SYSTEMATIC REVIEW

Thaumaturgical Distraction as a Modality for Reducing Dental Anxiety in Children: A Systematic Review

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Abstract

Background: Dental fear and anxiety have become a major obstacle for children to accept dental treatment. Dental anxiety ranks fifth among common fears.

Aim: The aim of this current systematic review is to assess the effect of thaumaturgical distraction in reducing anxiety in children undergoing dental procedures.

Materials and methods: This current systematic review was registered in Prospero (CRD42023411750) following PRISMA guidelines. Electronic searches were performed in the databases: PubMed, Scopus, Web of Science, and Google Scholar. The search was conducted from inception to March 1, 2024. A broader search strategy was used to prevent missing articles. The search was performed using broad terminology: ((thaumaturgy) OR (magic)) AND (dental). ResearchGate was also consulted, and cross-references were reviewed on this topic to extract all available literature. Only randomized controlled trials are included for data synthesis. Narrative and systematic literature reviews are excluded. Evaluation of the risk of bias is planned using the ROB2 criteria of the Cochrane Collaboration.

Results: A total of 798 titles were screened by title and abstract rigorously by three independent evaluators. After duplicate exclusion and removal of irrelevant titles, 11 articles were included for full-text analysis, of which 6 qualified for final data synthesis.

Conclusion: Within the limits of the available studies, significantly lower anxiety is exhibited in the children treated under the thaumaturgical distraction group as opposed to the control group.

Keywords: Children, Dental anxiety, Distraction, Magic, Thaumaturgy.

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Introduction

Dentistry has made incredible developments in technologies, materials, and techniques, but the fear and anxiety of pediatric patients regarding dental treatment remain persistent. It has become a key obstacle for children in accepting dental treatment.[1] Dental anxiety ranks fifth among common fears. Dental anxiety in children and adolescents has a prevalence ranging from 5.7 to 20.2%.[2] Along with the prevention and management of dental caries, dental treatment should also focus on the psychological aspects that dental treatment can induce. Pediatric dental treatment is successful when a pediatric dentist not only focuses on the nature and severity of the disease but also on the interaction with the child, as rightly stated by McElory: "Even though the dental treatment may be perfect, it is considered a failure if the child is in tears after treatment."[3] For clinical success in pediatric dentistry, understanding behavior management is as important as knowledge of the materials to be used. Behavior management is an extensive, continuous methodology aimed at building a relationship between the child, parent, and doctor to eliminate fear and ultimately build trust. According to the American Academy of Pediatric Dentistry (AAPD), behavior management techniques range from nonpharmacological approaches to pharmacological interventions.

Even though the effectiveness of techniques like Tell-Show-Do is well recognized, it is not always appropriate or suitable for every child. A child can suffer from physical threats due to pharmacological interventions and physical restraints. Reinforcement and modeling techniques can be quite time-consuming and inefficient for the private practitioner to implement. Aversive techniques may show better responses, but due to the changing attitudes of parents and dentists toward these management techniques, nonaversive methods like distraction are gaining much popularity.[4] Distraction is a method that diverts the child's attention from an unpleasant stimulus. Distraction techniques are of two types: active distraction and passive distraction. In the active distraction technique, the child actively

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participates in activities that involve various sensory components, while in the passive distraction technique, the child observes activities rather than actively participating.[5]

Various distraction techniques are used to divert the child's mind from anxiety-evoking stimuli, such as audio distraction, audio-visual distraction,[6] audio story distraction,[7] video game distraction,[8] virtual reality distraction,[9] intellectual color games, stress ball distraction,[10] dog-assisted therapy distraction,[11] eye movement distraction,[12] distraction by medical clowns,[13] breathing exercises,[14] and hands-eyes-mouth distraction technique (HEM-DT).[15] The most widely used form of amusement for children is magic. Magic can be defined as "the art of creating illusions for entertainment purposes by the use of hand skills or illusive devices." Magic tricks are most effectively used as passive distraction techniques. Magic is based on the vital principles of insight, deception, and psychology.[16] Over the years, magic has been established both as a form of amusement and as a scientific technique of illusion. Healthcare revolves around both the workings of the mind and the body, and there exist methods in which magic can be applied practically. Magic is being used in various healthcare areas, including occupational therapy, humor therapy, psychotherapy, and pediatric nursing. It has been proposed that magic can play a major role in pain management. There is a substantial relationship between psychology and pain. Pain often originates in, and can therefore be influenced by, the mind. Thus, it is rightly said that the distraction of the mind is as necessary as the distraction of the eye.[17] Magic tricks can effectively be used in dental settings to draw the child's attention away from the dental procedure and help achieve cooperation.

