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REVIEW ARTICLE

Effectiveness of Preoperative Therapeutic Play on Anxiety Among Children Undergoing Invasive Procedure: a Systematic Review and Meta-analysis

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Abstract

Play is an indispensable part of growing up and by using play to distract children while undergoing invasive procedures can have a positive impact. Play can help children to cope with painful procedures and long-term treatment. The aim of the review was to evaluate the evidence concerning the effect of play on anxiety among children undergoing invasive procedures. This is a systematic review and meta-analysis. Data sources: PubMed, The MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Clinical Key, Cochrane Library, and Google Scholar were searched between 2012 and 2020. Review methods: randomized controlled trials (RCTs) that evaluated the effectiveness of play on anxiety among children undergoing invasive procedures were included. Meta-analysis was done using Revman v5.3 software. A total of 451 participants from 5 trials were involved in the systemic review and meta-analysis. Self-reported anxiety, parents reported anxiety, and self-reported pain were found significant in intervention [$\chi 2 = 7.57$, df = 2 at $P < 0.02$]. When compared with control group, the review result revealed that experimental group reduced the anxiety and pain ($P < 0.05$).

Keywords Anxiety · Play therapy · Children · Parents · Invasive procedures

Introduction

Hospitalization or mere visibility of medical professionals could be a nerve-racking experience for children. Anxiety is the most usual feeling reported among children during invasive procedures [1, 2]. With their level of cognitive development, they exhibit behavior rather than words to communicate their feelings. The frequently exhibited behavioral presentations during times of anxiety include aggressiveness, non-cooperation, and standoffish behavior [3]. Although acute invasive procedures result in short-term suffering, of late evidences reiterate that negative medical

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experiences have long-term detrimental effects on their physiological and psychological health [4–8]. An early painful insult has been coupled to future adulthood fright, pain, and turning away from medical care [9, 10].

Owing to the strangeness of the hospital environment, separation anxiety, an upcoming medical procedure could substantially elevate anxiety of hospitalized children [11]. Children with enough self-control would adopt a positive coping strategy, resulting in enhanced psychological health [12]. Preoperative anxiety has a significant positive correlation with days of hospitalization, postoperative side effects, postoperative pain, and post-anesthetic recovery [13–15]. Owing to detrimental effects of anxiety, several modalities have been tried out to reduce the preoperative anxiety, viz. preoperative education [16–18], audio-visual presentations [19–22], preoperative nursing visit [23, 24], and creating a pleasing ambience [25, 26].

In accordance to the American Academy of Pediatrics, every child should have at least 30 min of instructor- or parent-guided play and 60 min of unobstructed free playtime each day [27, 28]. Play provides an opportunity for the children to explore themselves and enhances their cognitive, physical, social, and emotional well-being [29]. Florence Erikson, who was a pioneer in studying the benefits of play as an intervention to enhance expression of feelings among hospitalized children, reported that play prepared hospitalized children to invasive procedures [30]. Hospital play interventions provide children with an opportunity to desensitize stressful situations and instill greater self-control over the novel situation, resulting in a favorable postoperative outcome.

Till date, there is no any systematic review and meta-analysis that assessed the impact of therapeutic play on anxiety among children undergoing invasive procedures. The results of this review would furnish novel perception on the efficacy of play as an interventional modality on anxiety.

Methods and Materials

Aim

The systematic review and meta-analysis was carried out to evaluate the efficacy of therapeutic play on anxiety among children undergoing invasive procedures. The review was carried out based on the guidelines of Cochrane collaboration [30] and reported using Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement [31] The review was registered in Prospective Register of Systematic Reviews (PROSPERO), with identification number CRD-42021231666.

Search for studies was carried out from 2 January 2021 to 28 February 2021. Search scheme was developed using search or keywords connected to Population or Patient, Intervention, Comparator or Control and Outcome (PICO) statement. Two authors independently searched in databases, viz. PubMed, MEDLINE, Clinical Key, Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Cochrane Library, and Google Scholar. Those studies published in English language period from 2010 to 2020 employed play therapy in experimental group and control group received routine care for those children scheduled for invasive procedure.

