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Digital Play and Distraction Interventions for Pediatric Pain and Anxiety Management: A Scoping Review and Evidence Map for Post-Laparotomy Care

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ABSTRACT

Background: Postoperative pain and anxiety after pediatric surgery impair mobility and recovery. Digital play-based interventions, distraction, and interactive media are non-pharmacological adjuncts to standard analgesia, but the evidence for their use after laparotomy is unclear.

Purpose: To map the evidence on digital play and distraction interventions, including digital design-based play therapy, for pain and anxiety in children receiving procedural, perioperative, or postoperative care, using the Population–Concept–Context framework, and to evaluate how far this evidence can be transferred to post-laparotomy care.

Methods: This scoping review followed the Joanna Briggs Institute methodology and the reporting guideline for scoping reviews of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses. PubMed, PubMed Central, and Google Scholar were searched in May 2026 for primary quantitative studies published in English from 2020 to 2025. Two reviewers screened records independently. Data were charted with a piloted extraction form and synthesized numerically and narratively.

Results: Of 276 records identified, 17 primary studies met the eligibility criteria. They examined virtual reality, mobile applications, video games, interactive multimedia, and non-digital play in procedural pain (7 studies), preoperative anxiety (5 studies), and postoperative recovery (5 studies). Thirteen studies assessed pain and 15 assessed anxiety, and all reported reductions in pain or anxiety. Media, devices, and protocols varied widely. No study reported outcomes specific to children after laparotomy, and none evaluated digital drawing, coloring, or interface-design activities.

Conclusion: Digital distraction offers promising complementary benefits for pediatric procedural distress and preoperative anxiety. However, no direct evidence exists for post-laparotomy care, so controlled feasibility and safety trials are needed before any claim of clinical efficacy.

Keywords : Children, Digital Distraction, Play Therapy, Postoperative Pain, Scoping Review

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BACKGROUND

In pediatric nursing, acute postoperative incisional pain after major open surgery, such as laparotomy, poses serious clinical challenges that affect recovery, mobility, and psychological comfort. Acute postoperative pain must be distinguished from chronic postsurgical pain (Ceniza-Bordallo et al., 2025a, 2025b; Rosenbloom et al., 2019), procedural pain (e.g., venipuncture and intravenous insertion), and preoperative anxiety. Open laparotomy also involves a large abdominal wall incision, which distinguishes it from laparoscopic surgery, after which children have been reported to experience less postoperative pain than after open appendectomy (Liu et al., 2017). Transferring evidence between these surgical and procedural settings therefore requires cautious appraisal.

Postoperative pain management requires a multimodal approach in which non-pharmacological distraction acts strictly as a complement to prescribed analgesia, not as a replacement. In a randomized trial, Gökoğlu and Sukut (2025) found that an active digital game reduced pain and anxiety more than passive cartoon viewing. Consequently, digital technologies such as virtual reality (VR), smartphone applications, interactive multimedia, and tablet-based digital design activities (e.g., digital coloring, interactive drawing, and interface-design games) are increasingly investigated.

However, the existing literature is heterogeneous, and different intervention types and clinical contexts are often conflated. For example, interactive multimedia education for preoperative anxiety (Hou et al., 2023) addresses a different clinical problem from VR used for short procedural pain during peripheral intravenous catheter placement (Gold et al., 2021) or venipuncture (Wong & Choi, 2023), and none of these addresses postoperative recovery. Likewise, non-digital art activities (Suleman et al., 2022) and non-digital play therapy (Kurt & Seval, 2021; Patel et al., 2024) are frequently grouped with digital design interventions, although their mechanisms and feasibility differ.

To establish a clear research gap, this scoping review maps contemporary evidence across these distinct clinical contexts. By defining “digital design-based play therapy” and delineating it from general digital distraction, preoperative education, and non-digital play, the review evaluates the transferability of current evidence and identifies priorities for pediatric post-laparotomy nursing. The objective was to map the evidence on digital play and distraction interventions, including digital design-based play therapy, for pain and anxiety in children receiving procedural, perioperative, or postoperative care, and to evaluate how far this evidence can be transferred to children after laparotomy.

