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ORIGINAL RESEARCH

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Dog-assisted therapy for control of anxiety in pediatric dentistry

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Abstract

Anxiety is common in pediatric dental care, and affects the behavioral management of children. Animal-assisted therapy (AAT) has been shown to improve children's behavior. However, few studies have applied this technique in dentistry. The aim of the present study was to evaluate the applicability of dog-assisted therapy to control anxiety during pediatric dental treatment. Twenty children were selected from the Pediatric Dentistry Clinic of the Pontifical Catholic University of Campinas (PUC-Campinas), Brazil. Participants were divided into two groups: Control (n = 11; visits = 16), in which children were conditioned by methods routinely used in the clinic; and AAT (n = 9; visits = 23), in which children had contact with a dog therapist first at the reception desk and then again inside the office. The dog therapist stayed beside the dental chair with the child throughout the procedures. Corah's Dental Anxiety Scale (CS) and heart rate (HR) were used for evaluation of child anxiety. The results were tested for normality of distribution with the Shapiro-Wilk method, and subsequently analyzed in BioEstat 5.0. HR results were compared by Analysis of Variance (ANOVA) with Tukey's test, and CS scores, with the Wilcoxon test. There was a significant reduction in HR in the AAT group (p = 0.0069). In the Control group, HR did not change before, during, or after treatment (p = 0.6052). Controls showed a significant increase in anxiety measured by CS before and after treatment (p = 0.0455). In the AAT group, there was no change in CS scores before and after treatment (p = 0.3739). AAT could be an alternative to reduce anxiety during pediatric dental care.

Keywords

Anxiety; Pediatric dentistry; Animal assisted therapy; Dogs

1. Introduction

For centuries, humans and dogs have had a relationship of motivation and companionship [1], but recognition of the potential for positive outcomes with animal-assisted therapeutic strategies in the field of health care is a more recent phenomenon [2]. Therapeutic animal-assisted interventions (AAI) are classified by the American Veterinary Medical Association as: service animal programs (SAP), which utilize service animals; animal-assisted activities (AAA), which use companion animals; and animal-assisted therapy (AAT), which uses specially trained therapy animals and can be defined technically as the use of animals by health professionals, both trained, to facilitate patient cooperation in some instance during treatment [3].

In pediatrics, AAT with dogs (dog-assisted therapy or canine-assisted therapy) has been shown to increase positive behaviors and attention in children with developmental disorders and during painful procedures, as well as promote calmness in children [4–9]. A study reported significant reductions in anxiety and related behaviors during dental treatment with AAT, believed to be mediated by a distracting effect on perception [10]. AAT can elevate IgA levels, enhancing host defenses [11]. Another study [12] concluded that a therapy dog's presence promoted better results than conventional physical therapy for infants with delayed neuropsychomotor development.

Anxiety in children poses a major challenge to optimizing oral health outcomes and is associated with increased incidence of diseases such as dental caries, as well as with need for urgent dental care [13, 14]. The American Academy of Pediatric Dentistry advocates the use of pharmacological and non-pharmacological behavior guidance techniques to address anxiety [15]. Sedation, which is required for highly anxious patients, carries a risk of respiratory depression, neurological injury, and death [16]. As a result, non-pharmacological approaches are needed for managing anxious patients in pediatric dentistry. Management of anxiety is essential to the success of dental treatment in children, since anxious patients have greater difficulty to cooperate. Although established measures exist for such management, new methods should be studied and evaluated to further facilitate pediatric dental treatment, avoiding behavior-related complications without the need for

pharmacological intervention. Within this context, the present study sought to evaluate dog-assisted therapy as a means of controlling children's anxiety during dental treatment.

2. Materials and methods

The inclusion and exclusion criteria are described in Fig. 1.

2.1 Interventions

The participants (n = 20) were recruited into one of the two intervention groups; 9 children were assigned to the dog-assisted therapy group (AAT) and 11 to the control group (C). Overall, 23 procedures were performed in the AAT group and 16 in the control group. As a COVID-19 control protocol, before treatment, screening and temperature measurement were performed in all patients. The dog's paws were cleaned before entered the clinic.