Medicals Subject Heading (MeSH) terms that were used included pediatric, school children, kids, preadolescent, adolescence, children, pre-surgery, preoperative, before procedure, pre-procedural, play therapy, game, video game, play, anxiety, fear, afraid, uneasiness, unease, scare, and anxious. The references of relevant trials and systematic reviews that matched inclusion criteria were manually searched for further studies. After screening the titles and abstracts, duplicate records and trials were removed. Left over full-text articles were screened as per the inclusion and exclusion criteria. The participants of this review were children undergoing anxiety-provoking invasive procedures, who had a random allocation to either a treatment group or a control group. The children who were in the interventional group received therapeutic play as an intervention. The control group received as usual care based on preoperative checklist. Anxiety among the children was the primary outcome of this systemic review and meta-analysis. The search could identify 1365 records from various databases. Similarly, six studies were retrieved from a printed material. Of the 1371 records obtained, 660 duplicate records were removed. On further evaluation of the remaining 711 articles, 683 studies were removed after screening titles and abstracts, as they did not meet the criteria of the review in accordance to PICO. On assessment of the full text, another 23 articles were excluded. The reasons for exclusion are as follows: quasi-experimental design, multiple interventions, and primary outcomes assessed were different from the objective of our review. Finally, 5 trials were selected for quantitative narrative synthesis and meta-analysis [31–35] (Fig. 1).

Included trials were appraised by the Cochrane risk of bias assessment tool [30]. There was a 100% low risk of bias in selection, reporting, and other bias. However, there were performance and detection of high risk of bias 40% and 40%, respectively. There was unclear risk of bias in allocation concealment (10%) (Figs. 2 and 3).

Data Extraction

Two authors independently extracted data from the included trials, and any difference in opinion was resolved in discussion with the third reviewer. All reviewers followed the data extraction form; author name, country, year publication,

