

A Comparative Study of the CARD™ System and Tell-show-do Technique in the Behavior Management of 6–10-year-old Children

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ABSTRACT

Background: Dental fear and anxiety are common issues affecting pediatric dental care, leading to challenges in treatment delivery and patient compliance. Nonpharmacological techniques such as the tell-show-do (TSD) method and CARD™ system have emerged as effective strategies for managing child dental anxiety.

Aim: This study aims to compare the effectiveness of the CARD™ system and TSD technique in managing the behavior of 6–10-year-old children during dental procedures.

Methods: Forty children requiring invasive dental treatments were randomly assigned to either the TSD technique (group 1, $n = 20$) or CARD™ system (group 2, $n = 20$) groups. Physiological parameters (oxygen saturation and pulse rate) and behavioral responses (evaluated using the Facial Image Scale) were assessed before and after procedures. Data were analyzed using t -tests and Mann–Whitney U tests as appropriate.

Results: No statistically significant differences were found between the techniques regarding physiological parameters or behavioral responses. Both groups exhibited comparable oxygen saturation levels (CARD™: 98.00 ± 1.02 ; TSD: 98.00 ± 1.12) and pulse rates (CARD™: 87.45 ± 7.28 bpm; TSD: 90.30 ± 10.26 bpm) before procedures, with minimal changes observed postprocedure. Similarly, there were no significant differences in emotional responses assessed by the Facial Image Scale before (CARD™: 1.90 ± 0.85 ; TSD: 1.80 ± 0.76) or after procedures (CARD™: 2.80 ± 1.60 ; TSD: 2.95 ± 1.50).

Conclusion: This study suggests that the CARD™ system and TSD technique are equally effective in managing child dental anxiety. Both methods offer viable options for reducing anxiety and enhancing cooperation during dental procedures.

Keywords: Behavior management, CARD™ system, Dental anxiety, Pediatric dentistry, Tell-show-do technique.

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INTRODUCTION

Dental fear and anxiety are prevalent psychological issues that significantly impact the provision of dental care, particularly in pediatric patients.¹ These reactions can interfere with daily activities and present considerable challenges in delivering adequate dental treatments.² Several factors contribute to the development of dental fear and anxiety in children, including previous negative experiences, parental anxiety, and the child's temperament. Fear of the unknown, sight and sound of dental instruments, and potential for pain are common triggers. Dental fear can lead to avoidance of dental care, which exacerbates oral health problems and creates a cycle of increasing anxiety and deteriorating oral health.³ Therefore, addressing dental fear and anxiety in children is essential for their overall well-being and successful dental treatment outcomes.⁴

Various methods have been developed to manage children's behavior during dental visits, with nonpharmacological techniques gaining popularity due to their safety and effectiveness.^{5,6} These methods include parental presence and reassurance, distraction, relaxation techniques, systematic desensitization, modeling, and the use of music or light physical contact. Previous studies have shown that these nonpharmacological techniques can effectively reduce anxiety and improve cooperation in pediatric patients, offering a safer and more holistic approach for managing child dental anxiety compared to pharmacological interventions.⁷ Among the various nonpharmacological techniques, the tell-show-do (TSD) technique

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is one of the most widely used techniques in pediatric dentistry.⁸ TSD involves explaining the dental procedures to the child (tell), demonstrating the procedures using models or instruments (show), and then performing the procedure (do). This step-by-step approach aims to familiarize children with dental procedures, reduce their fear through clear communication, and build trust between the dentist and child. The effectiveness of the TSD technique has been well documented in previous studies,^{9,10} which have shown that it can significantly reduce anxiety and improve cooperative behavior in children. Its simplicity and efficacy have made it a popular choice among pediatric dentists for managing child dental anxiety.