METHODS

Design and Setting

This study is a secondary evidence synthesis (scoping review) rather than a primary quantitative study. It followed the Joanna Briggs Institute (JBI) methodology for scoping reviews (Peters et al., 2020), the framework of Arksey and O’Malley (2005), and the methodological enhancements of Levac et al. (2010). A scoping review was chosen because the aim was to map the extent and nature of heterogeneous evidence rather than to estimate pooled effects (Munn et al., 2018). Reporting followed the Preferred Reporting Items for

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Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR; Tricco et al., 2018). The review protocol was not prospectively registered, for example on the Open Science Framework (OSF); this is acknowledged as a limitation.

Participants and Sampling

Eligibility criteria were established using the Population–Concept–Context (PCC) framework:

1. **Population (P):** Pediatric patients aged 2–18 years (preschool, 2–5 years; school age, 6–12 years; adolescents, 13–18 years) receiving procedural, perioperative, or postoperative care.
2. **Concept (C):** Digital design-based play therapy (interactive visual creation, digital drawing or coloring, and interface-design interaction), digital media (VR, mobile applications, and video games), and non-digital play interventions.
3. **Context (C):** Inpatient pediatric surgical wards, day surgery units, procedure rooms, and perioperative care environments, including home-based preoperative preparation.
4. **Study designs:** Primary quantitative interventional studies (randomized controlled trials, quasi-experimental studies, and pilot or single-arm intervention studies) published in English between 2020 and 2025. The 2020–2025 window was chosen to capture contemporary mobile and VR technology.

Instruments and Data Collection

A systematic literature search was conducted in May 2026 across three major databases: PubMed, PubMed Central (PMC), and Google Scholar. Conducting the search in May 2026 ensured that all publications from the year 2025 were fully indexed within the systems. To manage the retrieved citations, all records were imported into EndNote (version 20) to systematically identify and remove duplicates found between PubMed and PMC. Meanwhile, the screening process for Google Scholar was limited to the first 100 most relevant records using adapted variations of the primary search string.The search strategy in PubMed was comprehensively designed by combining controlled vocabulary (MeSH terms) and free-text terms to maximize retrieval sensitivity. This keyword combination focused on four distinct domains: a pediatric or school-age child population; clinical conditions involving postoperative pain, surgical pain, laparotomy, abdominal surgery, or procedural pain; interventions encompassing play therapy, digital play, virtual reality, audiovisual distraction, digital media or design, and mobile applications; and clinical outcomes measuring pain, anxiety, comfort, or patient engagement. The complete, reproducible PubMed search string was executed as follows:

("child"[MeSH Terms] OR "pediatric" OR "school-age children") AND ("postoperative pain"[MeSH Terms] OR "surgical pain" OR "laparotomy" OR "abdominal surgery" OR "procedural pain") AND ("play therapy"[MeSH Terms] OR "digital play" OR "virtual reality"[MeSH Terms] OR "audiovisual distraction" OR "digital media" OR "digital design" OR "distraction" OR "mobile application" OR "mobile app") AND ("pain"[MeSH Terms] OR "anxiety"[MeSH Terms] OR "comfort" OR "engagement")

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Following the initial screening, the evaluation proceeded to the full-text review stage, where several articles were excluded for not meeting the established inclusion criteria. The specific reasons for exclusion were documented with explicit counts: eight articles were non-primary literature or reviews, five involved the wrong population or adult participants, and six lacked relevant pain or anxiety outcomes. Additionally, four articles were excluded due to a non-play or non-digital intervention, and the final two articles were excluded because the full text remained unavailable despite formal library loan requests.

Data Analysis

Two reviewers independently conducted title and abstract screening and full-text evaluation. Initial calibration on 20 random citations showed more than 90% inter-rater agreement, and disagreements were resolved by consensus with a third reviewer. Data were charted using a pre-piloted Microsoft Excel (version 2019) extraction form covering author, year, country, design, sample size, age range, clinical context, intervention details, comparator, timing and duration, outcome instruments, and findings. The charted data were summarized descriptively using frequency counts and organized into themes through narrative-thematic synthesis. No meta-analysis was performed because of the heterogeneity of interventions and outcome measures.

