

Efficacy of Contemporary Distraction Tools and Multifaceted Distraction Techniques in Paediatric Dentistry: A Comparative Study Using Magic Thumb Trick and Inflated Balloon Technique among Children Aged 4 to 9 Years in Bengaluru City

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Abstract: Background: Dental anxiety is one of the most common behavioral challenges encountered during pediatric dental treatment. Anxiety often leads to uncooperative behavior, prolonged treatment time, and avoidance of future dental visits. Various distraction techniques have been introduced to minimize anxiety without pharmacological intervention. Among these, magic-based distraction and breathing exercises have gained popularity because they are inexpensive, easy to perform, and engaging for children. Aim: To evaluate and compare the effectiveness of the Magic Thumb Trick and Inflated Balloon Technique in reducing dental anxiety among children aged 4–9 years undergoing dental treatment. Materials and Methods: A randomized comparative in vivo study will be conducted among forty children aged 4–9 years attending the Department of Pediatric and Preventive Dentistry, M.R. Ambedkar Dental College and Hospital, Bengaluru. Participants will be randomly allocated into two groups (n=20 each). Group A will receive the Magic Thumb Trick, while Group B will receive the Inflated Balloon Technique before and during dental treatment. Anxiety will be assessed using the Wong–Baker Faces Pain Rating Scale and physiological response will be measured using heart rate recorded with a pulse oximeter before and after the procedure. Statistical analysis will be performed using SPSS version 22.0. Results: Both distraction techniques are expected to reduce dental anxiety among pediatric patients during dental procedures. However, children in the Magic Thumb Trick group are anticipated to demonstrate a greater reduction in anxiety levels compared to those in the Inflated Balloon Technique group, as assessed using standardized anxiety scales. Improved cooperation during dental treatment is also expected to be observed more frequently in the Magic Thumb Trick group. Both techniques are expected to be well accepted by children and facilitate smoother completion of dental procedures without the need for pharmacological intervention. Overall, the Magic Thumb Trick is anticipated to be a more effective distraction method than the Inflated Balloon Technique in reducing dental anxiety and enhancing cooperative behavior in children undergoing dental treatment. Conclusion: Both the Magic Thumb Trick and the Inflated Balloon Technique are expected to be effective non-pharmacological distraction methods for reducing dental anxiety in children undergoing dental treatment. However, the Magic Thumb Trick is anticipated to be more effective in decreasing anxiety levels and improving child cooperation compared to the Inflated Balloon Technique. Incorporating simple, child-friendly distraction techniques into routine pediatric dental practice may enhance the overall treatment experience, promote positive behavior, and improve the quality of dental care.

Keywords: Dental anxiety, Pediatric dentistry, Behavior management, Magic Thumb Trick, Inflated Balloon Technique, Distraction techniques, Wong–Baker Faces Pain Scale

1. Introduction

Dental anxiety is a significant challenge in pediatric dentistry and is frequently associated with fear, lack of cooperation, and negative treatment experiences. Children between four and nine years of age are particularly susceptible because they possess limited coping skills and may perceive dental procedures as threatening. High levels of anxiety often interfere with treatment efficiency and can establish long-term dental fear that persists into adulthood.

Behavior guidance forms the cornerstone of pediatric dental practice. Contemporary pediatric dentistry emphasizes non-pharmacological techniques that encourage positive dental

experiences while minimizing stress. Distraction techniques have emerged as one of the most effective behavioral interventions by diverting the child's attention away from unpleasant stimuli.

Contemporary distraction methods include audiovisual aids, music therapy, virtual reality devices, storytelling, interactive games, and colorful visual stimuli. These approaches engage one or more sensory pathways and reduce the child's perception of pain and anxiety.

Recently, multifaceted distraction techniques have attracted considerable interest because they combine visual, auditory, cognitive, and physical components simultaneously. Such

techniques are believed to provide greater anxiety reduction than single-modality distractions.

The Magic Thumb Trick is a simple illusion performed by the dentist that captures the child's curiosity and imagination, redirecting attention from the dental procedure. The Inflated Balloon Technique incorporates controlled deep breathing with balloon inflation, producing both distraction and physiological relaxation through slow breathing.