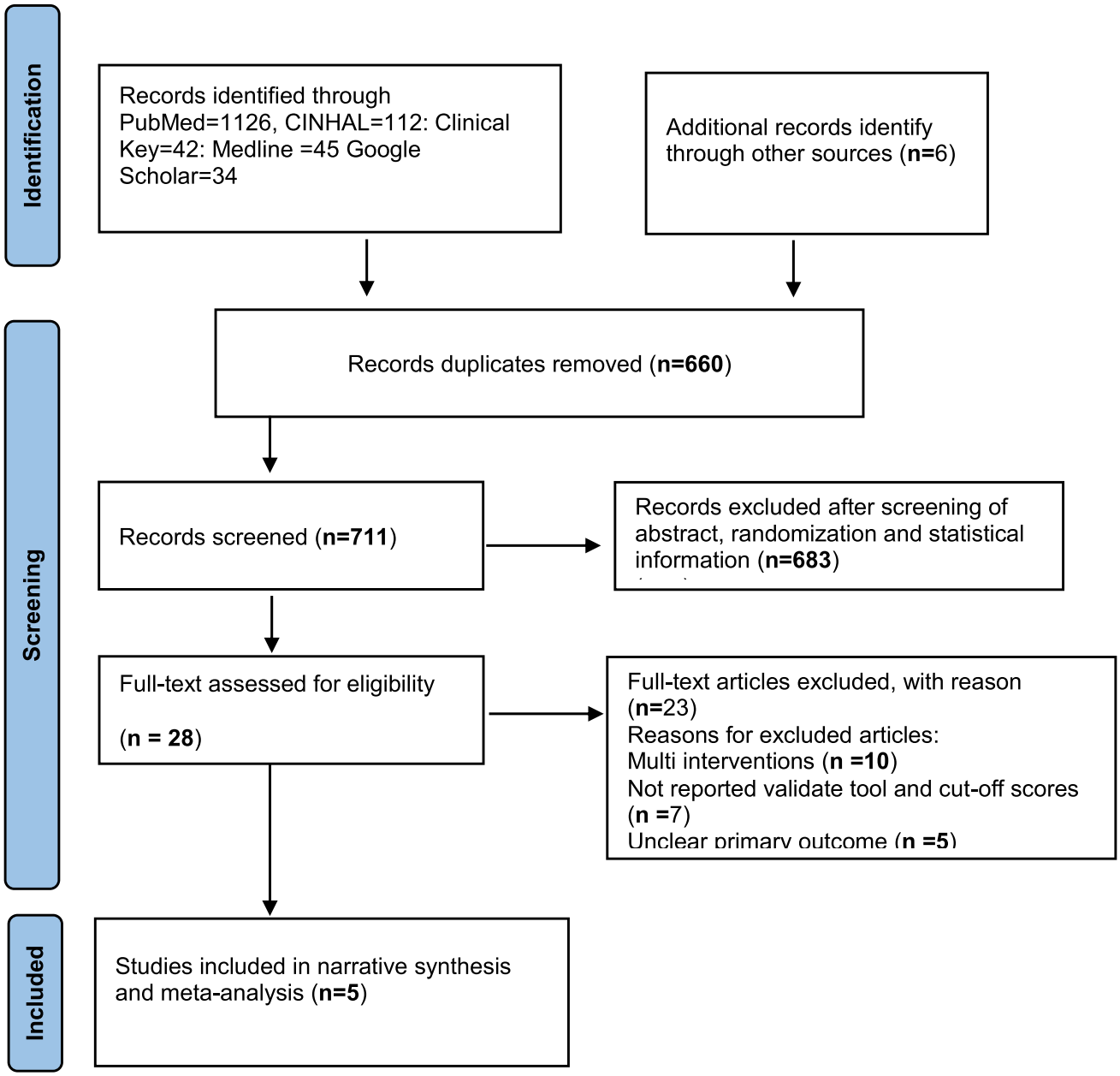

Fig. 1 PRISMA flow diagram of study selection

sample size, study design, type of intervention, instruments, and primary outcome were extracted.

Synthesis and Statistical Analysis

Anxiety was the primary outcome of all the included trials and level of anxiety was compared between the intervention and control group. Intervention group received play therapy, while the control group received routine preoperative care. A meta-analysis was carried out to pool results from the included trials. The effect of play therapy was analyzed using a random-effect model to compute weighted mean difference and standard mean difference between experimental and control groups. The standard mean difference was analyzed after adjusting the standard deviation. Heterogeneity was calculated by I^2 value. Similarly, subgroup difference was calculated by using chi-square test. We used RevMan software v5.3 in this review for pooling and analyzing the data.

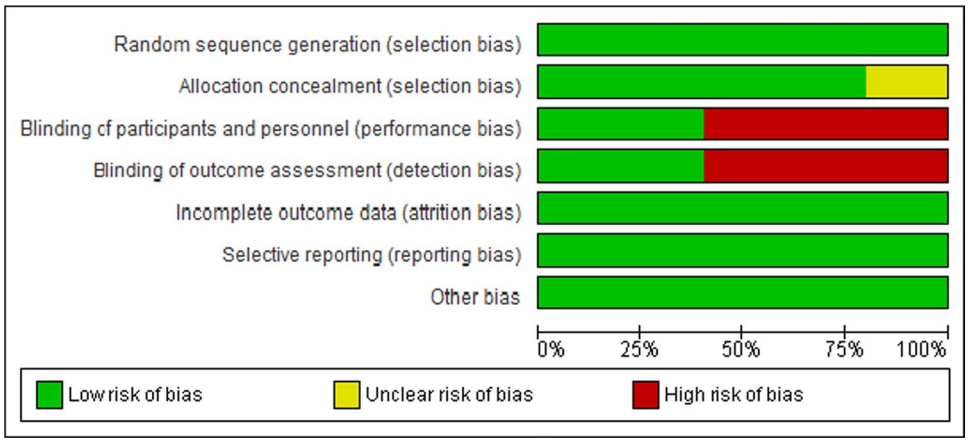

Fig. 2 Risk of bias graph

Fig. 3 Summary of risk of bias

Result

Participant's Characteristics

This systemic review and meta-analysis reviewed was carried out among 5 RCTs comprising 451 children, 247 children in intervention and 204 children in control group, respectively. Sample size of trails ranged from 55 to 136. The average mean age of participants ranged from 7 to 12 years, of which 296 were boys and 155 girls, respectively. The majority of the children explored to elective procedures [34–36] except one trail [37]. Anxiety was the primary outcome of all trails and was measured by standardized anxiety scales. Intervention group was given play therapy while control group received as routine care of the hospital. The author name, country, year of publication, sample size, instrument used, and other statistical findings are summarized and available in Table 1.

Effect of Intervention

Play therapy is a commonly used distractive method to reduce psychological distress in all age groups, especially in children. Majority of the RCTs included in this review used various play articles, viz. video games, dolls, and cartoon projects. Play items were selected based on the child's interest, age, and safety precautions. Anxiety was the primary outcome measured in our review. The effect of play therapy was evaluated by comparing intervention and control group findings. The finding of our review reveals that play therapy is an effective intervention in reducing the anxiety among children undergoing anxiety-provoking invasive procedures in the experimental and control group [standard mean difference and 95% CI] [−1.78 (−2.30, −1.26) $P < 0.001$, $I^2 - 86\%$] as compared to the control group. Similarly, parents reported anxiety [−1.17 (−1.84, 0.50) $P < 0.00$, $I^2 - 93\%$] and self-reported pain (children) [−0.90 (−1.26, −0.55) $P < 0.001$, $I^2 - 40\%$]; details of the summary are available in Fig. 4.