This study was conducted at a university Pediatric Dentistry clinic in Campinas, state of Sao Paulo, Brazil. All participants were recruited from the existing patient pool of the clinic. The study interventions were as follows:

Control group (C): Children assigned to this group were conditioned by conventional methods used in the pediatric dentistry clinic, such as the talk-show-do technique, giving the patient a gift in response to favorable behavior as positive reinforcement, modeling, and voice control.

Animal-assisted therapy group (AAT): Children assigned to this group were conditioned by methods discussed in the C group as well as contact with a therapy dog, first at the clinic's reception desk and subsequently inside the dental office. Initial contact with the dogs (before treatment) lasted 15 minutes per patient. During treatment, the therapy dog stayed beside the child, next to the dental chair, while all procedures were performed (Fig. 2).

2.2 Sample size

The sample size calculation was based on the results of a pilot procedure carried out with 5 results obtained from the two groups' HR, using the *t* test (G*Power 3.1.9.4, Franz Faul, University of Kiel, Germany), with $\alpha = 0.05$, $\beta = 0.80$, and effect size f = 1.3. The minimum number of patients for each group was calculated as 9.

2.3 Randomization and allocation

This was not a randomized trial, but the sample was randomly distributed. One child who formed a connection with the dog was placed in the AAT group by convenience (nonprobabilistic sampling) (Table 1).

2.4 Primary outcomes/endpoints

The primary endpoints assessed in this study were heart rate (HR) and Corah's Dental Anxiety Scale scores (CS). For administration of the Corah scale, the children were approached by an examiner individually and in the presence of a parent or legal guardian [17].

2.5 Heart rate

The HR of the participants were measured at three timepoints: T0 (before), T1 (during), and T2 (after the procedures), using a fingertip pulse oximeter (model OX-06, Multilaser, Chongqing Guiguzi Medical Device Technology Co., Ltd) [18].

2.6 Anxiety

Anxiety was measured using Corah's Dental Anxiety Scale [17, 19]. The scale comprises 20 items, divided into four groups, with each item assigned a score of 1 (one) to 5 (five). The questions were asked to the children themselves and scored according to a representation of their emotions and feeling at the time.

The scale is interpreted as follows: 5 points or less, very little anxiety; 6 to 10 points, mildly anxious; 11 to 15 points, moderately anxious; and 16 to 20 points, extremely anxious. The questionnaire was completed by the participants before dental treatments to provide a baseline.

2.7 Statistical analyses

The results were tested for normality by the Shapiro-Wilk method in BioEstat version 5.0 (Belém, Pará, Brasil). HR results were compared by analysis of variance (ANOVA) with Tukey's test. CS scores were compared by Wilcoxon's test. The significance level was set at 5%.

3. Results

There was a significant reduction in HR in the AAT group ($p = 0.0069$). In the Control group, HR did not change before, during, or after treatment ($p = 0.6052$). In the Control group, there was a significant increase in anxiety measured using the CS comparing values obtained before and after treatment ($p = 0.0455$). In the AAT group, there were no changes in CS scores obtained before and those obtained after treatment ($p = 0.3739$) (Table 2).

4. Discussion

Dental appointments are not very pleasant experiences, especially for children, and most of them do not cooperate during treatment, which can delay or hinder the execution of clinical procedures [20–22]. One out of every four dental patients experiences moderate or severe anxiety about dental treatment [19, 23]. Within this context, the present study was designed to evaluate the effect of animal-assisted therapy (specifically, dog-assisted therapy) on control of children's anxiety during dental care.

The children were separated into two groups, AAT and control. Corah's Dental Anxiety Scale (CS) [17] and heart rate (HR) were used as measures of anxiety, as reported elsewhere in the literature [22, 24–26]. Baseline measurements of both parameters were obtained, and procedures (including local anesthesia, restorative dentistry, oral surgery, endodontics, and impressions) were then performed. These treatments, though involving only mild to moderate pain or discomfort, may cause anxiety in children [19, 20, 23].