The CARD™ system represents a newer approach that empowers children by involving them in managing their dental anxiety. This system educates children on various evidence-based coping strategies, categorized into four letters: Comfort, Ask, Relax, and Distract.¹¹ During dental treatment, children can choose their preferred coping interventions from these categories, fostering a sense of control and participation in their care. The limited literature on the CARD™ system is available compared to the extensive research on the TSD technique.¹² However, preliminary studies suggest that involving children in selecting coping strategies can enhance their sense of agency and reduce anxiety.¹³ The need for this study arises from the lack of comprehensive research comparing the effectiveness of the CARD™ system to the well-established TSD technique. This study aims to fill this gap by systematically evaluating the anxiety levels, physiological parameters, and behavioral responses of children managed with these two techniques, with the primary objective being to find the effectiveness of the CARD™ system technique in managing the behavior of 6–10-year-old children during dental procedures. Specifically, the study aims to determine which method is more effective in reducing anxiety and enhancing cooperation among pediatric patients. The null hypothesis is that there is no significant difference in the effectiveness of the CARD™ system and TSD technique in managing child dental anxiety. By systematically assessing anxiety levels and physiological and behavioral parameters before and after the procedures, this study will provide a comprehensive comparison of the two techniques.

MATERIALS AND METHODS

Study Design and Sample Size Estimation

This cross-sectional prevalence study aims to compare the effectiveness of the CARD™ system and TSD technique in managing the behavior of 6–10-year-old children during dental procedures. Conducted at the Department of Pedodontics & Preventive Dentistry, the study received approval from the Institutional Review Board and ethical clearance from the Institutional Human Ethics Committee (IHEC) and the sub-board (approval number: IHEC-CDCRI/2024/STU-0012). This detailed methodology adhered to the CONSORT guidelines for reporting clinical trials, ensuring transparency and reproducibility. All procedures followed the ethical standards outlined in the Declaration of Helsinki (1964) and its subsequent amendments. Sample size estimation using G*Power software (version 3.1.9.2) with a priori power analysis for *t*-tests of independent means yielded a total sample size of 40 (20 participants per group), with parameters set at α error of 0.05, β error of 0.02, power of the test at 98%, and effect size (Cohen's *d* statistic) of 1.3463 (determined from Raseena et al., 2020).¹⁴

Participants

Children aged 6–10 years were recruited from the Department of Pedodontics & Preventive Dentistry for procedures requiring local anesthesia. Participants were selected based on specific inclusion and exclusion criteria to ensure group homogeneity. Inclusion criteria encompassed should be children who are visiting dental setup for the first time, physically and mentally healthy children demonstrating positive behavior according to Wright's modification of Frankl's Behavior Rating Scale, necessitating an inferior alveolar nerve block for dental procedures such as extractions, pulpomies, or restorations. Informed consent was obtained from children to their parents or guardians for participation.

Exclusion criteria included children with prior dental treatment experience, history of unpleasant dental visits, acute painful oral conditions, known systemic diseases, recent prolonged hospitalization, or physical disabilities. Participants who did not provide informed consent were also excluded from the study.

Intervention Groups

Group 1: TSD Technique

The TSD technique involved explaining the procedure, demonstrating it, and then performing it to familiarize children with the process.

Group 2: CARD™ System

Participants in the CARD™ system group were introduced to coping strategies categorized under Comfort, Ask, Relax, and Distract. For children to understand the CARD™ system, strategies were prepared in simple English and in regional language from which children chose one from each segment (Fig. 1). They selected strategies they preferred, which were then employed during their treatment.

Randomization and Allocation

For randomization, a stratified approach was adopted to ensure an equitable distribution of participants across intervention groups. Allocation concealment was maintained using an open list of random numbers. Both participants and outcome assessors were blinded to group assignments to minimize bias.

Outcome Measurements

Primary Outcome

The primary outcome measured the effectiveness of both behavior management techniques in reducing pain and anxiety levels among children undergoing dental procedures. Physiological parameters such as pulse rate (PR) [beats per minute (bpm)] and oxygen saturation (SpO₂) were recorded using a pulse oximeter. Behavioral responses were evaluated using the Facial Image Scale (FIS) (comprising five faces ranging from very happy to very unhappy) by an observer not involved in the treatment process. Children indicated their feelings before and after the procedure, with scores from 1 (most positive) to 5 (most negative).