Subgroup analysis was done among 5 RCTs. It comprises 1406 children, i.e., 699 and 708 children in intervention and control groups, respectively. Anxiety and pain were found significant between self-reported anxiety, parents reported anxiety, self-reported pain, and parents reported pain [$\chi 2 = 7.57$, df = 2 at $P < 0.02$], although overall subgroup of anxiety and pain was significant [standard mean difference

Table 1 Summary of all included trials

Author, year	Country	Design	Sample size	Age in years	Gender	Type of procedure	Instrument	Intervention		Remark
								Experiment	Control	
Gerçeker and Ayar (2020)	Turkey	RCT	T-136 I-45 + 45 C-46	5–12	M-73 F-63	Blood drawing	CFC CAM	Game (VR-Rollercoaster)	Standard care	Reduces anxiety
Kumar et al. (2020)	India	RCT	T-55 I-28 C-27	5–15	M-33 F-22	Congenital cardiac surgery	STAI-C	Toys and video games	Standard care	Reduces anxiety
Jeongwoo Lee et al. (2012)	South Korea	RCT	T-86 I-42 C-44	3–7	M-57 F-29	Elective surgery	mYPAS	Toys	Standard care	Reduces anxiety
Chaurasia et al. (2019)	India	RCT	T-80 I-40 C-40	4–8	M-65 F-15	Elective surgery	mYPAS	Game with medical equipment	Standard care	Reduce anxiety
Ünver et al. (2020)	Turkey	RCT	T-94 I-47 C-47	7–12	M-68 F-26	Elective surgery	FAS VFAS	Group play with mother and researcher	Standard care	Reduce anxiety

CFC Child Fear Scale, *CAM* Children's Anxiety Meter, *mYPAS* Modified Yale Preoperative Anxiety Scale, *STAI-C* State-Trait Anxiety Inventory-Children, *FAS* Facial Affective Scale, *VFAS* Visual Facial Anxiety Scale