This review aims to evaluate the effectiveness of magic tricks as a behavior guidance strategy in pediatric dental settings and to identify the levels of evidence regarding the effectiveness of such techniques.

Materials and Methods

This current systematic review was registered in Prospero (CRD42023411750). PRISMA guidelines were followed in the reporting of this systematic review. The search strategy is portrayed in Table 1 (Table 1: Search strategy). Electronic searches were performed in the databases: PubMed, Scopus, Web of Science, and Google Scholar. The search was conducted from inception to March 1, 2024. A broader exploration was done to avoid missing articles. The search was performed using broad terminology: ((thaumaturgy) OR (magic)) AND (dental). ResearchGate was also consulted, and cross-references were reviewed on this topic to extract all available literature. Only randomized controlled trials are included for data synthesis. Narrative and systematic literature reviews are excluded. Evaluation of the risk of bias is planned using the ROB2 criteria of the Cochrane Collaboration.

Table 1: Search strategy

Search terms	PubMed and Scopus	((Thaumaturgy) OR (magic)) AND (Dental)
	Web of Science	Magic and Dental
Search dates	Inception to 1 March 2024 Last search was performed on 1 March 2024	
Selection criteria	Inclusion	Randomized control trials, clinical studies, and case reports
	Exclusion	Narrative and systematic reviews

Results

An extensive literature search was carried out using a predefined search strategy in the selected databases (depicted in Table 1). A total of 798 titles were screened by title and abstract rigorously by three independent evaluators. After duplicate exclusion and removal of irrelevant titles, 11 articles were included for full-text analysis, of which 6 qualified for final data synthesis (Fig. 1: PRISMA flowchart of articles). The 6 studies included for final data synthesis are referenced.[16,18–22] The features of the studies included are mentioned in Table 2. Details of the studies excluded,[17,23–26] along with the reasons, are mentioned in Table 3.

Characteristic of Included Studies

Represented in Table 2, a total of 6 studies were included for the final qualitative data synthesis. Of these, three studies followed a systematic randomization process, where the allocation of groups was randomized.[16,19,22] Three studies did not follow randomization.[18,20,21] The age of children in the involved studies ranged from 3 to 13 years. Most of the children in the included studies were strong-willed, with a Frankl behavior rating scale of 4. Various magic tricks were used in the included studies, but thaumaturgy (magic thumb sleeve) was more commonly used. The treatments performed ranged from oral examination, radiographs, scaling, local anesthesia, and inferior alveolar nerve block (IANB). The outcome evaluated was anxiety in most of the studies, except the study by Peretz and Gluck,[18] where cooperation and behavior were evaluated. The comparison of magic tricks was carried out with Tell-Show-Do, audiovisual distraction, and mobile dental games. In most of the included studies, magic tricks showed a reduction in the anxiety of children compared to baseline.

Risk of Bias

Risk of bias evaluation in five domains was carried out using the Cochrane criteria of ROB2. There is a high risk of bias in domains such as randomization and outcome evaluation, leading to an overall high risk of bias in the studies included (Figs 2 and 3).