Randomization and Allocation

For randomization, a stratified approach was adopted to ensure an equitable distribution of participants across intervention groups. Allocation concealment was maintained using an open list of random numbers. Both participants and outcome assessors were blinded to group assignments to minimize bias.

Statistical Analysis

Data about SpO₂, PR (bpm), and FIS in the CARD™ system and TSD groups were entered into Microsoft Excel and analyzed using IBM SPSS Statistics for Windows, version 29.0 (IBM Corp., Armonk, NY, USA). The normality of the data for SpO₂ and PR was assessed using the Kolmogorov–Smirnov test, indicating that both variables followed a normal distribution. Descriptive statistics, including mean, standard deviation, frequencies, and percentages, was calculated. Intergroup comparisons of SpO₂ and PR were conducted using independent *t*-tests, while the Mann–Whitney *U* test was utilized to analyze differences in the FIS scores between groups. Statistical significance was set at $p < 0.05$.

Fig. 1: Intervention groups

Table 1: Intergroup comparison of physiological parameters

Physiological parameters	Groups	n	Mean + SD	Mean difference	95% confidence interval of the mean difference		Independent t-test value (p-value)
					Lower	Upper	
Oxygen saturation (SpO ₂)							
Before	CARD	20	98.00 ± 1.02	0.000	−0.688	0.688	0.00 (1.000) (NS)
	TSD	20	98.00 ± 1.12				
After	CARD	20	98.35 ± 0.74	0.050	−0.399	0.499	0.225 (0.823) (NS)
	TSD	20	98.30 ± 0.65				
PR (bpm)							
Before	CARD	20	87.45 ± 7.28	−2.850	−8.548	2.848	−1.012 (0.318) (NS)
	TSD	20	90.30 ± 10.26				
After	CARD	20	87.70 ± 5.96	−2.400	−6.988	2.188	−1.059 (0.296) (NS)
	TSD	20	90.10 ± 8.19				

RESULTS

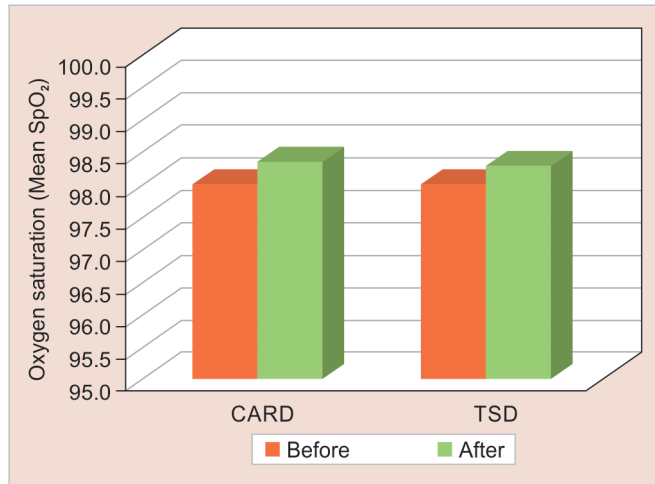
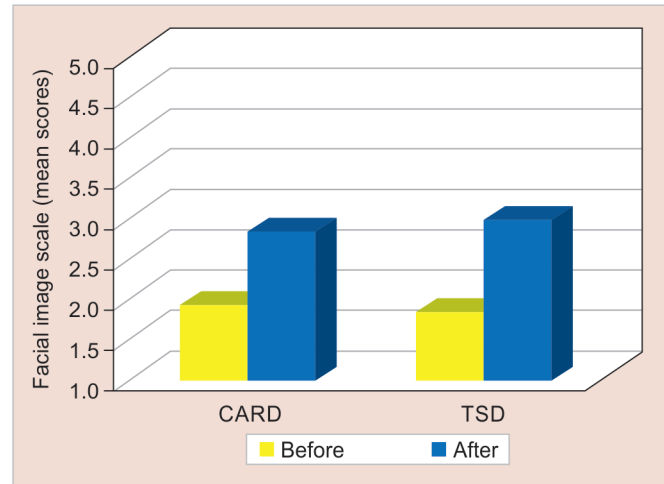
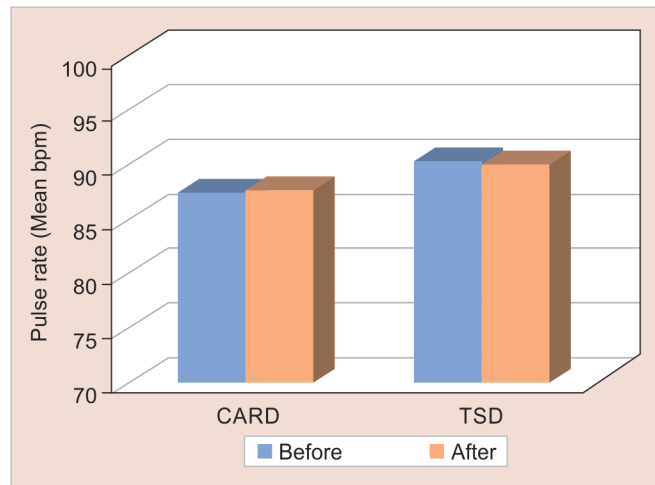
Physiological parameters, (including SpO₂) and PR, were assessed before and after the procedures (Table 1). Before the procedure, both the CARD™ system and TSD method groups demonstrated comparable mean SpO₂ levels (CARD™: 98.00 ± 1.02; TSD: 98.00 ± 1.12) with no statistically significant difference observed ($p = 1.000$). Similarly, there was no significant difference in mean PR before the procedure between the groups (CARD™: 87.45 ± 7.28 bpm; TSD:

90.30 ± 10.26 bpm; $p = 0.318$). After the procedure, mean SpO₂ levels showed a slight increase in both groups (CARD™: 98.35 ± 0.74; TSD: 98.30 ± 0.65), with no significant intergroup difference found ($p = 0.823$) (Fig. 2). Likewise, there was no significant difference in mean PR after the procedure (CARD™: 87.70 ± 5.96 bpm; TSD: 90.10 ± 8.19 bpm; $p = 0.296$) (Fig. 3).

Behavioral responses were evaluated using the FIS, which assesses the child's emotional state before and after the procedure

Table 2: Intergroup comparison of behavioral parameters

Facial Image Scale	Groups	n	Mean + SD	Mean rank	Sum of rank	Mann–Whitney U test value (p-value)
Before	CARD	20	1.90 ± 0.85	21.10	422.00	188.000 (0.729) (NS)
	TSD	20	1.80 ± 0.76	19.90	398.00	
After	CARD	20	2.80 ± 1.60	19.93	398.50	188.500 (0.750) (NS)
	TSD	20	2.95 ± 1.50	21.08	421.50	

**Fig. 2:** Oxygen saturation between the CARD™ system and TSD**Fig. 4:** Facial Image Scale between CARD™ system and TSD**Fig. 3:** Pulse rate between CARD™ system and TSD

(Table 2). Before the procedure, both groups exhibited similar FIS scores (CARD™: 1.90 ± 0.85 ; TSD: 1.80 ± 0.76), indicating comparable emotional states (Mann–Whitney *U* test, $p = 0.729$). After the procedure, FIS scores slightly increased in both groups (CARD™: 2.80 ± 1.60 ; TSD: 2.95 ± 1.50), with no significant difference observed between the groups (Mann–Whitney *U* test, $p = 0.750$) (Fig. 4).

DISCUSSION

This study aims to compare the effectiveness of the CARD™ system and TSD technique in managing the behavior of 6–10-year-old children during dental procedures. The results indicated no statistically significant differences between the two techniques in terms of physiological parameters (SpO₂ and PR) or behavioral responses (FIS) before and after dental procedures. These findings

suggest that both the CARD™ system and TSD technique are similarly effective in mitigating anxiety and improving cooperation among pediatric patients undergoing dental treatment. Therefore, our study accepts the null hypothesis that there is no discernible difference in the behavioral management efficacy between the CARD™ system and TSD technique in this population.