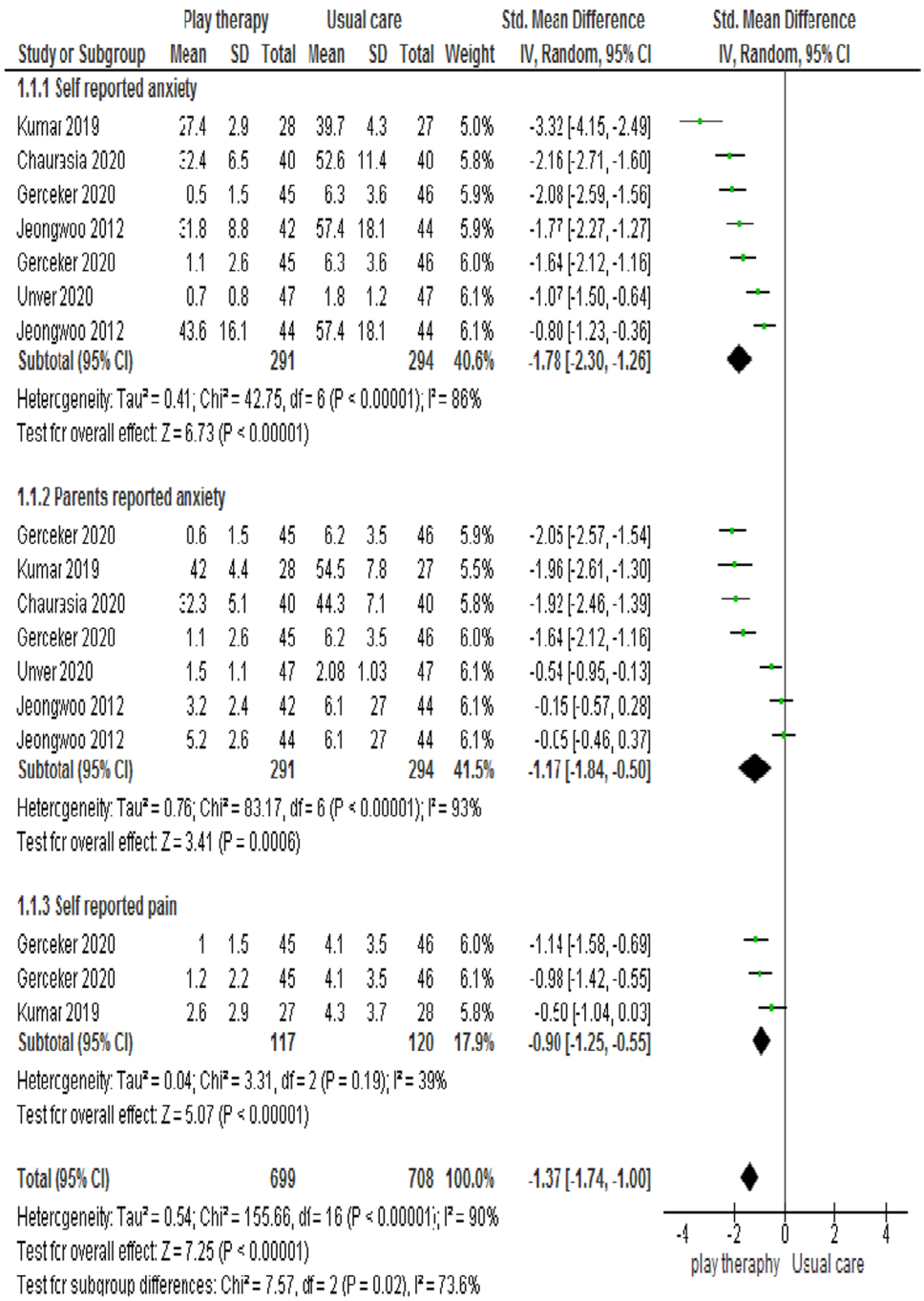

Fig. 4 Forest plot showing the effect of play therapy for reduction of anxiety among children undergoing invasive procedures

and 95% CI [− 1.32 (− 1.74, − 1.00) $P < 0.00$, $I^2 - 90\%$] (Fig. 4).

The duration and timing of outcome measured varied from one trial to another. However, majority of the trials measured the primary outcome (anxiety) either before surgery or during pre-anesthetic induction. A few trials measured anxiety, during and after wound dressing or venipuncture, and a few trials had reported secondary outcomes (pain, fear, and parent satisfaction) in addition to the primary outcome [34, 37].

Some trails reported multidimensional intervention VR-Rollercoaster and VR-Ocean [37], toy and animated cartoon [36] estimated anxiety compared with control group children undergoing invasive procedure. Similarly, two trails reported secondary outcome as pain that reduced in experimental groups [32, 37]

All studies were registered to clinical trials: CTRI/2017/10/009980 [38], NCT04040036 [37], CTRI/2016/05/006900 [35], and No.54542207- 600 [34] except one trail was not reported a register number but

reported to IRB of Chonbuk National University Hospital in South Korea [36].

Publication Bias

Publication bias reported with funnel plot for the outcome variable–like self-reported anxiety; parents reported anxiety and self-reported pain. Furthermore, we used regression-based Begg's and Egger's tests to find publication bias. However, outcome of studies found publication bias [$P < 0.5$, $\beta 1 = -13.96$, SE of $\beta 1 = 2.85$, $Z = -4.94$], i.e., when P value is less than 0.05, it implicates publication bias (Fig. 5).

Discussion

This review result revealed that children in intervention group received the play interventions that decreased their anxiety level, while compared to the control group. Hospitalization or even a visit to the hospital for children means leaving their comfortable environment and an interruption in their daily activities or daily routines. The lack of predictability and control can induce fear and anxiety for children who are unable to understand the rationale for invasive procedure and who are not capable of consistently using cognitive pain-coping strategies. Parents also experience substantial stress and anxiety when their child is hospitalized or undergoes any invasive procedures [37].

