Dog-Assisted Therapy (DAT) for the management of anxiety during paediatric dental care. A scoping review

A. Garrocho-Rangel[1], M. Rosales-Berber[1], D. Ríos-Méndez[1], J. Flores-Velázquez[1], D. Trejo-Herbert[1], F. Pozos-Guillén[2], A. Pozos-Guillén[1]

[1]*Paediatric Dentistry Postgraduate Program. Faculty of Dentistry, University of San Luis Potosí, México.*
[2]*Medicine Program. Faculty of Professional Studies Zona Huasteca, University of San Luis Potosí, México.*

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Email: apozos@uaslp.mx

Abstract

Aim Distraction techniques in paediatric dentistry can be effective in decreasing the child's attention span from an unpleasant or stressful procedure. Distraction is achieved through imagination, audio, and/or visual stimuli. It has been shown that the accompaniment and participation of animals or pets, specifically dogs (Dog-Assisted Therapy or DAT), during medical, oral, and therapeutic activities can improve the physical and mental health of patients, especially children. However, there is limited information available regarding the impact of incorporating a certified therapy dog into the paediatric dental environment as a distraction strategy to alleviate anxiety levels during dental procedures.

Methods and Results This scoping review aimed to identify and review published articles concerning the use of DAT in paediatric dentistry. The article discusses indications, benefits, and potential risks to human health and safety in clinical settings. Eligible sources encompass clinical trials, observational studies, and narrative reviews written in either English or Spanish and published over the last two decades, sourced from four electronic databases. Ultimately, seven pertinent studies were included in the review.

Conclusions and clinical significance DAT presents itself as a promising alternative in managing anxiety and stress among children during dental visits. The integration of a therapy dog and its handler into the paediatric oral care team should be thoughtfully considered by clinicians as a means to enhance the comfort and compliance of apprehensive patients.

KEYWORDS Animal therapy, anxiety, behavioural management, dog-assisted therapy.

Introduction

The fear or avoidance of dental treatment among children is recognised as a detrimental emotional response that becomes evident through cognitive, physiological, and motor reactions. When linked to dental appointments or procedures, it is labelled as dental anxiety [Cruz-Fierro et al., 2019]. This phenomenon can significantly impact oral health, as it obstructs effective dental care and the continued commitment to treatment., sometimes reaching such a degree that the patient stops going to professional consultation or prematurely terminates dental treatment [Weiner and Sheehan, 1984; Cass et al., 2022].

Dental anxiety occurs in up to 21% of children and 80% of adults [Cass et al., 2022]. This condition is characterised by subjective sensations of tension, apprehension, nervousness, and concern; these emotions stem from mental representations that involve memories or anticipated situations, inducing uncertainty in circumstances perceived as threatening. These symptoms often complicate the management of paediatric patients. As a result, dentists are expected to employ appropriate management techniques, both psychological and pharmacological, to alleviate or lessen the patient's fears and anxieties in the dental chair [Weiner and Sheehan 1984; Cruz-Fierro et al., 2019].

The terms "dental anxiety" and "dental phobia (or "dentophobia")" are often used interchangeably to describe a child's fearful behaviour in the dental chair; however, they should be recognised as distinct emotional states. Dental anxiety impacts a child's rationality, altering their perception of the dental environment. Fear causes the patient to assume an attentive and cautious attitude toward what she or he considers a threat or danger. This reaction can stem from prior medical or dental encounters, resulting in what is referred to as acquired fear. Instead, dental phobia is a type of fear disproportionate to a threatening situation or environment related to dental treatment, which leads you to avoid such a situation; that is, there is an irrational and exaggerated fear that, in extreme situations, can cause panic attacks or episodes of severe anxiety [Ríos et al., 2014; Fine et al., 2019].