The TSD technique was selected due to its widespread acceptance and established efficacy in pediatric dental practice. Previous studies have consistently demonstrated that TSD effectively reduces anxiety by familiarizing children with procedures through verbal explanation, demonstration, and then execution.¹⁵ This method is widely recommended for its simplicity and effectiveness in preparing children for dental treatment, fostering a positive dental experience, and reducing the likelihood of disruptive behaviors.

Similarly, the CARD™ system was chosen for its structured approach to engaging children in their dental care through educational preparation and active participation in coping strategies during procedures.¹⁶ Previous literature supports the use of similar structured approaches in pediatric dentistry, emphasizing the importance of empowering children to manage their anxiety through informed decision-making and coping skills.¹⁷ Studies have shown that such patient-centered approaches can enhance children's cooperation and reduce dental fear, contributing to better treatment outcomes and overall patient satisfaction.^{16,17}

In this study, the selection of physiological parameters such as SpO₂ and PR, along with the FIS, was deliberate in assessing the efficacy of both techniques in managing pediatric dental anxiety. SpO₂ and PR are objective measures commonly used to gauge physiological stress responses during medical and dental procedures.^{18–21} By monitoring these parameters, the authors aim to quantify the immediate physiological impact of anxiety-reducing interventions on children undergoing dental treatments. The negligible differences observed in SpO₂ and PR between the CARD™

system and TSD groups indicate that both techniques similarly mitigate physiological stress, supporting their effectiveness in promoting a calm and cooperative state among young patients.

The FIS was employed to subjectively evaluate the emotional state of children before and after dental procedures. This scale, ranging from very happy (most positive, score 1) to very unhappy (most negative, score 5), provides insight into the subjective experience of anxiety and comfort levels perceived by the children.²² Our findings revealed consistent FIS scores across both intervention groups, implying comparable emotional responses and suggesting that both the CARD™ system and TSD technique contribute equally to alleviating dental anxiety among pediatric patients.

In our study, both the CARD™ system and TSD technique yielded comparable results in terms of physiological parameters and behavioral responses. This may have resulted from their shared focus on preparing children through structured engagement and coping strategies, effectively reducing anxiety and enhancing cooperation during dental procedures. However, it is important to note that individual preferences and the specific needs of each child may influence the choice of technique. Future research could explore the long-term effects of these techniques on dental anxiety, patient compliance with follow-up visits, and the role of gender in responding to different behavior management strategies. Limitations of this study include the relatively small sample size and single-center setting, which may limit the generalizability of the findings to broader populations and clinical settings. Additionally, while efforts were made to standardize procedures and minimize bias, variations in dentist–patient interactions and procedural complexities could influence outcomes. Future studies could address these limitations by conducting multicenter trials with larger sample sizes and diverse demographic profiles to enhance the robustness and applicability of the findings.

CONCLUSION

This study contributes to the growing body of evidence supporting the effectiveness of the CARD™ system and TSD technique in managing children's behavior during dental procedures. The findings indicate no significant differences in physiological parameters (SpO₂ and PR) or behavioral responses (FIS) between the two methods. These results support the notion that both approaches offer viable options for reducing anxiety and improving cooperation among pediatric patients in the dental setting. Dentists and healthcare providers can consider either technique based on individual patient preferences and clinical circumstances, improving the overall quality of pediatric dental care. Future research could explore additional factors influencing treatment outcomes and validate these findings across diverse patient populations and settings.