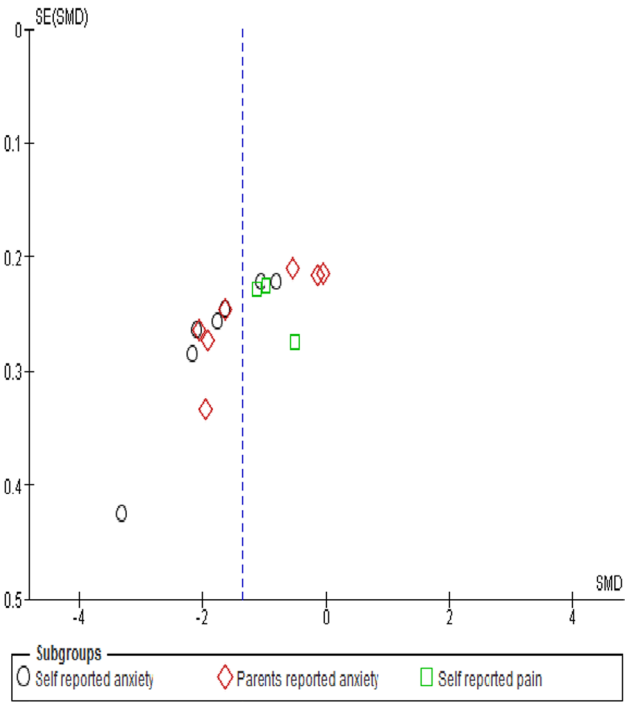

Fig. 5 Funnel plot of comparison of self-reported anxiety, parents reported anxiety, and self-reported pain

This systematic review and meta-analysis involved 5 trials to analyze the effect of play therapy on children undergoing invasive procedures. Trials included for meta-analysis were carried out in different parts of the world and two studies were conducted in Turkey [33, 36], India [34, 39], and South Korea [35] and most of the studies were conducted in South-east Asia. Randomized controlled trials (RCTs) involved in this review used different play items during various invasive procedures, viz. elective surgery, vaccination, intravenous cannulation, and blood withdrawal. Selection of an appropriate play material in accordance to children's desire was a challenging task [33, 38, 40]. Nevertheless, play material or toys should be chosen in accordance to a child's stage of development, interest, and desires. Play facilitates which may influence the development of emotional capacity, resilience, creativity, and problem-solving skills [41–43]. Play of any kind could occupy the mind, resulting in a mind that is devoid of worries. Playing with parents is helpful to children during times of distress like as those induced by invasive procedures. Playing together brings happiness which is precisely what the child needs to feel safe and secure [44].

Anxiety was the primary outcome measured in the included trials. Though the included trials have assessed anxiety using various scales of anxiety, all instruments used in trials resembled true measurements of anxiety; similarly, lower anxiety score indicates the less anxiety. Various scales used to assess anxiety were State-Trait Anxiety Inventory-Child (STAI-C) [32], Facial Affective Scale (FAS) [33], Yale Preoperative Anxiety Scale (mYPAS) [34, 45], and Children's Anxiety Meter (CAM) [36]. Nevertheless, play therapy could be clubbed with various other modalities to reduce anxiety in children, viz. exercise [46, 47], deep-breathing exercise [48, 49], both [50, 51], laughter therapy [52, 53], and music [54, 55]. Some studies reported presence of the mothers during waiting hall may reduce the children's anxiety [33].

This systematic review and meta-analysis finding emphasizes the necessity of involving play therapy in clinical practice to lessen anxiety among children undergoing anxiety-provoking invasive procedures. Evidences from our article urge the healthcare professionals and clinical administrators' necessary arrangement of destructive activities pertaining to anxiety among children undergoing invasive procedures.

Conclusion

Findings of our meta-analysis concluded that play therapy was an effective intervention for reducing anxiety among children undergoing invasive procedures. It was also found to reduce the pain and fear and improve the quality of life.

In this review, we pooled the data from recent RCTs published in indexed journals to assess the effectiveness of play therapy on anxiety among children undergoing invasive procedures. However, merely studies published in English language and challenging to conclude the effectiveness of a play therapy on anxiety in specific age groups. Therefore, vigorous RCTs are needed in the future for sound evidence on the effectiveness of play therapy using universal anxiety scales for specific age groups children undergoing invasive procedures.

Limitations

There is a limitation to our findings of meta-analysis based on 5 RCTs, which included 451 children. We are not able to assess the parents' anxiety due insufficient data reported. Anxiety was the primary outcome of all trails and recently published in English language, between 2012 and 2020.

Recommendations

Compared to existing evidences, our systematic review and meta-analysis finding emphasizes the necessity of involving destructive activities in clinical practice to lessen anxiety among children undergoing invasive procedures. Evidences from our article urge the healthcare professionals and clinical administrators in implementing various types of play therapy children undergoing anxiety-provoking invasive procedures.

Author Contribution All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE).

Conceptualization: KH, EM.
Data curation: KH, AI, PM, SD.
Visualization: KH, PM, EM, AM.
Writing—original draft: KH, AI, SD.
Writing—review and editing: KH, AI, SD, AM.

Declarations

Conflict of Interest The authors declare no competing interests.

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