Hence, it is imperative for the paediatric dentist to possess the requisite experience, knowledge, and skills necessary to apply those complementary techniques, which aim to modify the negative or inappropriate behaviour of the paediatric patient and thus change their reactions and perceptions regarding dental treatment [Ríos et al., 2014]. Through the effective management of a child's anxiety, the practitioner can foster a more favourable

and harmonious environment that facilitates successful treatment outcomes. Conversely, an excessive fear on the part of the patient can yield unfavourable outcomes, potentially leading to incomplete or unsuccessful treatment [Weiner and Sheehan 1984; Fine et al., 2019; Cass et al., 2022].

Distraction stands as an efficacious strategy employed within paediatric dentistry to effectively manage distress. This technique functions by redirecting attention and consciousness away from sensations or emotional reactions triggered by exposure to intimidating or painful stimuli. Distraction strategies may decrease stress by competing with a stressful event for a child's attentional resources, eliciting a relaxation response in children. Since there is an inverse relationship between the strength of the stressor and the effectiveness of the distractor, a strongly attractive distractor combined with a mild to moderately stressful situation can effectively diminish the stress [Gupta and Yadav 2018]. The American Academy of Paediatric Dentistry (AAPD) has long recommended the utilisation of distraction techniques to alleviate the fear and anxiety associated with dental procedures [AAPD, 2022]. One notable distraction technique utilised in the realm of paediatric health sciences to alleviate anxiety linked with medical and dental treatments involves the inclusion of companion animals. Diverse studies have proven that animals exert favourable effects on the psychological, physiological, and social aspects of children and adolescents [Lundqvist et al., 2017; Gussgard et al., 2019; Rodriguez et al., 2020]. Animal-Assisted Interventions (AAI) are structured approaches that intentionally incorporate animals in health services for therapeutic purposes and to improve the wellness of children and adults [Lundqvist et al., 2017; Cruz-Fierro et al., 2019; Rodriguez et al., 2020]. Across various parts of the world, beneficial effects have been observed in paediatric patients of different ages who visit hospitals accompanied by pets, including the dental setting. Specifically trained dogs are a prevalent choice among companion animals employed for AAI, often referred to as Dog-Assisted Therapy (DAT) [Gussgard et al., 2019].

Dogs possess acute observational skills, enabling them to discern signals of intent and emotions from human facial expressions. They also exhibit behaviours that children interpret as happy, friendly, and affectionate. During dental visits, dogs can play a role in dismantling communication barriers and fostering a secure and reassuring rapport between patients and the dental team. For all these reasons, dogs are considered highly suitable for use during oral therapy interventions, for example, to calm or comfort a fearful and anxious child [Lundqvist et al., 2017; Gussgard et al., 2019a; Gussgard et al., 2019b; Rodriguez et al., 2020; Gussgard et al., 2023].

DAT could be viewed as a compelling substitute for sedation for children experiencing anxiety [Gussgard et al., 2019a; Gussgard et al., 2019b]. According to the AAPD [2022], the DAT should exclusively involve dogs with rigorous training, temperament testing, and full certification. The present manuscript aims to provide a comprehensive overview, establishing both conclusions and directions for future research.

Methods

The present scoping review was developed following the methodology recommended by Arksey and O'Malley [Arksey and O'Malley 2005], Levac et al. [Levac et al., 2010], and the Preferred Reporting Item for Systematic Reviews and Meta-analysis guidelines for scoping reviews (PRISMA-ScR) [Tricco et al., 2018]. A scoping review encompasses the mapping and synthesis of the existing relevant literature on a broad range of key concepts underpinning a clinical topic of interest [Levac et al., 2010. Peters et al., 2015]. This type of review explores the primary sources and types of evidence available, especially when this topic has not been reviewed comprehensively before or when the literature shows a complex and heterogeneous nature not acquiescent to a more precise systematic review [Peters et al., 2015]. In general, a scoping review comprises five steps: (i) formulation of a focused research question, (ii) searching and identifying relevant studies, (iii) study selection, (iv) extracting and charting the data, and (v) collating, summarising, and reporting the results.

Eligibility criteria. The search strategy was conducted for the most relevant studies published in the past 20 years about dog-assisted therapy in paediatric dental practice. The defined POC ("Population"-"Outcomes"-"Context") question was as follows: "In anxious or fearful children (Population), which are the behavioural benefits and limitations (Outcomes) of incorporating a certified therapy dog and handler in the paediatric clinical setting (Context)?".