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REFERENCES

- Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *Int J Paediatr Dent* 2007;17:391–406.
- Cianetti S, Lombardo G, Lupatelli E, et al. Dental fear/anxiety among children and adolescents. A systematic review. *Eur J Paediatr Dent* 2017;18:121–130.
- Asl AN, Shokravi M, Jamali Z, et al. Barriers and drawbacks of the assessment of dental fear, dental anxiety and dental phobia in children: a critical literature review. *J Clin Pediatr Dent* 2017;41:399–423.
- Appukkuttan DP. Strategies to manage patients with dental anxiety and dental phobia: literature review. *Clin Cosmetol Invest Dent* 2016;8:35–50.
- Abrahamsson KH, Berggren U, Hallberg LRM, et al. Ambivalence in coping with dental fear and avoidance: a qualitative study. *J Health Psychol* 2002;7:653–664.
- Kakkar M, Wahi A, Thakkar R, et al. Prevalence of dental anxiety in 10–14 years old children and its implications. *J Dent Anesth Pain Med* 2016;16:199–202.
- Campbell C. *Dental Fear and Anxiety in Pediatric Patients: Practical Strategies to Help Children Cope*. Springer; 2017.
- Lekhwani PS, Nigam AG, Marwah N, et al. Comparative evaluation of tell-show-do technique and its modifications in managing anxious pediatric dental patients among 4–8 years of age. *J Indian Soc Pedod Prev Dent* 2023;41:141–148.
- Abbasi H, Saqib M, Jouhar R, et al. The efficacy of little lovely dentist, dental song, and tell-show-do techniques in alleviating dental anxiety in paediatric patients: a clinical trial. *Biomed Res Int* 2021;2021:1119710.
- Khandelwal D, Kalra N, Tyagi R, et al. Control of anxiety in pediatric patients using 'tell show do' method and audiovisual distraction. *J Contemp Dent Pract* 2018;19:1058–1064.
- Taddio A, Gudzak V, Jantzi M, et al. Impact of the CARD (Comfort Ask Relax Distract) system on school-based vaccinations: a cluster randomized trial. *Vaccine* 2022;40:2802–2809.
- Taddio A, Morrison J, Gudzak V, et al. CARD (Comfort Ask to Relax Distract) for community pharmacy vaccinations in children: effect on immunization stress-related responses and satisfaction. *Can Pharm J* 2023;156:275–355.
- Modabber M, Campbell KM, McMurtry CM, et al. Children's perceptions of dental experiences and ways to improve them. *Children (Basel)* 2022;9:1657. DOI: 10.3390/children9111657
- Raseena K, Jeeva P, et al. A comparative study of tell-show-do technique with and without the aid of a virtual tool in the behavior management of 6–9-year-old children: A nonrandomized, clinical trial. *J Indian Soc Pedod Prev Dent* 2020;38:393–399.
- Limbu S, Dikshit P, Malla M, et al. Live modeling versus tell-show-do technique based on children's heart rates, oxygen saturation and facial image scale. *J Nepal Health Res Counc* 2022;19:797–804.
- Taddio A. Introducing CARD (Comfort Ask Relax Distract) as a vaccine delivery program for community pharmacy-based vaccinations. *Can Pharm J* 2023;156:25–55.
- Tetui M, Grindrod K, Waite N, et al. Integrating the CARD (Comfort Ask to Relax Distract) system in a mass vaccination clinic to improve the experience of individuals during COVID-19 vaccination: a pre-post implementation study. *Hum Vaccin Immunother* 2022;18:2089500.
- Taddio A, Coldham J, Logeman C, et al. Feasibility of implementation of CARDTM for school-based immunizations in Calgary, Alberta: a cluster trial. *BMC Public Health* 2021;21:260.
- Sin M, Dennis T. Can music therapy and aroma therapy really reduce dental anxiety and fear? *Evid Based Dent* 2023;24:59–60.
- Aeschliman SD, Blue MS, Williams KB, et al. A preliminary study on oxygen saturation levels of patients during periodontal surgery with and without oral conscious sedation using diazepam. *J Periodontol* 2003;74:1056–1059.
- Hoffmann B, Erwood K, Ncomanzi S, et al. Management strategies for adult patients with dental anxiety in the dental clinic: a systematic review. *Aust Dent J* 2022;67(Suppl 1):S3–S13.
- Pande P, Rana V, Srivastava N, et al. Effectiveness of different behavior guidance techniques in managing children with negative behavior in a dental setting: a randomized control study. *J Indian Soc Pedod Prev Dent* 2020;38:259–265.