

Meta-analysis of the Effect of Non-drug Intervention on Relieving Anxiety in Children Undergoing Pediatric Surgery before Operation

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Abstract: *Objective:* To explore the effect of non-drug intervention in relieving preoperative anxiety in children undergoing pediatric surgery through Meta-analysis. *Methods:* PubMed database (a foreign language database) and Cochrane Library (a Cochrane database), as well as the domestic mainstream Chinese databases of China HowNet, Wanfang Database, and VIP database were used for simultaneous retrieval. After the retrieval, the list of references that met the inclusion criteria was searched for all articles that were related to the theme of non-drug intervention in alleviating preoperative anxiety of children undergoing pediatric surgery but did not appear in the previous database retrieval, and the additional retrieval and screening were performed one by one. During the screening, the screening was performed in strict accordance with the preset inclusion and exclusion criteria. Finally, the data of standard-compliant RCTs were extracted and organized, and then meta-analysis was performed using RevMan5.3 software. *Results:* The effects of different non-drug interventions on pre-operative anxiety in children undergoing pediatric surgery were ranked as follows: virtual reality technology, game therapy, diversified interest induction, picture book scenario simulation, interest induction combined with seamless nursing, medical doll intervention, concentration dispersion method, and routine nursing. *Conclusion:* The results of the meta-analysis recommend the use of virtual reality technology, game therapy, and diversified interest induction to relieve preoperative anxiety in children undergoing pediatric surgery.

Keywords: Non-drug intervention; Pediatric surgery; Children; Preoperative anxiety; Meta analysis

Online publication: June 26, 2026

1. Introduction

Surgery is one of the core means for correction of pediatric clinical diseases. However, surgery can cause different degrees of pre-operative stress response in children, and pre-operative anxiety is the most common psychological problem in the pediatric perioperative period. At present, clinical interventions for pre-operative anxiety in pediatrics are mainly divided into drug intervention and non-drug intervention ^[1].

Although drug sedation can quickly alleviate the symptoms of anxiety, it has the risk of adverse reactions. Compared with drug intervention, non-drug intervention highly conforms to the pediatric humanized and meticulous nursing concept, and has become the mainstream direction of psychological intervention in pediatric surgery. On this basis, we systematically retrieved the RCT trials concerning non-drug intervention in alleviating preoperative anxiety in children undergoing pediatric surgery, objectively evaluated the application effects of various non-drug interventions through the meta-analysis method, and compared the clinical values of different intervention schemes, aiming to provide an evidence-based reference for optimizing the perioperative psychological care scheme in pediatric surgery and reducing preoperative anxiety in children.

2. Materials and methods

2.1. Inclusion and exclusion criteria

Inclusion criteria: (1) Study type was RCT; (2) The subjects should meet both the following two conditions: age ≤ 14 years old and children undergoing surgery; (3) The intervention measures should conform to the design of “non-drug intervention in experimental group” and “routine care in control group”; (4) If the articles with repetitive contents were encountered, the articles with the latest publication time and the most comprehensive data would be preferred.

Exclusion criteria: (1) Non-RCT articles such as case-control studies, cohort studies, and review articles were excluded. (2) Exclude articles with incomplete data; (3) Exclude articles lacking effect evaluation cases; (40) Non-Chinese and English literature.

2.2. Literature retrieval

The PubMed database, Cochrane Library, China HowNet, Wanfang database, VIP database, etc. were searched for all the related literature published in the past three years. The search terms in the Chinese database included anxiety, fear, worry, surgery, pre-surgery, perioperative, children, children. The retrieval of foreign language databases included anxiety, fear, worry, operation, PREOPERATIVE AND PERIOACTIVE PERIOD, children, children, children.

2.3. Quality evaluation

During literature screening and data collection, two uniformly trained investigators were assigned to complete literature screening and data collection independently. If there were differences on whether to include literature or not, and the accuracy of data extraction, the two people would first duplicate the literature content and screening criteria together, and try to reach an agreement through consultation. If the differences still cannot be resolved after consultation, a third expert with more than 5 years of experience in evidence-based medicine research would be invited to intervene, and the unified result would be finalized.

2.4. Statistical methods

Meta-analyses were performed using the RevMan5.3 software in a unified manner and the chi-square test in combination with the I-value was used to assess heterogeneity between included studies. First, the heterogeneity of all included studies was assessed by the chi-square test. If the result of the chi-square test was $P > 0.05$ and $I < 50\%$, it indicated that the heterogeneity among included studies was small, and the

meta-analysis could be conducted. If the result of the chi-square test was $P < 0.05$ and $I > 50\%$, it indicated that there was significant heterogeneity among included studies. After the heterogeneity treatment was completed, if there was still a certain heterogeneity among studies, the random effect model was used for merger analysis.