Available clinical trials, observational studies (cohort, case–control, cross-sectional designs, clinical case reports), and narrative reviews, limited to the English and Spanish languages and published between June 2003 and May 2023, were eligible for the present review. Studies performed in adults, nondental studies, opinion papers, abstracts, letters to the editor, and grey literature were excluded. Reasons for exclusion after full-text reading were recorded.

Search strategy and screening process. A comprehensive electronic and manual (reference lists of included articles) search for potential titles and abstracts was performed in these four databases: PubMed, EMBASE, Google Scholar, and Dentistry & Oral Sciences Source (EBSCO). An electronic search strategy was developed, employing different combinations of related keywords (and synonyms), free terms, MeSH terms, and Boolean operators. The main key search terms were "dog-assisted therapy" and "paediatric oral care". We adapted the search strategy for all databases. In PubMed, the following algorithm was created:

"dog-assisted"[All Fields] AND ("therapeutics"[MeSH Terms] OR "therapeutics"[All Fields] OR "therapies"[All Fields] OR "therapy"[MeSH Subheading] OR "therapy"[All Fields] OR "therapy s"[All Fields] OR "therapys"[All Fields]) AND ("paediatric dentistry"[All Fields] OR "paediatric dentistry"[MeSH Terms] OR ("paediatric"[All Fields] AND "dentistry"[All Fields]) OR "paediatric dentistry"[All Fields]).

The complete search process was sensibly conducted by two independent and precalibrated authors (MRB and DRM), according to the predefined inclusion and exclusion criteria. The inter- and intrareviewer agreement levels between these reviewers were calculated using Cohen's kappa coefficient. Any discrepancy was resolved through discussion and consensus by consulting the other two authors (JFV and DTH). Duplicated studies were eliminated. Then, potentially eligible articles were retrieved and carefully read in full-text form. The final list of selected studies for the scoping review was developed by three authors (MRB, JFV, and DRM); again, any difference was solved by consensus with the other authors (APG, FPG, and AGR).

Data charting and synthesis of results. Data extraction was carried out to generate a narrative/descriptive summary of the results, according to the review's aims and the research question. From each included article, the following items were recorded:

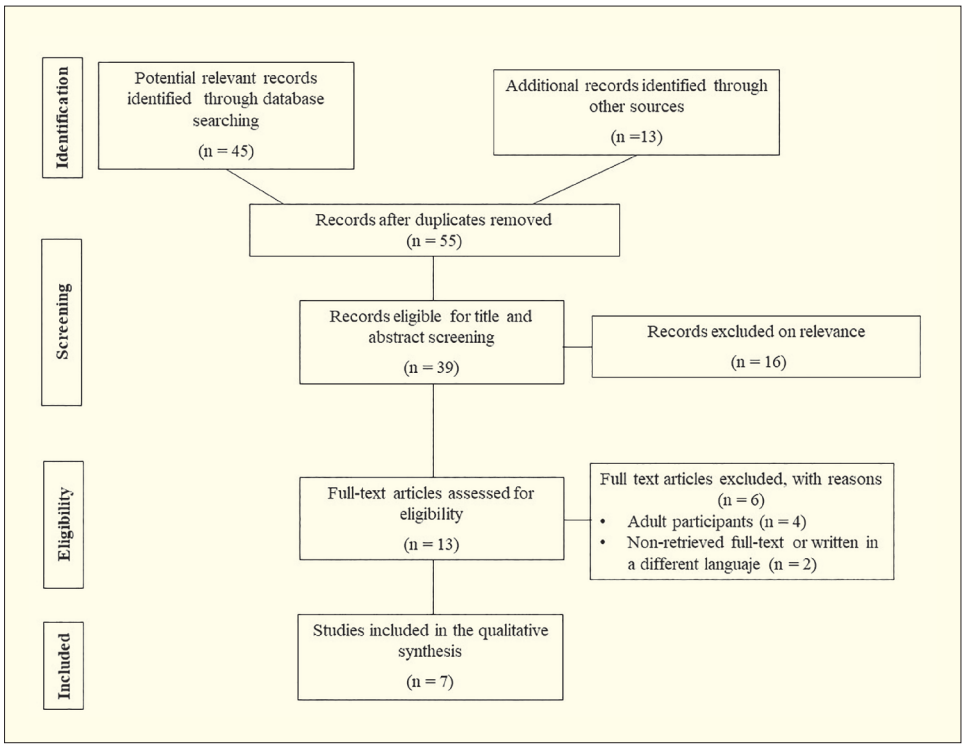

FIG. 1
Flow diagram describing the selection process according to the PRISMA recommendations.

first author and year, country, study methodological design, intervention(s), outcomes, and main findings/conclusions. In the cases of clinical trials and observational/longitudinal studies, the target population, sample size, and follow-up period were also mentioned. All items were independently collected by two authors (APG and AGR). Disagreements during the data extraction process were resolved by seeking expert advice from a third reviewer (FPG). Data were directly entered into a predesigned and piloted Excel 2019 worksheet (Microsoft Office®); the worksheet was then carefully rechecked by other authors (MRB, FPG, and DTH) for errors or inconsistencies throughout the data set. All bibliographic references were managed by Mendeley software, including citation identification and localisation of potential cross-referenced articles. In the cases in which there was missing or insufficient relevant information from the included studies, the authors of these studies were contacted by email, trying to obtain the pending data.

Results

Fifty-eight potential references were identified in the different electronic databases and the subsequent manual searching. After title and abstract screening and duplicate removal, 14 full-text articles were carefully reviewed for eligibility. Finally, seven relevant, representative, and most informative studies, according to the authors' experience (no critical appraisal was performed), were included. The selection process was performed according to the PRISMA-ScR statement flowchart, as shown in Figure 1. Excellent intra- and interreviewer agreement levels were found for the search and screening processes, according to the kappa coefficients (0.89 and 0.93, respectively).

Considering the selected studies, there were three randomised and nonrandomised clinical trials [Havener et al., 2001; Cajares et al., 2016; Nammalwar et al., 2018; Gussgard et al., 2023] and two narrative literature reviews [Gussgard et al., 2019a; Gussgard et al., 2019b]; two observational studies [González-Jara et al., 2010; Vincent et al., 2020] were also included. No case-control studies or cohorts could be detected. Regarding the country, most articles were conducted in the USA and Norway; one was developed in Chile. The publication dates ranged from 2001 to 2023, most of them in the past seven years. The principal characteristics, numerical data, and main findings/conclusions from each included article are summarised in Table 1.

Discussion

Anxiety stands as a detrimental phenomenon that wields a substantial impact on paediatric dental care. When confronted with an anxious or fearful patient, the practitioner must approach this factor from a multifaceted perspective, encompassing the identification of its underlying causes, optimal evaluation methods, and effective management strategies. Currently, there exists a scarcity of valid and reliable scientific data regarding the psychological benefits afforded to paediatric patients with noticeable anxiety through the presence of therapy dogs in the clinical dental setting, i.e., DAT. To date, the findings have been encouraging, so it is of great importance to conduct more high-quality clinical research to fully justify the use of these noninvasive distraction and sedation procedures in uncooperative or disabled children. This is especially crucial for those with challenges in communication or expressing their emotions [Sobo et al., 2006; Havener et al., 2001; Calcaterra et al., 2015].