The CS assesses anxiety level regarding dental treatment

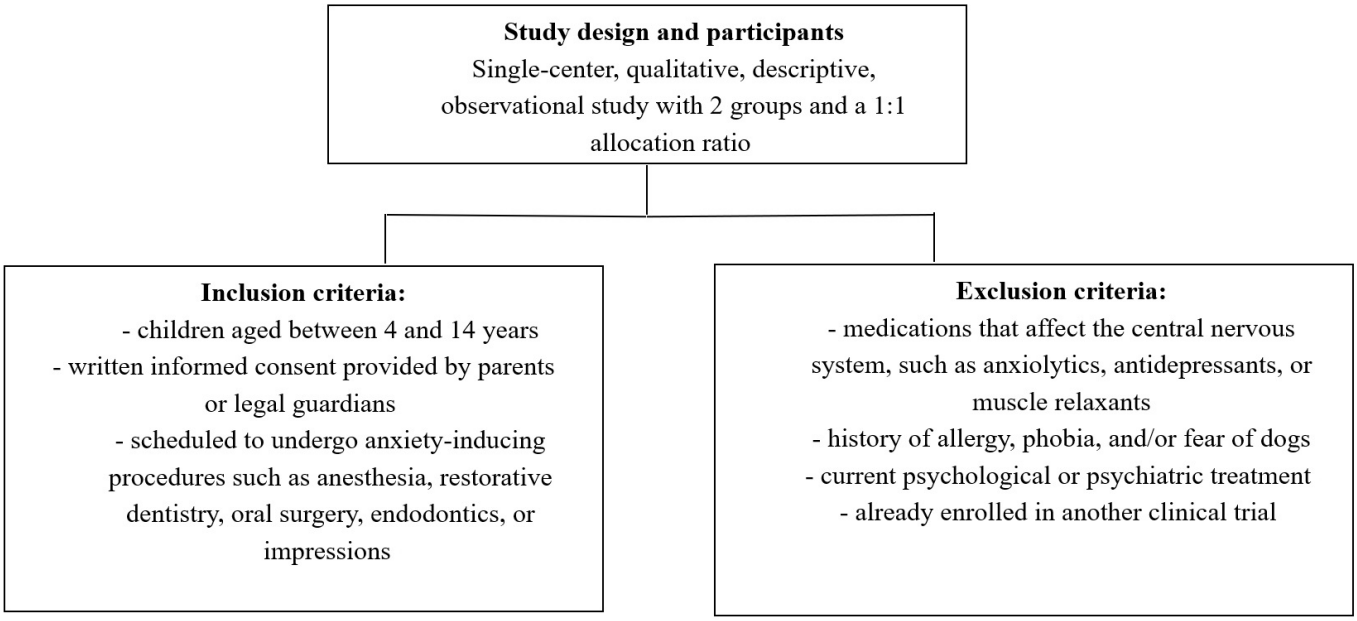

FIGURE 1. Study design and participants.

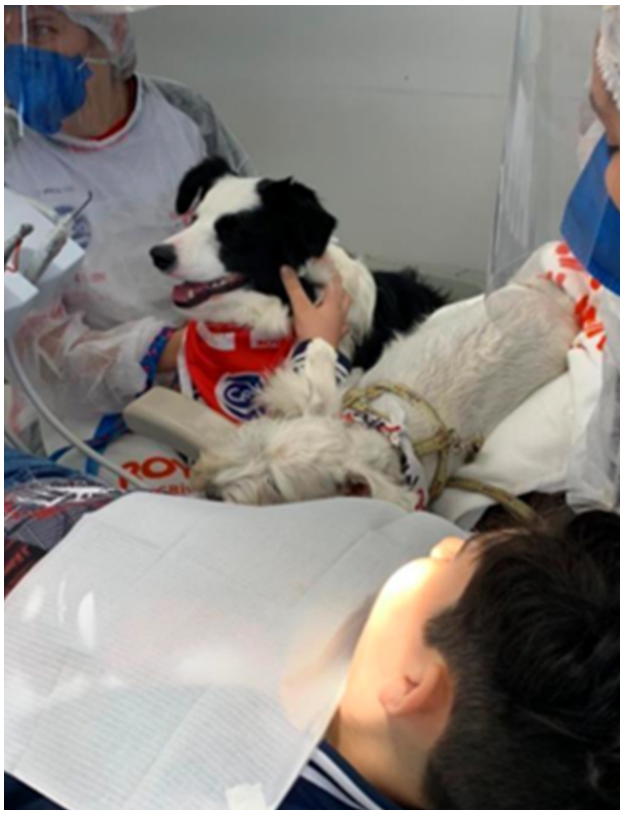

FIGURE 2. Therapy dog providing AAT during the study.