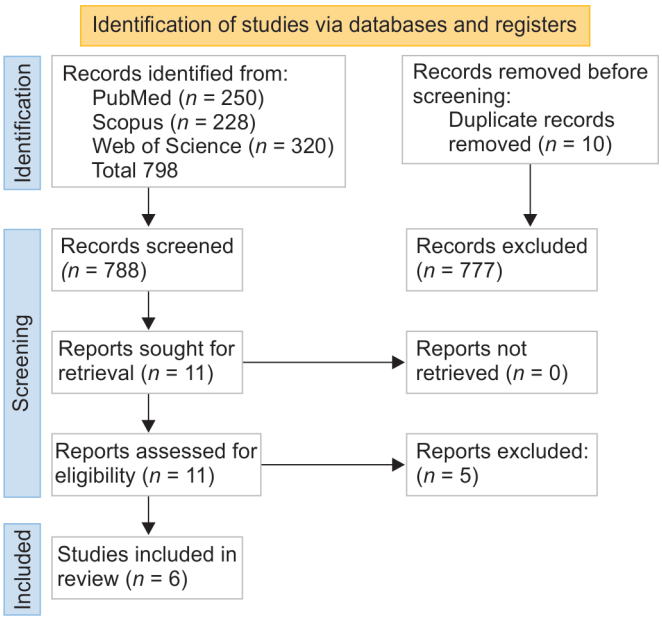

Fig. 1: PRISMA flowchart

Table 2: Characteristics of included studies

S. no.	*Author-year*	*Study design*	*Sample characteristics*	*Study group*	*Control group*	*Dental treatment for which the distraction was performed*	*Outcomes evaluated*	*Scale used*	*Results*	*Miscellaneous*
1.	Kothari et al., 2023	Randomize controlled pilot trial	30 children (4–6 years) with high anxiety were randomly divided into two groups	Magic trick distraction group (Thaumaturgy-Magic thumb)	Convectional group	IANB	Anxiety	RMS-PS scale (Raghavendra Madhuri Sujatha)	Children in thaumaturgy group (group I) exhibited significantly lower anxiety during IANB in comparison with children in the conventional group (group II) and the difference was statistically significant	Magic trick is effective in reducing anxiety from baseline for IANB administration
2.	Asokan et al., 2020	Randomized-controlled pilot trial	60 children (4–5 years) with high anxiety scores were randomly divided into three groups	Magic trick distraction group (Thaumaturgy-Magic thumb)	Mobile dental game (Lovely little dentist, Tell-Show-Do)	Ultrasonic scaling	Anxiety baseline and postintervention		Statistically significant reduction in the anxiety level was seen in children who received magic ($p = 0.001$), mobile dental game ($p < 0.001$), and TSD technique ($p < 0.001$)	Magic trick is effective in reducing anxiety from baseline
3.	Konde et al., 2020	Clinical study	240 children (aged 2–13 years) were divided into four groups based on the type of magic trick Each magic trick group was subdivided into four groups basing on the age Strong willed children with a FAS score of 3–5 were included in the study.	Thaumaturgy Magic thumb, item prediction trick, magic coloring book	Control	Local anesthesia	Anxiety evaluation		There has been a significant decrease in anxiety on usage of the thumb and light trick and book trick in the 2- to 7-year-old age-group, the book trick and item prediction trick in the 7- to 11-year-old age-group, and only the item prediction trick in the 11- to 13-year-old age-group	Thaumaturgy worked best in 2–7 year age-group
4.	Krishna Shree et al., 2022	Clinical study	60 children of the age-group 4–13 years, with Frankl scale 4 to 5	Thaumaturgy-Magic thumb,	Audio distraction using earphones, and video distraction using cartoons played on smartphones	Local anesthesia	Anxiety evaluation	Chota Bheem and Chutki anxiety scale	Mean anxiety levels reduced significantly from baseline to postintervention in all the groups	Thaumaturgy is effective in reducing the mean anxiety scores
5.	Thosar et al., 2022	Randomized clinical trial	30 children (4–11 years) were divided into two groups.	Thaumaturgy-Magic thumb	Audiovisual distraction	Restorations under rubber dam without local anesthesia usage	Vital signs anxiety	Venham's Picture test and modified visual analog scale	Both the groups had no statistically significant reduction in the anxiety as compared to baseline and there is no significant difference in both the groups	The hemodynamic parameters like blood pressure and pulse rate were seen to decrease during the second visit, while the oxygen saturation was seen to increase
6.	Peretz and Gluck 2005	Clinical trial	Seventy children aged 3–6 years of age who were identified as manifesting strong-willed behavior were divided into two groups	Magic trick 'magic book'; pictures could be erased magically and drawn again	Tell-Show-Do	Oral examination and radiographs	Time from the beginning of session to sitting on the dental chair for each child Cooperation for dental radiograph and Frankl behavior rating scale	Time taken and Frankl Behavior scale	Children in the magic trick group were exhibiting more cooperative behavior	

Outcomes Evaluated

Anxiety was the primary outcome evaluated in most of the included studies. Behavior was evaluated in only one study, by Peretz and Gluck.