The first reports on the use of DAT in the hospital setting were presented by Nagengast et al. [1997]. In their study, 23 healthy children aged 3 to 16 years underwent two physical examinations (with and without DAT) while their vital signs were monitored. The authors detected statistically significant reductions in systolic blood pressure, heart rate, and distress in those patients accompanied by the therapy dog. Subsequently, other studies have reported promising findings from the application of DAT or AAI in general paediatrics. Kaminski et al. [2002] conducted a clinical study using DAT in children with different medical

Study	Design	Methodological features	Main outcomes/findings and conclusions
Havener et al., 2001	RCCT (Pilot study)	• 40 children (7 – 11 yrs. old). • Half the children had the dog present; half did not. • Data were obtained before, during, and after the dental session, through the "Observational Scale of Behavioural Distress". • Telethermometer for peripherical skin temperature.	• No significant differences in behavioural distress or skin temperature were found between the experimental and control groups. • Additional analysis revealed that for children who initially verbalized distress on arrival at the clinic, the presence of the dog decreased physiologic arousal before the dental procedures.
Nammalwar et al., 2018	Non-randomized CT (Before-After study)	• 20 children (4 – 11 yrs. old; 11 females and 9 males). • Half the children had the dog present; half did not. • Data were obtained before (waiting area) and during the dental session, through a questionnaire and the modified "RMS Pictorial Scale".	• Results determined that a 15-min exposure with the therapy dog in the waiting area reduced the level of apprehension; further, no increase in anxiety was shown in the dental chair. • Dog therapy exhibited to be a promising method of child anxiety control, as part of a successful paediatric dental practice.
Gussgard et al., 2019a	Literature review	• Risk and hazards of using therapy dogs in the paediatric dental operatory room. • Databases: PubMed (Medline), Clinicaltrials.gov, and Google Scholar. • No limits in study type, time, sample size, or language.	• Seven articles. • Potential risks to health and safety for children are classified into four categories: (1) the dog as a source of zoonotic pathogens and human diseases; (2) exposure to canine allergens; (3) adverse animal behaviour; and (4) associated dangers. • Risks in the dental setting with the presence of a therapy dog are low if the dental staff and dog handlers meet with diverse practices and recommendations.
Gussgard et al., 2019b	Literature review	• Occupational risk and hazards of using therapy dogs in the paediatric clinical setting. • Databases: PubMed (Medline), Clinicaltrials.gov, and Google Scholar. • No limits in study type, time, sample size, or language.	• Hazards in the dental clinic that apply to both humans and therapy dogs. • Allergies, sharps injury, eye injury, stress, rhinitis, and hearing impairment are the most important hazards. • Patient and/or dog erratic behaviour and threats should also be considered.
Vincent et al., 2020	Cross-sectional surveys	• Two surveys (caregiver and provider) using Bowel's model, with 22 and 21 five-point Likert-scale items, respectively; 5 to 10 min to complete. • Acceptability, demand, implementation, practicality, adaptation, integration, expansion, and limited-efficacy testing of dog-assisted therapy in paediatric dentistry.	• Ninety percent of caregivers manifested acceptability to support their children with therapy dogs. • Sixty-two percent of providers accepted the overall integration of therapy dogs. • Main concerns were risk of accidents (36%), infection control (50%), and clinic efficiency (33%). • Caregiver survey qualitative responses were positive (68%), sharing concerns about efficiency and zoonosis.
González-Jara et al., 2020	Retrospective study	• Describe the experience of dog-assisted therapy during dental treatment of children and adolescents with special needs. • Thirty-two clinical records of paediatric patients between 4 and 13 years of age, attended the paediatric dentistry clinic, with the support of therapy dogs.	• 81.25% of children received successful dental interventions. • A total of 36 dental procedures were performed, 19 invasive and 17 non-invasive. • The implementation of dog-assisted therapy in the clinical room was widely accepted among patients, parents, and practitioners.
Gussgard et al., 2023	- Crossover RCCT (Pilot study)	• Sixteen anxious children aged 6 to 12 yrs. • Two intraoral examinations, with and without the dog, under random allocation. • Assessment of the child's compliance, anxiety, and satisfaction. • CFSS-DS (Dental Children's Fear Survey Schedule) scale completed by the parent/guardian. • Salivary cortisol levels, heart rate, and skin conductance were also measured.	• - All patients completed both clinical visits and exhibited full compliance during the dental examination with the therapy dog. • - Children and parents/guardians reported great satisfaction. • - The salivary cortisol level reduction during the first clinical examination decreased by 30% in the presence of the therapy dog and 20% without. • - While the decrease during the second clinical examination was 29% in the presence of the therapy dog and 3% without.
RCCT = Randomized Controlled Clinical Trial.			