TABLE 1. Number of interventions performed in each experimental group.

Number of patients	Total number of interventions	Number of teeth restored	Number of teeth treated endodontically	Number of teeth extracted	Number of impressions taken
Control N = 11	16	8	4	3	1
AAT N = 9	23	11	5	3	4

AAT: Animal-assisted therapy.

TABLE 2. Arithmetic means, standard deviations, and statistical analysis of age, HR and CS per group.

Groups	Control	AAT
Age, range (yr)	5–14	4–14
Age, mean (SD) (yr)	7.66 (2.87)	9.18 (2.92)
HR, before (bpm)	91.37 (14.75)^{A}	98.22 (11.99)^{A}
HR, during (bpm)	98.37 (15.20)^{A}	96.54 (11.96)^{A}
HR, after (bpm)	92.37 (16.49)^{A}	87.45 (11.03)^{B}
p	0.6052	0.0069
CS, before	9.28 (3.64)^{A}	7.39 (3.65)^{A}
CS, after	11.35 (3.65)^{B}	7.69 (4.11)^{A}
p	0.0455	0.3739

Different capital letters denote statistically significant differences.

using a questionnaire. This scale allows assessment of anxiety under a standardized methodology at different time points [24–26]. Accordingly, in our study the scale was administered before and after treatment. The other parameter of interest was HR, which is known to increase in response to anxiety and fear. Anxiety produces changes in the central nervous system, which sends stimuli to cardiac receptors through electrical and neurochemical pathways, increasing HR [18, 21, 22]. Conversely, contact with dogs has been shown to cause endocrine changes, such as activation of the oxytocin system, which can decrease blood pressure and HR and increase the pain threshold. (Oxytocin, a peptide produced in the hypothalamus, decreases levels of the stress-hormone glucocorticoids.) This justifies the use of HR measurement to assess anxiety in children [6, 7, 27, 28].

In the Control group, there was a significant increase in CS-measured anxiety after dental treatment, which is consistent with the findings of previous studies [22]. In the AAT group, there was no statistically significant change in CS scores before and after treatment, which can be justified by the positive experience of contact with the therapy dog, corroborating the previous findings of Sobo *et al.* [29], Cruz-Fierro *et al.* [25], and Cass *et al.* [26], who noted that the interaction between children and dogs resulted in behavior changes and patients became calmer.

In the AAT group, there was a continuous reduction in HR during and after treatment, unlike in the Control group, which showed an increase HR during treatment, denoting an increase in the child's anxiety; thus, the null hypothesis was again rejected. Previous results show that AAT can be useful and effective in reducing distress, HR, and anxiety especially in painful procedures [11, 30, 31]. Beetz *et al.* [6, 7] in their review, presented studies that showed a significant reduction in humans' catecholamine levels when interacting with dogs. Catecholamines are neurotransmitters implicated in the autonomic response to stress, which modify brain activities and act on cardiac receptors, increasing HR [21, 22]. Therefore, our finding of a positive effect of patient-dog interaction in the clinical environment, facilitating the reduction of anxiety, corroborates the reports of Beetz *et al.* [6, 7], Lundqvist *et al.* [32], Silva & Osório [30], Pruskowski *et al.* [11], and Thakkar *et al.* [31]. Furthermore, behavioral management of the child by the practitioner may have been influenced by the animal, since the presence of a dog promotes encouragement and improves social interaction and connection [30, 33, 34].

One of the limitations of this study was the non-randomized trial design. A child who felt a connection with the dog was placed in the AAT group for convenience (non-probabilistic sampling), and the same child was seen more than once, influencing management due to improvement of conditioning during treatment. Another potential limitation is the small sample size, although formal sample size calculation showed that an n = 9 per group would provide sufficient statistical power. Despite this source of selection bias and the small sample size, seeing the same child several times allowed provision of more humane care and enabled completion of treatment.