Ethical Considerations

Ethical approval was not applicable to this study because it is a secondary evidence synthesis (scoping review) based solely on previously published literature and involved no direct human or animal participants. Informed consent and consent for publication were therefore not required.

RESULTS

The search identified 276 records: PubMed (n = 31), PMC (n = 220), and Google Scholar (n = 25). After 82 duplicate records were removed, 194 unique records were screened by title and abstract, and 152 were excluded because they did not meet the PCC criteria. A total of 42 full-text articles were assessed, and 25 were excluded for the documented reasons (Figure 1). Ultimately, 17 primary studies met all eligibility criteria.

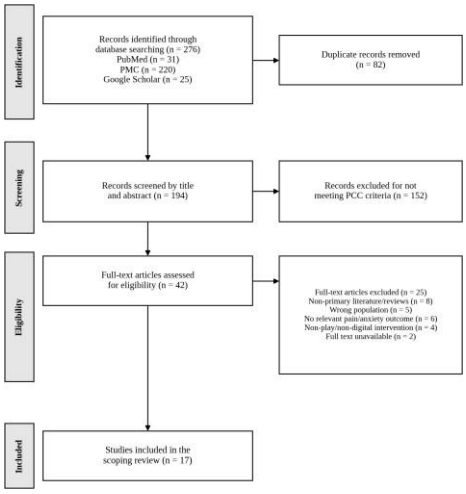


Figure 1. PRISMA-ScR flow diagram of study selection.

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The characteristics of the 17 included studies are summarized in Table 1. Twelve were randomized controlled trials (including one pilot trial), four were quasi-experimental studies, and one was a single-arm pilot observational study. Seven studies were conducted in procedural settings, five in preoperative preparation, and five in postoperative recovery.

Table 1. Summary of Included Studies on Digital Play Therapy and Distraction

Author (Year); Country	Design; Sample & Age	Clinical Context	Intervention; Duration & Timing	Comparator	Outcome Measures	Key Findings
Akarsu et al. (2023) Turkey	RCT N = 90, 6–12 yrs	Venous blood draw (Procedural)	VR video (nature/sports) Single 5–10 min during procedure	Standard care	FPS-R, VAS	VR distraction reduced procedural pain, fear, and anxiety.
Amaya et al. (2025) USA	RCT N = 107 dyads (VR 51; control 56); 6–12 yrs	Preoperative preparation (ambulatory tonsillectomy or adenoidectomy)	360° VR exposure video (head-mounted display) ~5 min, preoperative holding area	Standard preoperative experience (no intervention)	STAI-6 (child and guardian)	VR exposure reduced preoperative anxiety in children and guardians (lower odds of moderate or high anxiety).
Çevik Özdemir et al. (2025) Turkey	Quasi-exp N = 60, 5–12 yrs	Circumcision recovery (Day surgery)	VR immersion & music 20 min postoperative session	Passive resting	FPS-R, CAS	Immersive VR decreased postoperative pain, fear, and anxiety.
Gökoğlu & Sukut (2025) Turkey	RCT N = 80, 7–12 yrs	Venous blood draw (Procedural)	Active digital game vs cartoon Single procedure duration	Standard care	WB-FACES, VAS	Active digital gaming provided superior pain and anxiety reduction.
Gold et al. (2021) USA	RCT N = 108, 10–17 yrs	PIVC placement (Procedural)	Immersive VR headset 10–15 min procedural session	Standard care	VAS, Heart Rate	Immersive VR significantly reduced acute procedural pain and distress.
Hoag et al. (2022) USA	Pilot RCT N = 30, 8–17 yrs	Inpatient procedures (Procedural)	VR vs. Guided imagery Single procedure duration	Standard distraction	FPS-R, mYPAS	Active VR showed high feasibility and reduced procedural pain/distress.
Hou et al. (2023) China	RCT N = 150, 3–7 yrs	Preoperative preparation	Interactive multimedia app 15 min home preparation	Standard video	mYPAS, ICC	Interactive multimedia reduced preoperative and parental anxiety.
Kerimaa et al. (2023) Finland	Quasi-exp N = 45, 4–9 yrs	Day surgery preparation	Mobile game app Home prep (3 days preop)	Standard booklet	mYPAS, Satisfaction	Mobile game preparation improved child coping and reduced preop anxiety.