TABLE 1 Summary of main characteristics from retrieved studies.

conditions or who had undergone surgery (e.g., transplants). The results obtained showed that the heart rate, the parents' assessments of their child's mood, and the positive manifestations of the patients were better in the DAT group. Therefore, it was concluded that this therapy provided an additional source of psychological support for hospitalised children. Sobo et al. [2006] studied the effects of DAT in children and adolescents aged 5 to 18 years who experienced postoperative pain using surveys before and after the surgical procedure. The authors determined that DAT significantly reduced perceived pain, theorising that interaction with a dog positively distracts patients in an active cognitive way to provide them with more comfortable feelings. Calcaterra et al. [2015] presented the results of a pilot randomised controlled trial in children and adolescents between 3 and 17 years of age who underwent orchidopexy, inguinal or umbilical hernia repair, circumcision, and varicocele surgery. All patients received 20-minute postoperative sessions with a therapy dog, finding favourable psychological outcomes. The authors concluded that DAT improved and diminished the recovery time after anaesthesia, modified pain perception, and induced emotional prefrontal responses; a better cardiovascular response was also detected.

In the specific area of paediatric dentistry, the use of DAT or AAI has also reported favourable results in several clinical studies. In 2001, Havener et al. [2001] conducted a pilot study to evaluate the effects of a companion-trained dog on physiological arousal and behavioural distress in 40 children between 7 and 11 years of age experiencing a dental procedure. Only half of the patients were accompanied by a dog. Data were obtained before, during, and after the procedure. No significant differences were found in either measured variable between the studied groups, although it was observed that in some children who initially presented fear when arriving at the session, the presence of the dog reduced anxiety in the dental chair. Furthermore, three recent clinical studies have confirmed these findings. Nammalwar and Rangeeth [2018] compared the anxiety levels of 20 healthy children (4 to 11 years old) who had a 15-minute approach with a therapy dog in the waiting room and during dental noninvasive procedures (e.g., topical fluoride applications or small restorations) in the dental chair. The authors observed an evident reduction in anxiety levels in all participating children. Furthermore, Gupta et al. [2018] evaluated through a specific questionnaire the parent's acceptance of the presence of therapy pets, the child's choice between a soft toy or a live pet, and the child's predilection towards their own home pet or a trained therapy pet. The authors concluded that the employment of AAI, especially with dogs, is highly recommended as a behaviour management technique; furthermore, most children preferred pet-assisted oral consultation with a therapy pet over their own pet. Vincent et al. [2020] conducted a cross-sectional study, applying Likert-type surveys among parents and dentists about the benefits and risks they perceived from DAT or AAI in their children who attended dental care. In general, both parents and practitioners accepted and demanded this type of assisted therapy because of its nonpharmacological features and for being accessible, safe, and efficient to reassure the child patient during dental care. González Jara et al. [2020] carried out a descriptive/retrospective study aimed at narrating the experience among children aged between 4 and 13 years with special healthcare needs. They were assisted by therapy dogs in the clinical oral setting for receiving diverse dental procedures (invasive and noninvasive). Thirty-two clinical registers from a hospital paediatric dentistry service were reviewed. It was concluded that the implementation of DAT for emotional support, as a complement to paediatric dental care, showed good acceptance among children and their parents, which facilitated the performance of dental interventions. On the other hand, AAI has been successfully employed in orthodontics both in children and adults, according to the findings reported by Cass et al. [2022].