The results of this study support the use of AAT as an auxiliary tool for the control of anxiety in children during dental care. However, there is no substantive scientific evidence in the literature regarding this approach [35]. More studies on AAT are needed, particularly to allow standardization of the physiological parameters that influence stress and anxiety in pediatric patients during dental treatment.

5. Conclusions

AAT can be an option to reduce anxiety during pediatric dental procedures and thus help optimize patient care.

AVAILABILITY OF DATA AND MATERIALS

The data are contained within this article.

AUTHOR CONTRIBUTIONS

CS, LL, NS, RF, TV and SLP—designed the research study and performed the research. DRG and SLP—provided help,

advice and wrote the manuscript. SLP—analyzed the data. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Pontificia Universidade Católica de Campinas (PUC-Campinas) Research Ethics Committee with certificate number CAAE 3359752030000548 (protocol number: 412319) and registered in the Brazilian Clinical Trials Registry (Registro Brasileiro de Ensaios Clínicos—ReBEC) with accession number RBR-3fn3p3r. Patient aged under 16, the informed consent was signed by their guardian/parent(s).

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Miller J, Connor K. Going to the dogs… for help. Nursing. 2000; 30: 65–67.

[2] Wohlfarth R, Mutschler B, Beetz A, Kreuser F, Korsten-Reck U. Dogs motivate obese children for physical activity: key elements of a motivational theory of animal-assisted interventions. Frontiers in Psychology. 2013; 4: 796.

[3] Kamioka H, Okada S, Tsutani K, Park H, Okuizumi H, Handa S, *et al.* Effectiveness of animal-assisted therapy: a systematic review of randomized controlled trials. Complementary Therapies in Medicine. 2014; 22: 371–390.

[4] Martin F, Farnum J. Animal-assisted therapy for children with pervasive developmental disorders. Western Journal of Nursing Research. 2002; 24: 657–670.

[5] Braun C, Stangler T, Narveson J, Pettingell S. Animal-assisted therapy as a pain relief intervention for children. Complementary Therapies in Clinical Practice. 2009; 15: 105–109.

[6] Beetz A, Julius H, Turner D, Kotrschal K. Effects of social support by a dog on stress modulation in male children with insecure attachment. Frontiers in Psychology. 2012; 3: 352.

[7] Beetz A, Uvnas-Moberg K, Julius H, Kotrschal K. Psychosocial and psychophysiological effects of human-animal interactions: the possible role of oxytocin. Frontiers in Psychology. 2012; 3: 234.

[8] O'Haire ME. Animal-assisted intervention for autism spectrum disorder: a systematic literature review. Journal of Autism and Developmental Disorders. 2013; 43: 1606–1622.

[9] Berry A, Borgi M, Francia N, Alleva E, Cirulli F. Use of assistance and therapy dogs for children with autism spectrum disorders: a critical review of the current evidence. The Journal of Alternative and Complementary Medicine. 2013; 19: 73–80.

[10] Lundberg A, Srinivasan M. Effect of the presence of an aquarium in the waiting area on the stress, anxiety and mood of adult dental patients: a controlled clinical trial. PLOS ONE. 2021; 16: e0258118.

[11] Pruskowski KA, Gurney JM, Cancio LC. Impact of the implementation of a therapy dog program on burn center patients and staff. Burns. 2020; 46: 293–297.

[12] Prado CMCS, Pinheiro SL. Physical therapy with toys and dog-assisted therapy in infants: observational study. Physiotherapy and Research. 2022; 29: 189–195.

[13] Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. International Journal of Paediatric Dentistry. 2007; 17: 391–406.

[14] McGrath C, Bedi R. The association between dental anxiety and oral health-related quality of life in Britain. Community Dentistry and Oral Epidemiology. 2004; 32: 67–72.

[15] Behavior guidance for the pediatric dental patient. Pediatric Dentistry. 2018; 40: 254–267.

[16] Cote CJ, Wilson S; American Academy of Pediatrics; American academy of pediatric dentistry. Guidelines for monitoring and management of pediatric patients before, during, and after sedation for diagnostic and therapeutic procedures. Pediatrics. 2019; 143: e20191000.

[17] Corah NL. Development of a dental anxiety scale. Journal of Dental Research. 1969; 48: 596.