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Author (Year); Country	Design; Sample & Age	Clinical Context	Intervention; Duration & Timing	Comparator	Outcome Measures	Key Findings
Kurt & Seval (2021) Turkey	RCT N = 70, 6–12 yrs	Postoperative ward (General)	Non-digital finger puppets 20 min postoperative session	Standard nursing care	FPS-R, VAS-Anxiety	Finger puppet play significantly reduced postoperative pain and anxiety.
Mathias et al. (2024) India	RCT N = 160 (80 per group); age range not stated in abstract	Postoperative recovery (pediatric surgical unit, elective surgery)	Age-appropriate distraction delivered by nurses (modality not specified) 3 postoperative days	Standard care	EVENDOL, mYPAS; heart rate, respiratory rate, oxygen saturation	Distraction reduced postoperative pain, anxiety, and physiological parameters.
Mersin et al. (2025) Turkey	RCT N = 64, 7–12 yrs	Tonsillectomy or adenoidectomy	Preop VR cartoon viewing 15 min preoperative session	Standard care	FPS-R, VAS	Preoperative VR viewing reduced postoperative pain and anxiety.
Olbrecht et al. (2021) USA	Pilot Obs N = 50, 11–17 yrs	Acute postop ambulatory	Guided relaxation VR Single short session in PACU	Uncontrolled	NRS Pain/Anxiety	Guided relaxation VR temporarily reduced acute postoperative pain.
Patel et al. (2024) USA	RCT N = 40, 2–5 yrs	General pediatric surgery	Non-digital play therapy 15–20 min postop session	Standard care	FPS-R, FLACC	Play therapy reduced postoperative pain in young surgical patients.
Rostami et al. (2022) Iran	Quasi-exp N = 102; 3–6 yrs	Preoperative preparation (elective surgery)	Video game (expert-approved) 20 min while waiting in holding area	Control (waiting, no game)	mYPAS	Video game play was associated with lower preoperative anxiety than control ($P < 0.001$).
Suleman et al. (2022) Iraq	Quasi-exp N = 60, 6–12 yrs	IV Cannulation (Procedural)	Non-digital tracing & coloring During procedure duration	Standard care	WB-FACES	Art-based active distraction reduced cannulation pain and anxiety.
Thomas et al. (2023) India	RCT N = 60 (20 per group); 6–12 yrs	IV cannulation (Procedural)	Animation distraction (audiovisual) During cannulation	2% lignocaine application; control	VAS	Animation distraction was preferable to lignocaine for reducing cannulation pain.

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Author (Year); Country	Design; Sample & Age	Clinical Context	Intervention; Duration & Timing	Comparator	Outcome Measures	Key Findings
Wong & Choi (2023) China	RCT N = 112, 4–12 yrs	Venipuncture (Procedural)	Immersive VR game During venipuncture procedure	Standard care	FPS-R, mYPAS	Immersive VR reduced venipuncture pain, anxiety, and procedure duration.

Note. N = sample size; RCT = randomized controlled trial; Quasi-exp = quasi-experimental; Pilot Obs = pilot observational study; VR = virtual reality; PIVC = peripheral intravenous catheter; PACU = post-anesthesia care unit; CAS = Child Anxiety Scale; EVENDOL = Evaluation Enfant Douleur; FLACC = Face, Legs, Activity, Cry, Consolability; FPS-R = Faces Pain Scale–Revised; ICC = Induction Compliance Checklist; mYPAS = modified Yale Preoperative Anxiety Scale; NRS = Numeric Rating Scale; STAI-6 = six-item State-Trait Anxiety Inventory; VAS = Visual Analog Scale; WB-FACES = Wong-Baker FACES Pain Rating Scale.