Discussion

Dental fear and anxiety are the most common dental health problems, which can lead to uncooperative children. Around 22% of children seen by pediatric dentists have behavior management problems. It is of utmost importance to decrease the child's dental anxiety as early as possible, as this not only decreases the immediate fear but also helps avoid apprehension that may continue into later stages of life.[27] According to the theory stated by McCaul and Mallot, a patient's perception of pain can be decreased if their mind is diverted away from an unpleasant stimulus. Another theory explaining distraction is the limited attention capacity theory, which suggests that human capacity to concentrate on one stimulus is limited. Therefore, to perceive pain, one should concentrate on the stimuli causing pain. Many other neuro-physiological studies have signified the role of distraction in reducing pain levels, as there is a strong connection between the perception of pain and the attention a child gives to the unpleasant stimulus. Thus, based on these theories, distraction can be considered a major tool for managing the behavior of children in dental clinics. The distraction techniques influence the child's brain waves, aiding in relaxation and thereby reducing pain and anxiety.[28]

A number of distraction techniques can be used for managing a child's behavior in a dental clinic. The cognitive development of the child has an important effect on the selection of the method of distraction. Magic tricks are widely used as a form of delight and have a variety of applications in healthcare settings. They have been used in healthcare settings for many years. There are multiple programs, such as "Project Magic," "Healing of Magic," and "Open Heart Magic," that implement magic as a form of therapy for rehabilitation. Magic is used by many pediatricians

Table 3: List of excluded articles and reasons for exclusion

S. no.	*Title*	*Reason for exclusion*
1	Sharma et al., 2023[23]	Narrative review
2	Lam et al., 2017[17]	Scoping review in medicine
3	Asokan and Ajit 2011[26]	Not related to magic trick
4	Fayle 2006[25]	Not related to magic trick
5	Villamizar 2023[24]	Short communication