3. Results

3.1. Basic characteristics of included articles

In this study, 6724 related articles were preliminarily collected. Subsequently, the research team conducted layer-by-layer screening in strict accordance with the preset inclusion criteria and exclusion criteria, and finally determined that 15 RCTs met the requirements and were included in the Meta-analysis. The literature screening process, basic characteristics of included literature, and quality evaluation results can be referred to in Figure 1, Table 1, and Table 2.

Table 1. Basic characteristics of included articles

Inclusion studies	Sample size (example)		Intervention measure		Anxiety Assessment Scale
	T	C	T	C	
Yao Lingli ^[2]	50	50	Medical narrative role play combined with immersive virtual reality technology distraction intervention	Routine care	Cm-YPAS
Zeng Xiaoping ^[3]	40	40	Children's fun games health education combined with video distraction	Routine care	Cm-YPAS
Zhou Hechao ^[4]	thirty	thirty	Preoperative inter induction combined with tour seamless nursing	Routine care	mT-PAS, S-AI
Peng Xiuxiu ^[5]	55	55	Diversified interest induction	Routine care	mYPAS
Li Wenxia ^[6]	fifty-two	51	Diversified interests induction combined empathy feedback	Routine care	SCAS, mYPAS
Wu Shengnan ^[7]	thirty	thirty	play therapy	Routine care	m-YPAS
Li Jiayu ^[8]	thirty	thirty	Virtual reality technology	Routine care	m-YPAS-SF
Sasha Wang ^[9]	40	40	Virtual reality technology combined with clown care	Routine care	CAM-S
Zhang Lihua ^[10]	50	50	Virtual reality guided relaxation training	Routine care	Cm-YPAS
Tang Lin Rui ^[11]	43	43	virtual roaming	Routine care	Cm-YPAS
Teresa Teng ^[12]	62	62	Picture book reading combined scenario simulation	Routine care	mYPAS
Jiang Li ^[13]	thirty	thirty	Medical gaming coaching	Routine care	Cm-YPAS
Wei Xiaofu ^[14]	43	43	Rehearsal-type medical doll intervention	Routine care	mYPAS-SF
Mathias ^[15]	80	80	distraction	Routine care	m-YPAS
Carbó ^[16]	120	121	Virtual reality technology	Routine care	mYPAS

3.2. Included in the literature quality evaluation

Table 2. Quality evaluation of included articles

Inclusion studies	Assign hidden	Blind method	Withdrawal/loss of visit	Selective reporting	Literature quality evaluation	Baseline comparability
Yao Lingli ^[2]	Not mentioned	without	without	Not mentioned	b grade	be comparable

Inclusion studies	Assign hidden	Blind method	Withdrawal/loss of visit	Selective reporting	Literature quality evaluation	Baseline comparability
Zeng Xiaoping ^[3]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Zhou Hechao ^[4]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Peng xiuxiu ^[5]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Li Wenxia ^[6]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Wu Shengnan ^[7]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Li Jiayu ^[8]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Sasha Wang ^[9]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Zhang Lihua ^[10]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Tang Lin Rui ^[11]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Teresa Teng ^[12]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Jiang Li ^[13]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Wei Xiaofu ^[14]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Mathias ^[15]	Not mentioned	without	without	Not mentioned	b grade	be comparable
Carbó ^[16]	Not mentioned	without	without	Not mentioned	b grade	be comparable

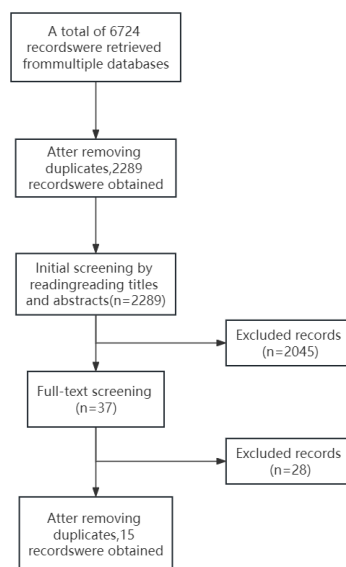


Figure 1. Document screening process.

3.3. Consistency check

Non-drug intervention methods were compared with conventional nursing in all included studies, and there was no direct comparison between different non-drug therapies, so they were not suitable for a consistency test.

3.4. Network structure diagram

Among the included non-drug interventions, the studies that compared virtual reality technology, game therapy, and diversified interest induction with conventional care were the most, while the studies that compared picture book scenario simulation, medical doll intervention, attention dispersion method, interest induction combined with seamless care and conventional care were less, but they were all indirect comparisons, as shown in **Figure 2**.