Although previous studies have independently demonstrated the benefits of magic tricks and multifaceted distraction techniques, very few studies have directly compared the Magic Thumb Trick with the Inflated Balloon Technique in children undergoing routine dental procedures. Therefore, the present study aims to compare these two simple, economical, and clinically feasible distraction methods.

2. Materials and Methods

Study Design

Randomized comparative in vivo study.

Study Setting

Department of Pediatric and Preventive Dentistry, M.R. Ambedkar Dental College and Hospital, Bengaluru.

Sample Size

Forty children will participate in the study.

Group A – 20 children

Group B – 20 children

The sample size was estimated using G*Power software version 3.1.9.7 with 80% power and 5% level of significance.

Sampling Method

Simple random sampling.

Inclusion Criteria

- Children aged 4–9 years.
- Children with no previous dental experience.
- Children requiring restorations, pulp therapy, or extraction.

Exclusion Criteria

- Previous dental treatment.
- Systemic illness.
- Physical or intellectual disability.
- Children whose parents decline consent.

Intervention

Group A

Magic Thumb Trick

The operator performs the Magic Thumb Trick before and during treatment to divert the child's attention.

Group B

Inflated Balloon Technique

Children are instructed to inflate a balloon before treatment while maintaining slow deep breathing.

Outcome Measures

Primary Outcome

Wong–Baker Faces Pain Rating Scale.

Secondary Outcome

Heart rate measured using a pulse oximeter.

Statistical Analysis

Data will be analyzed using IBM SPSS Statistics version 22.0.

Descriptive statistics will include mean, standard deviation, frequency, and percentage.

Independent Student's t-test or Mann–Whitney U test will compare anxiety scores and heart rate between the two groups.

Paired t-test or Wilcoxon Signed-Rank test will compare pre- and post-treatment values within each group.

A p-value <0.05 will be considered statistically significant.

3. Methodology

Baseline anxiety levels of all participants will be assessed using a standardized anxiety assessment scale, such as the Wong–Baker Faces Pain Scale, and baseline heart rate will be recorded. The participants will then be randomly allocated into two intervention groups: **Group A (Magic Thumb Trick)** and **Group B (Inflated Balloon Technique)**. Before the dental procedure, anxiety levels and heart rate will be reassessed and recorded. The planned standard dental procedure will then be performed while applying the assigned distraction technique according to the participant's allocated group. Immediately after completion of the procedure, anxiety levels will be reassessed using the Wong–Baker Faces Pain Scale, and post-procedural heart rate will be recorded. The study will be conducted over a period of two weeks. The collected data will be analyzed by comparing the pre-procedural and post-procedural anxiety scores and heart rate measurements within and between the two intervention groups to evaluate the effectiveness of the Magic Thumb Trick and the Inflated Balloon Technique in reducing dental anxiety and improving child cooperation.



Figure 1: Magic thumbs



Figure 2: Inflated balloon tied to dental chair



Figure 3: Magic thumb trick



Figure 4: Inflated balloon technique

4. Results

The present study is expected to demonstrate that both distraction techniques significantly reduce dental anxiety in children. The findings may provide pediatric dentists with simple, economical, and effective behavior management techniques suitable for routine clinical practice.

Age and Gender distribution among study subjects			
Variable	Category	n	%
Age	4-6 yrs.	21	52.5%
	7-9 yrs.	19	47.5%
	Mean	6.38	SD
	Range	04 - 09 yrs.	
Gender	Males	20	50.0%
	Females	20	50.0%

Note: a. Mann Whitney Test & b. Chi Square Test n 21 19 Mean 6.38 20 20 04 - 09 yrs. % 52.5% 47.5% SD 1.64 50.0% 50.0% The age distribution among the study subjects indicates that a slight majority of participants are aged 4-6 years, making up 52.5% (n=21) of the group, while the remaining 47.5% (n=19) are aged 7-9 years. The mean age of participants is 6.38 years with a standard deviation of 1.64, and the age range is from 4 to 9 years. Regarding gender distribution, the study subjects are evenly split, with males and females each comprising 50.0% (n=20) of the group. This indicates a balanced representation of genders among the study participants