[18] Balasubramaniyan N, Rayapati DK, Puttiah RH, Tavane P, Singh SE, Rangan V, *et al.* Evaluation of anxiety induced cardiovascular response in known hypertensive patients undergoing exodontia—a prospective study. Journal of Clinical and Diagnostic Research. 2016; 10: ZC123–127.

[19] De Carvalho RW, Falcao PG, Campos GJ, Bastos Ade S, Pereira JC, Pereira MA, *et al.* Anxiety regarding dental treatment: prevalence and predictors among Brazilians. Ciência & Saúde Coletiva. 2012; 17: 1915–1922. (In Portuguese)

[20] Pop-Jordanova N, Sarakinova O, Pop-Stefanova-Trposka M, Zabokova-Bilbilova E, Kostadinovska E. Anxiety, stress and coping patterns in children in dental settings. Open Access Macedonian Journal of Medical Sciences. 2018; 6: 692–697.

[21] Tshiswaka SK, Pinheiro SL. Effect of music on reducing anxiety in children during dental treatment. Gaúcha Journal of Dentistry. 2020; 68: e20200033.

[22] Rangel CRG, Pinheiro SL. Laser acupuncture and intravascular laser irradiation of blood for management of pediatric dental anxiety. Journal of Oral Science. 2021; 63: 355–357.

[23] Dahlander A, Soares F, Grindefjord M, Dahllof G. Factors associated with dental fear and anxiety in children aged 7 to 9 years. Dentistry Journal. 2019; 7: 68.

[24] Wu L, Gao X. Children's dental fear and anxiety: exploring family related factors. BMC Oral Health. 2018; 18: 100.

[25] Cruz-Fierro N, Vanegas-Farfano M, Gonzalez-Ramirez MT. Dog-assisted therapy and dental anxiety: a pilot study. Animals. 2019; 9: 512.

[26] Cass K, Bocklage C, Sulkowski T, Graves C, Ghaltakhchyan N, Rapolla A, *et al.* Patient and caregiver perceptions of animal assisted activity in orthodontics. Animals. 2022; 12: 1862.

[27] Calcaterra V, Veggiotti P, Palestrini C, De Giorgis V, Raschetti R, Tumminelli M, *et al.* Post-operative benefits of animal-assisted therapy in pediatric surgery: a randomised study. PLOS ONE. 2015; 10: e0125813.

[28] Hajar R. Animal-assisted therapy. Heart Views. 2015; 16: 70.

[29] Sobo EJ, Eng B, Kassity-Krich N. Canine visitation (pet) therapy. Journal of Holistic Nursing. 2006; 24: 51–57.

[30] Silva NB, Osorio FL. Impact of an animal-assisted therapy programme on physiological and psychosocial variables of paediatric oncology patients. PLOS ONE. 2018; 13: e0194731.

[31] Thakkar TK, Naik SN, Dixit UB. Assessment of dental anxiety in children between 5 and 10 years of age in the presence of a therapy dog: a randomized controlled clinical study. European Archives of Paediatric Dentistry. 2021; 22: 459–467.

[32] Lundqvist M, Carlsson P, Sjödahl R, Theodorsson E, Levin L. Patient benefit of dog-assisted interventions in health care: a systematic review. BMC Complementary and Alternative Medicine. 2017; 17: 358.

[33] McCullough A, Ruehrdanz A, Jenkins MA, Gilmer MJ, Olson J, Pawar A, *et al.* Measuring the effects of an animal-assisted intervention for pediatric oncology patients and their parents: a multisite randomized controlled trial. Journal of Pediatric Oncology Nursing. 2018; 35: 159–177.

[34] Moreira RL, Gubert FD, Sabino LM, Benevides JL, Tome MA, Martins

MC, *et al.* Assisted therapy with dogs in pediatric oncology: relatives' and nurses' perceptions. Brazilian Journal of Nursing. 2016; 69: 1188–1194.

[35] Ribeiro CDPV, Alves JB, Kominami PA, Takeshita EM, Bezerra ACB, Massignan C. Does use of animal therapy during dental care help to reduce anxiety in children and adolescents? A systematic review. International Journal of Paediatric Dentistry. 2023; 33: 181–195.

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