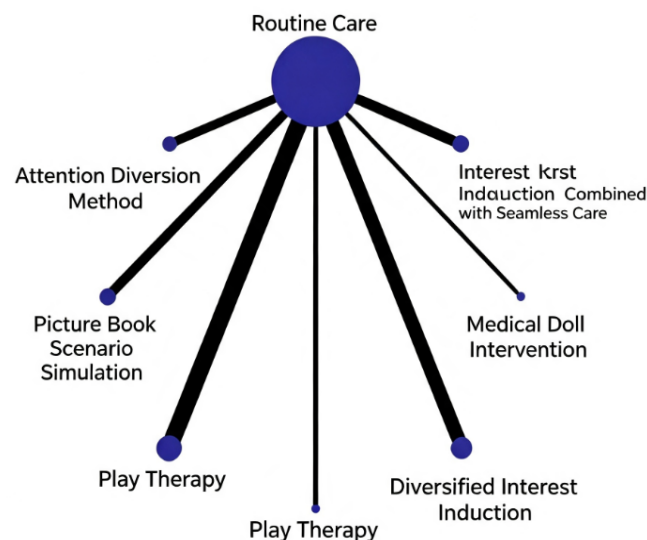


Figure 2. Mesh meta-analysis comparison network.

3.5. Reticulated meta-analysis results

Compared with routine nursing care, the virtual reality technology had a better effect of relieving preoperative anxiety in children undergoing surgery, and the difference was statistically significant ($P < 0.05$). Among the seven included intervention measures, the difference between virtual reality technology, the simple attention dispersion method, and conventional nursing was statistically significant ($P < 0.05$). There was no significant difference between virtual reality technology and other non-drug interventions ($P > 0.05$).

3.6. Ranking

According to the cumulative probability chart, the effects of different non-drug interventions on pre-operative anxiety in children undergoing pediatric surgery were ranked as follows: virtual reality technology, game therapy, diversified interest induction, picture book scenario simulation, interest induction combined with

seamless care, medical doll intervention, concentration dispersion method, and conventional care, as shown in **Figure 3**.

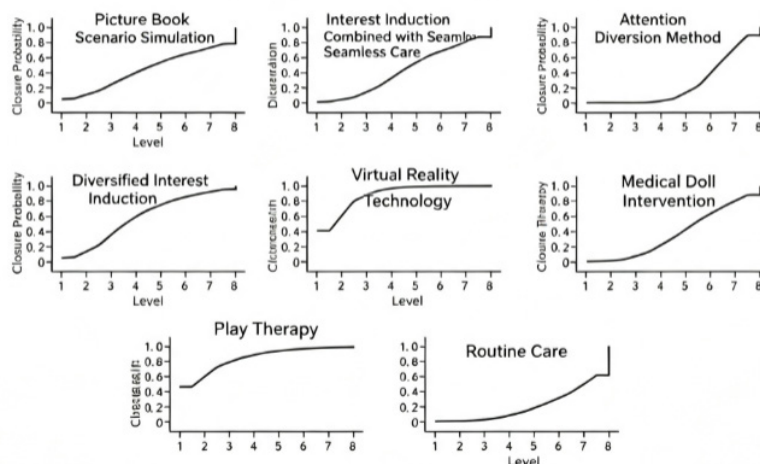


Figure 3. Ranking probability diagram.

4. Discussion

The results of this meta-analysis showed that virtual reality technology was the optimal intervention plan to improve pre-operative anxiety in pediatric children. Through simulating the operating room environment and reducing the diagnosis and treatment process, the technology could correct children's unknown fear of surgery and eliminate negative emotions from the cognitive level. At the same time, the use of scene transfer can distract children's attention and significantly reduce pre-operative anxiety levels. Game therapy and diversified interest induction are second only to virtual reality technology^[17]. The study pointed out that game therapy fits children's psychological development characteristics, can weaken the medical scene's strangeness and fear, improve children's cooperation degree during operations, and the effect of alleviating anxiety is significant^[18]. Our study has confirmed that diversified interest induction can transfer children's attention through diversified interest intervention. It is simple and noninvasive to operate, and suitable for grassroots clinical promotion. However, the intervention is mostly instant emotional comfort, and there is no systematic cognitive intervention, so the overall efficacy is weaker than that of virtual reality technology. Although picture book scene simulation and medical doll intervention had a certain intervention effect, the intervention form was single, and the effect dimension was limited. They were only suitable for young preschool children and had poor universality. This study found that simple distraction intervention had the weakest effect, could only achieve instantaneous attention transfer, and could not improve the cognitive deviation of children from the root cause of the operation. The sustainability of intervention was very poor. Conventional nursing care only provided basic health education and there was no targeted anxiety intervention, so it had the worst effect on relieving anxiety and could be used as the baseline of clinical control.

5. Conclusion

In summary, the results of the meta-analysis recommend the use of virtual reality technology, game therapy, and diversified interest induction Meta relieve preoperative anxiety in children undergoing pediatric surgery.

Disclosure statement

The authors declare no conflict of interest.

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