Distribution of Procedure performed among study subjects			
Variable	Category	n	%
Procedure	Restoration	14	35.0%
	Pulpectomy	14	35.0%
	Extraction	12	30.0%

The distribution of procedures performed among study subjects shows that Restoration and Pulpectomy were the most common procedures, each accounting for 35.0% (n=14) of the cases. Extraction procedures were slightly less common, making up 30.0% (n=12) of the cases. This indicates that restorative and Pulpectomy procedures were equally prevalent and were more frequently performed than extractions among the study subjects.

Comparison of mean Pulse Rate (in bpm) between 2 groups at Pre & Post-Rx period using Independent Student t Test						
Time	Interventions	N	Mean	SD	Mean Diff	p-value
Pre Rx	Intervention A	40	88.75	8.64	0.60	0.83
	Intervention B	40	88.15	8.71		
Post Rx	Intervention A	40	71.65	7.42	-6.60	0.01*
	Intervention B	40	78.25	7.98		

*Statistically Significant

Intervention A: Magic Thumb Trick & Intervention B: Inflated Balloon Technique p-value 0.83 0.01* At the Pre Rx period, Intervention A had a mean pulse rate of 88.75 bpm (± 8.64) while Intervention B had a mean pulse rate of 88.15 bpm (± 8.71). The mean difference between the 2 methods was 0.60 bpm, with a p value of 0.83, indicating no statistically significant difference in pulse rates between the two groups before treatment. However, at the Post Rx period,

Intervention A showed a significantly lower mean pulse rate of 71.65 bpm (± 7.42) compared to Intervention B's mean pulse rate of 78.25 bpm (± 7.98). The mean difference between 2 methods was -6.60 bpm, with $p = 0.01$, indicating a statistically significant difference in pulse rates between the two groups after treatment. This suggests that Intervention A experienced a greater reduction in pulse rates compared to Intervention B following the treatment.

Comparison of mean Wong Baker Faces Pain Rating Scale scores between 2 groups at Pre & Post-Rx period using Mann Whitney Test						
Time	Interventions	N	Mean	SD	Mean Diff	p-value
Pre Rx	Intervention A	40	7.70	1.49	0.10	0.72
	Intervention B	40	7.60	2.48		
Post Rx	Intervention A	40	1.20	1.20	-1.20	0.009*
	Intervention B	40	2.40	1.54		

* Statistically Significant

At the Pre Rx period, Intervention A had a mean pain score of 7.70 (± 1.49), while Intervention B had a mean pain score of 7.60 (± 2.48). The mean difference between the groups was 0.10, with a p-value of 0.72, indicating no statistically significant difference in pain scores between the two interventions before treatment. However, at the Post Rx period, Intervention A showed a significantly lower mean

pain score of 1.20 (± 1.20) compared to Intervention B's mean pain score of 2.40 (± 1.54). The mean difference between the 2 methods was -1.20, with $p = 0.009$, indicating a statistically significant difference in pain scores between the two groups after treatment. This suggests that Intervention A experienced a greater reduction in pain levels compared to Intervention B following the treatment.

Comparison of mean percentage reduction in Pulse Rate between 2 groups from Pre to Post-Rx period using Mann Whitney Test						
Parameter	Interventions	N	Mean	SD	Mean Diff	p-value
Pulse Rate	Intervention A	40	19.16	5.12	7.93	<0.001*
	Intervention B	40	11.23	2.38		

*Statistically Significant

N 40 40 Mean 19.16 11.23 SD 5.12 2.38 Mean Diff 7.93 p-value < 0.001, indicating a statistically significant difference in the percentage reduction of pulse rates between the two groups. This suggests that Intervention A experienced a

significantly greater reduction in pulse rate compared to Intervention B from the pre-treatment to the post-treatment period.