Categorization and Synthesis of Themes

The narrative-thematic synthesis yielded four overarching themes:

1. **Theme 1: Clinical benefits across outcome domains.** Thirteen studies assessed pain and 15 assessed anxiety, and four additionally reported fear or distress. All 17 studies reported reductions in pain or anxiety in the intervention group, and some also reported lower parental anxiety, better child coping, or greater satisfaction.
2. **Theme 2: Contextual and developmental application.** Seven studies addressed short procedural tasks, five addressed preoperative preparation, and five addressed postoperative recovery in day surgery, ambulatory, or ward settings. Most studies enrolled preschool (2–5 years) and school-age (6–12 years) children, and only a few included adolescents (13–18 years).
3. **Theme 3: Intervention heterogeneity and protocol variance.** Modalities ranged from head-mounted VR to tablets, smartphones, video games, and non-digital puppets or drawing. Single-session length varied from approximately 5 to 20 minutes, and some studies delivered the intervention over several days, indicating a lack of standardized clinical protocols.
4. **Theme 4: Absence of direct post-laparotomy evidence.** No study specifically evaluated digital design-based play therapy in children after open laparotomy. The included digital interventions were predominantly VR, games, animations, and multimedia; none was described as digital drawing, coloring, or interface-design activity. Existing findings therefore represent indirect, contextual evidence. The only included trial set in a general pediatric surgical unit (Mathias et al., 2024) enrolled children undergoing elective surgery and, as far as reported, did not present laparotomy-specific outcomes or specify the distraction modality.

DISCUSSION

This scoping review mapped 17 interventional studies of digital play and distraction modalities in pediatric nursing care. Active digital distraction appeared beneficial for short procedural pain and preoperative anxiety. However, effectiveness cannot be generalized to

children after laparotomy, because none of the included studies reported outcomes specific to this population.

Evidence from brief procedural tasks, such as venipuncture, cannot be extrapolated to sustained postoperative incisional pain. Recovery after laparotomy involves visceral and somatic tissue trauma that requires continuous multimodal analgesia, so digital play therapy should be regarded as a complementary adjunct rather than a substitute for analgesia. Implementation must also consider device safety, fatigue, and ward practicality. Head-mounted VR displays raise hygiene, cost, and motion-sickness concerns, which may make tablet- and smartphone-based applications more feasible in ward settings.

Limitations

The limitations of this review include the absence of a prospectively registered protocol, the restriction to PubMed, PMC, and Google Scholar, the inclusion of English-language publications only, and heterogeneity of interventions and outcome measures that precluded meta-analysis.

Implications for Nursing Practice

Digital play and distraction may help pediatric nurses manage procedural distress and preoperative anxiety as an adjunct to standard care. Before digital interventions are introduced on post-laparotomy wards, nurses and nurse leaders should ensure adherence to institutional safety protocols, including surgeon-directed positioning and mobilization, disinfection of devices between patients, and session lengths comparable to those evaluated in the included studies (approximately 5–20 minutes).

Future research should prioritize feasibility and safety studies, standardized intervention protocols, validated outcome instruments, and controlled evaluations in post-laparotomy cohorts.

CONCLUSION

Digital play therapy offers valuable non-pharmacological support for pediatric procedural distress and preoperative anxiety. However, direct evidence in post-laparotomy settings is currently absent. Future research must focus on feasibility, safety criteria, standardized intervention protocols (dose, timing, and duration), validated outcome instruments, and controlled evaluation in post-laparotomy cohorts.

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AUTHOR CONTRIBUTIONS

Yuliana: Conceptualization, Methodology, Investigation (database searching, independent title/abstract and full-text screening as first reviewer, and data charting), Data curation, Formal analysis, Writing - original draft. **Yuni Purwati:** Supervision, Validation (third reviewer who resolved screening disagreements by consensus), Visualization, Writing - review and editing. **Yuli Isnaeni:** Supervision, Project administration, Conceptualization,

Investigation (independent title/abstract and full-text screening as second reviewer), Writing - review and editing.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DECLARATION OF AI USE

During manuscript preparation, the authors used ChatGPT (OpenAI; GPT-4o, accessed June 2026) and Gemini (Google; Gemini 1.5, accessed June 2026) to check grammar and polish the language of text written by the authors. These tools were not used for the literature search, study screening, data extraction, synthesis, or generation of references. The authors reviewed and edited the output and remain responsible for the content and integrity of the article.

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