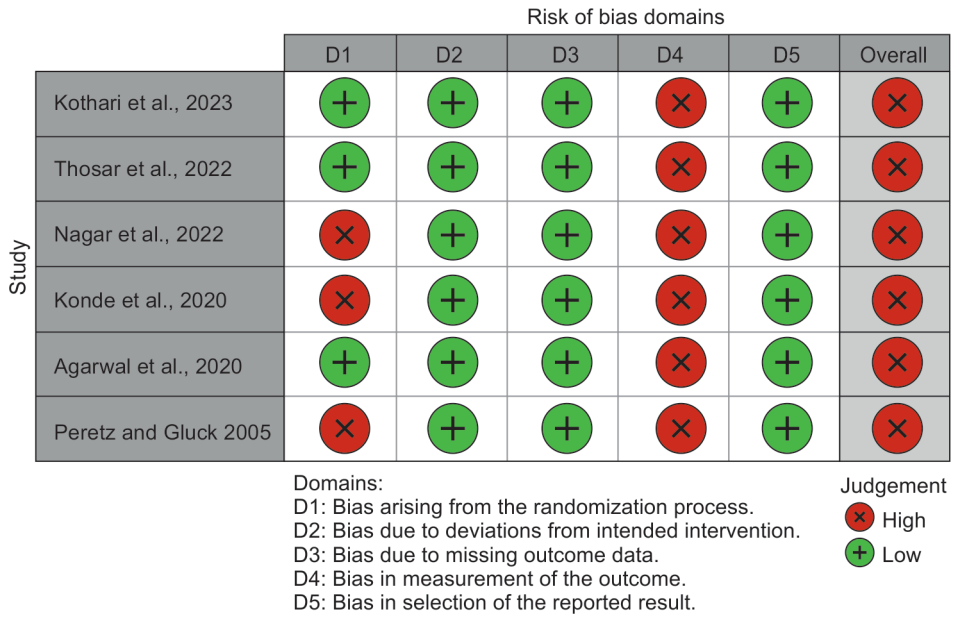

Fig. 2: Risk of bias traffic plot

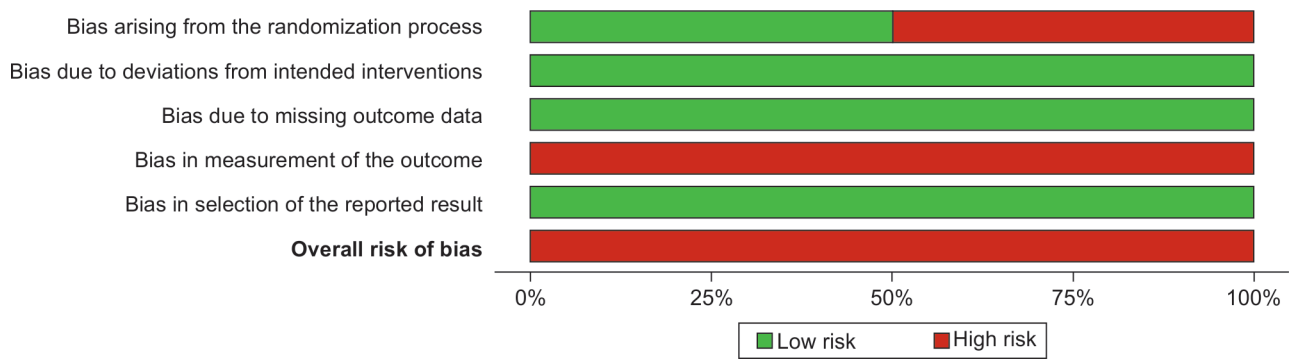

Fig. 3: Risk of bias summary

to ease patient tension. It is also effective in entertaining adult patients, thus relieving the tension of surgery.[29] Magic tricks are also one of the most effective tools in reducing anxiety in children related to dental treatment. A number of studies have been conducted to evaluate the effectiveness of magic tricks in reducing dental anxiety. The first randomized controlled trial by Peretz and Gluck compared magic tricks with the Tell-Show-Do technique and concluded that magic tricks were more effective than the Tell-Show-Do technique. Magic tricks facilitated two types of cooperative behavior: moving the child to the dental chair and enabling the dentist to take radiographs more easily.[18] Another clinical trial by Thosar et al. compared thaumaturgy (magic tricks) with audio-visual aids and concluded that magic tricks were equally effective as audio-visual aids for reducing anxiety in children during dental treatment.[19] Similar results were seen in a study by Nagar et al., where they compared different modes of distraction—magic tricks, audio-visual distraction, and audio distraction—and found that the highest anxiety alleviation was seen with the magic trick group.[20] Another study by Konde et al. assessed various magic tricks, such as the thumb and light trick, book trick, and item elimination trick, in various age-groups and concluded that the thumb and light and book tricks were beneficial in children from ages 2 to 6 years for anxiety reduction, while the book and item elimination tricks were beneficial in children above 6 years of age.[21] In a pilot randomized trial by Asokan et al., magic tricks were found to be correspondingly beneficial in reducing the anxiety of children when compared to a dental game on mobile and the Tell-Show-Do technique. A study by Kothari et al. compared magic tricks with conventional behavior management techniques and concluded that children in the magic trick group exhibited lower anxiety during the administration of local anesthesia when compared to other conventional techniques.

The current systematic review evaluated the effect of thaumaturgy on anxiety in children undergoing dental procedures. A total of six studies qualified for the final qualitative analysis. Quantitative data analysis was not carried out due to a deficiency of available data. In the majority of the included studies, the primary objective evaluated was anxiety. The results of the qualitative analysis report that there is significantly lower anxiety in procedures carried out under the thaumaturgy distraction method than in the control method. Various magic tricks were used in the included studies, but thaumaturgy (magic thumb sleeve) was more commonly used. The treatments performed ranged from oral examination, radiographs, scaling, local anesthesia, and IANB.

Limitations of the Current Study

The current systematic review included studies where the treatments performed varied, such as oral examination, radiographs, scaling, local anesthesia, and IANB. There was no availability of studies with a uniform treatment, and the age range of the children also varied greatly among the included studies.[3–13] The scales used to measure anxiety also varied across the individual studies (RMS-PS scale, Chota Bheem and Chutki anxiety scale, modified visual analog scale, and Venham Picture Test).

Directions for Future Research

There is a need to carry out more studies on thaumaturgy distraction for reducing the anxiety of children undergoing extractions, IANB, and infiltrations.

Conclusion

Within the limits of the available studies, significantly lower anxiety was exhibited in the children treated under the thaumaturgical distraction group as opposed to the control.

Author Contributions

The manuscript was prepared with the collaborative effort of all the authors. SPT planned the design and envisioned the topic. PL conducted the searches. LA performed the methodological part for the manuscript. PL and LA wrote the manuscript, and SPT edited it.

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