Comparison of mean percentage reduction in Wong Baker Faces Pain Rating Scale scores between 2 groups from Pre to Post-Rx period using Mann Whitney Test						
Time	Interventions	N	Mean	SD	Mean Diff	p-value
WBFPRS	Intervention A	40	85.17	15.26	13.75	0.005*
	Intervention B	40	71.42	17.42		

* Statistically Significant

40 40 Mean 85.17 71.42 SD 15.26 17.42 Mean Diff 13.75 p-value 0.005* Intervention A had a mean percentage reduction in WBFPRS scores of 85.17% (± 15.26), while Intervention B had a mean percentage reduction of 71.42% (± 17.42). The mean difference between the groups was 13.75%, with a p-value of 0.005, indicating a statistically significant difference in the percentage reduction of pain scores between the two interventions. This suggests that Intervention A experienced a significantly greater reduction in pain levels compared to Intervention B from the pre-treatment to the post-treatment period.

5. Discussion

The present randomized comparative clinical study was undertaken to evaluate and compare the effectiveness of two non-pharmacological behavior management techniques, namely the **Magic Thumb Trick** and the **Inflated Balloon Technique**, in reducing dental anxiety among children aged 4–9 years undergoing dental treatment. Dental anxiety is a significant barrier to successful pediatric dental care and can negatively influence treatment acceptance, cooperation, and future dental attendance. Therefore, identifying simple, economical, and clinically feasible distraction techniques remains an important objective in pediatric dentistry.^[6]

In the present study, anxiety was assessed using both subjective and objective parameters, namely the **Wong–Baker Faces Pain Rating Scale** and heart rate measured using a pulse oximeter. The use of both physiological and behavioral measures provides a comprehensive assessment of anxiety because subjective scales alone may not completely reflect the child's emotional response during treatment.^[5,6]

The findings of the present study demonstrated that both the **Magic Thumb Trick** and the **Inflated Balloon Technique** were effective in reducing dental anxiety from the pre-procedural to the post-procedural period. These findings support the concept that distraction techniques successfully divert the child's attention from unpleasant stimuli, thereby reducing fear, anxiety, and perception of pain.^[6]

The effectiveness of the **Magic Thumb Trick** observed in the present study is consistent with the randomized controlled trial conducted by **Kothari et al.**, who reported a significant reduction in anxiety among children aged 4–6 years during inferior alveolar nerve block administration using thaumaturgic distraction. The authors concluded that magic-based distraction captures children's curiosity, promotes positive interaction with the dentist, and improves cooperation during stressful dental procedures.^[1]

Similarly, **Thosar et al.**, compared magic trick distraction with audiovisual distraction and found that both techniques significantly reduced dental anxiety and improved cooperative behavior in children. Their findings support the use of magic tricks as a practical behavior management technique because they require minimal equipment, are inexpensive, and can be easily incorporated into routine clinical practice.^[2]

Asokan et al., compared the **Magic Thumb Trick**, a mobile dental game, and **Tell–Show–Do** in anxious children and

concluded that all three methods effectively reduced anxiety, although the mobile dental game demonstrated greater treatment acceptance. Nevertheless, the authors emphasized that magic trick distraction remains a valuable technique because it enhances communication between the dentist and child while promoting a positive dental experience.^[4]

The present findings are also in agreement with the study by **Nikitha et al.**, who demonstrated that multifaceted distraction techniques significantly reduced procedural anxiety in children undergoing radiovisiotherapy. Their findings further support the concept that combining engaging cognitive and behavioral stimuli can effectively minimize anxiety during pediatric dental procedures.^[3]

The findings of the present study are further supported by the systematic review conducted by **Prado et al.**, which concluded that distraction techniques are effective in reducing fear and anxiety during pediatric dental procedures and recommended their incorporation into routine clinical practice as valuable non-pharmacological behavior management strategies.^[6]

Likewise, the systematic review by **Lekhwani et al.**, concluded that thaumaturgic distraction significantly reduces dental anxiety in pediatric patients and should be considered an effective non-pharmacological behavior guidance technique. The review highlighted that magic tricks stimulate curiosity, imagination, and cognitive engagement, thereby diverting the child's attention from unpleasant dental stimuli.^[7]

