commonly used passive distraction techniques for pain relief. Using Buzzy can effectively reduce fear and pain in children during invasive procedures such as vaccinations, intramuscular injections, and venipuncture. This mechanism occurs through the "gate control" theory of pain, where non-painful stimulation such as vibration and cold, helps block signals to the brain.[12] Buzzy is also relatively easy to use, has an attractive bee-shaped design, and does not require much preparation before the procedure.[20] However, using Buzzy also has several drawbacks. These include the need to freeze the ice wings and their durability is only about 10 minutes at room temperature. The equipment is expensive to purchase. It also does not completely eliminate pain and fear in children with needle phobia. Therefore, for cases of severe fear and pain, pharmacological therapy is still required.[4]

Active distractions (involving children's motor/sensory skills) such as playing musical instruments, drawing, blowing up balloons, interacting with animals, and the SuperKid technique have been proven to be effective in reducing children's fear during invasive procedures.[6,8,16,14,15] In addition, active distraction techniques can reduce pain and anxiety in children as well.

Previous research reported that active distraction techniques can improve patients' knowledge and motor skills, SuperKid Therapy and animal interactions (goldfish and water turtles) that provide educational stories to children can improve children's knowledge regarding the importance of maintaining health.[9.15] Therapy that can improve children's motor skills is TICK-B which can help train the small muscles in children's hands and fingers, besides that it can encourage creativity and self-expression in children.[4] This can improve a child's concentration, thereby reducing their fear and pain during

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invasive procedures. The active distraction technique in TICK-B can be used by nurses in the emergency department without additional training. This therapy is easy to apply, cost-effective, engaging for children, and can significantly reduce pain and fear during invasive procedures.[22]

Numerous studies have shown that active distraction techniques offer significant benefits, particularly in reducing pain and fear. This is because active distraction involves multisensory intervention to block painful stimuli, making it considered more effective than passive distraction in reducing children's anxiety during invasive procedures.[8] Therefore, healthcare professionals such as nurses should consider using active distraction techniques to help reduce children's fears when undergoing invasive procedures.

Several factors can influence the effectiveness of distraction techniques (active/passive) influenced by age (preschool-school), facilities, patient-medical personnel relationship, environment, and parental support in decision making.[8]

In general, distraction techniques (active/passive) are generally accepted by children and parents because they are non-invasive and effective in reducing fear during invasive procedures. Hand pressure has been shown to reduce fear during injections/vaccinations, while coughing techniques (without instruments) and other distractions (using media such as toys/gadgets) are also effective. However, not all methods are recommended for all hospital settings.

Advantages and Limitations

Study limitations include the majority of research from Asia (specifically Turkey), the search was limited to four databases (in the last 10 years), no specific distraction techniques for each age group, and the limited setting in a hospital for children aged 4-12 years. Recommendations: Expand the age group and explore developmentally appropriate distraction techniques to increase the generalizability of the findings.

Contribution to global nursing practice

This review provides current evidence on the effectiveness of non-pharmacological distraction techniques (such as Buzzy, TICK-B, play therapy, and virtual reality) in reducing children's anxiety and pain during invasive procedures. These findings can be directly applied by nurses in various clinical settings, including those with limited resources, thereby improving the quality of child-centered care in the future.

CONCLUSION

This review concluded that active distraction techniques (such as TICK-B) and passive distraction techniques (such as buzzers) are equally effective in reducing children's fear during invasive procedures. These findings can help healthcare professionals choose distraction therapies that are appropriate for their work environments. However, because most of the research is from Asia, further studies in other continents (such as the Americas and Europe) are needed to increase the generalizability of these findings.

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