In addition, the presence of these dogs during the paediatric dental setting has been demonstrated to have a positive influence on various physiological parameters, such as blood pressure, peripheral skin temperature, and stress hormones, such as epinephrine and norepinephrine, as well as increases in endorphin, dopamine, and oxytocin levels [Vagnoli et al., 2015; Lundqvist et al., 2017]; oxytocin is a neuropeptide hormone secreted by the posterior pituitary, which has demonstrated calming effects and increases the pain threshold in children. Furthermore, a significant reduction in the levels of cortisol secreted in response to stressful stimuli has been observed [Nammalwar and Rangeeth 2018; Lavín-Pérez et al., 2023]. Despite the reported beneficial effects of DAT or AAI in the clinical paediatric dentistry environment, concerns have been raised by parents/caregivers and professional practitioners regarding potential risks to children's health and safety [Gussgard et al., 2019a; Gussgard et al., 2019b; Vincent et al. 2020]. Accidents or cross-infections can occur in the operating room (even in the waiting area); therefore, it is necessary to identify all possible risk factors to human health and safety associated with the presence of a therapy dog and the handler in the dental clinical setting [Gussgard et al., 2019b]. For instance, dogs are vectors for zoonotic infections, exposure to animal allergens, adverse animal behaviour, eye injuries, and patient or animal stress and convey inconveniences related to congested waiting and/or operatory rooms [Gussgard et al., 2019a; Gussgard et al., 2019b]. According to Vincent et al. [2020], these hazards can be addressed through the implementation of a clear procedure protocol that includes a specific space for the therapy dog and handler, additional chairs, and appropriate sanitation or disinfection (e.g., use of sanitation wipes), among others. Regarding hygiene protocols in the dental setting, there are published useful guidelines, including asepsis regimens and protective barriers, that must be comprehensively followed and adapted for the therapy dog and the guardian. Paediatric dentistry practitioners are obligated to improve safety among patients, dog handlers, and dental teams. Everyone present (even dogs) in the operating room should be considered a potential source of infectious microorganisms, including resistant bacteria, during the possible cross-infection process [Gussgard et al., 2019a; Gussgard et al., 2019b]. Another disadvantage of the application of DAT is the confined operatory room that usually allows little manoeuvrability and is surrounded by diverse stimuli, such as strange smells, chemicals and/or aerosols, and noises, which may alter the animal's welfare and behaviour [Gussgard et al., 2019a; Gussgard et al., 2019b; Gussgard et al., 2023].

On the other hand, a stressed dog should always be considered a potential risk for injuring humans in the operating room. In this respect, Gussgard et al. [Gussgard et al., 2019a] stated the following recommendations and practices to minimise these hazards: (i) the therapy dog must be regularly evaluated for adequate temperament testing by a qualified professional; additionally, the dog should be examined by an experienced veterinarian for detecting any physical discomfort, disease, or pain that can lead to disturbed behaviour; (ii) the assisting team (trainer and dog) should undergo continuous training and recertification in therapy assistance; for example, a crucial recommendation is that a dog handler must immediately

recognise the first manifestations of the dog's adverse behaviour; and (iii) the clinical setting should have access to a separate and peaceful room or space where the dog can rest and recuperate between one patient and another to avoid the animal becoming stressed.

Study limitations. Narrative reviews of the literature (that lack a critical evaluation of the retrieved evidence) carry a high risk of the occurrence of methodological biases. Considering this, our study does not intend to generate generalisable knowledge but a useful and suitable contribution to the paediatric dentistry community. Therefore, the findings and conclusions from the present study should be interpreted with caution by readers.

Conclusions

In general, mild to moderate antianxiety effects have been reported in the dental literature when DAT is employed in the paediatric dentistry environment. Although this management strategy has demonstrated high potential, practitioners should be cautious about its clinical effectiveness and consider the different associated pros and cons before implementation in their daily professional practice. More related high-quality research is therefore necessary.

Author Contributions

Project administration, Arturo Garrocho-Rangel; Investigation, Dulce Ríos-Méndez, Joselin Flores-Velázquez, Fernando Pozos-Guillén, Daniel Trejo-Herbert; Conceptualisation, Miguel Rosales-Berber, Amaury Pozos-Guillén; Writing, Miguel Rosales-Berber, Arturo Garrocho-Rangel; Review and editing, Amaury Pozos-Guillén; Supervision, Arturo Garrocho-Rangel. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare that they have no conflicts of interest.

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