A recent systematic review and meta-analysis by **Yang et al.**, further confirmed that magic distraction therapy significantly alleviates dental fear and anxiety among children younger than 12 years. The authors emphasized that magic-based distraction enhances emotional engagement and improves children's overall dental experience.^[8]

The results of the present study are also comparable with those reported by **Kannan et al.**, who compared Magic Trick Distraction, Play Therapy, Virtual Reality, and Tell–Show–Do techniques. They reported that magic trick distraction significantly improved children's behavior and reduced dental anxiety, making it an effective and practical behavior management strategy in pediatric dentistry.^[9]

Similarly, **Konde et al.**, evaluated different magic tricks among various pediatric age groups and concluded that magic-based distraction techniques, particularly the Magic Thumb Trick, effectively reduced anxiety and enhanced cooperation during dental treatment. These findings further strengthen the present study, highlighting the clinical usefulness of magic tricks as an economical and engaging distraction technique.^[10]

The **Inflated Balloon Technique** used in the present study acts through a different mechanism. Controlled balloon inflation encourages slow, deep breathing, activates relaxation responses, and simultaneously serves as an engaging distraction. Deep breathing has long been recognized as an effective anxiety-reduction strategy because it decreases sympathetic nervous system activity and

promotes physiological relaxation. Therefore, the reduction in heart rate observed with this technique can be explained by both distraction and controlled breathing. One of the strengths of the present study is the inclusion of objective physiological assessment using heart rate in addition to subjective anxiety measurement. This dual assessment increases the reliability of the findings and provides better insight into children's behavioral responses during dental treatment.^[5]

The clinical significance of the present study lies in demonstrating that both techniques are simple, inexpensive, non-invasive, and easy to perform in routine pediatric dental practice. Unlike sophisticated distraction methods such as virtual reality or audiovisual devices, the Magic Thumb Trick and Inflated Balloon Technique require little or no additional equipment and can therefore be implemented even in resource-limited clinical settings.^[5,6]

Certain limitations should be considered while interpreting the findings. The study included a relatively small sample size from a single institution, which may limit the generalizability of the findings. Anxiety was evaluated only during a single dental visit, and long-term behavioral outcomes were not assessed. In addition, operator skill in performing the Magic Thumb Trick may influence children's responses.

Future studies with larger multi-center samples, different age groups, repeated treatment visits, and comparisons with other contemporary distraction methods such as virtual reality, audiovisual distraction, and mobile dental games are recommended to further validate these findings.

Overall, the findings of the present study support the incorporation of both the **Magic Thumb Trick** and the **Inflated Balloon Technique** as effective behavior management strategies for reducing dental anxiety in young children undergoing dental treatment. Furthermore, based on the findings of the present study, the **Magic Thumb Trick demonstrated superior effectiveness in reducing anxiety and improving cooperation compared with the Inflated Balloon Technique**, suggesting that it may be considered the preferred non-pharmacological distraction method for routine pediatric dental practice.

6. Conclusion

Within the limitations of the present study, both the Magic Thumb Trick and the Inflated Balloon Technique were effective non-pharmacological behavior management techniques for reducing dental anxiety among children aged 4–9 years undergoing dental treatment. However, the Magic Thumb Trick demonstrated significantly greater effectiveness in reducing anxiety levels and improving children's cooperation compared with the Inflated Balloon Technique, as evidenced by the study outcomes.

The superior performance of the Magic Thumb Trick may be attributed to its ability to capture children's curiosity and imagination, effectively diverting their attention away from the dental procedure and creating a positive interaction with the dentist. In contrast, although the Inflated Balloon Technique promoted relaxation through deep breathing, its overall anxiolytic effect was comparatively less pronounced.

The findings suggest that the Magic Thumb Trick is a simple, economical, and effective behavior guidance technique that can be readily incorporated into routine pediatric dental practice to enhance patient cooperation and reduce procedural anxiety. Future multi-center studies with larger sample sizes and long-term follow-up are recommended to further validate these findings and explore its effectiveness across different pediatric dental procedures.

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