



Distraction Methods for Management of Dental Anxiety in Children: A Systematic Review

Maria Mtalsi¹ Khadija Oumensour¹ Kawtar Ouhammou¹ Samira El Arabi¹

¹Department of Pedodontics and Preventive Dentistry, Faculty of Dentistry, Hassan II Casablanca University, Morocco

Address for correspondence: Khadija Oumensour, MDS, Department of Pedodontics and Preventive Dentistry, Faculty of Dentistry, Hassan II Casablanca University, Casablanca, Morocco

E-mail: dr.oumensour@hotmail.com

Abstract

The aim of this systematic review of the literature was to evaluate the effectiveness of different types of distraction on behavior, pain perception, and dental anxiety in children and to compare them to conventional approaches. An electronic search was conducted on three databases (PubMed, Science Direct, and Scopus) and concerned randomized clinical trials published between 2000 and 2022, dealing with the effectiveness of distraction as a psycho-behavioral approach in the odontological management of children. This systematic review followed the guidelines of the PRISMA Statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). A qualitative assessment of the risk of bias was performed using the online Cochrane Handbook for Systematic Reviews of Interventions. Ten randomized clinical trials were included in this review. These studies used active and passive distraction and demonstrated its role in the management of dental anxiety in children with superior efficacy to behavioral approaches. Both active and passive distraction are behavioral approaches that can positively improve the dental care process. However, further research with more homogeneous methodological characteristics, using different types of distraction, is desirable in order to have relevant conclusions.

Keywords: Children, dental anxiety, distraction

Introduction

The odontological care of children can be considered a real challenge in the daily life of the dental surgeon in general and the pedodontist in particular. Indeed, contact with strangers in potentially threatening and invasive situations can generate a feeling of unease in children.

To better manage the child's apprehension about dental care, the American Academy of Pediatric Dentistry has identified ten behavioral management methods to help the practitioner treat the anxious child and promote a positive dentist-child relationship; these relate to voice control, tell-show-do, positive reinforcement, distraction,

nonverbal communication, hand to mouth, physical restraint, conscious sedation, nitrous oxide inhalation, and, as a last resort, general anesthesia.[1]

Thus, distraction is one of the non-pharmaceutical approaches whose success in medical settings, mainly in children, is well documented. In dentistry, it is considered a common technique that diverts the child's attention from what may be perceived as an unpleasant procedure, by shifting his or her attention to captivating and fascinating distractors. This distraction is divided into two main categories: namely, Passive Distraction, which consists of watching videos, listening to music, reading to the child, or telling him a story to divert his

How to cite this article: Mtalsi M, Oumensour K, Ouhammou K, El Arabi S. Distraction Methods for Management of Dental Anxiety in Children: A Systematic Review. J Pediatr Dent 2024;10(1):1-8



attention. For Active Distraction, this encourages the child to participate in activities during interventions. It can include squeezing balls, relaxing breathing exercises, or playing with electronic devices.[2,3]

Although there is a large body of research on the role of distraction in managing children's behavior during dental care, it is controversial and heterogeneous in its methods and results. Thus, a systematic review was conducted to critically analyze the role of distraction in the dental setting in order to attribute its scientific value as a method of psychobehavioral approach.

Methods

Protocol and registration

This study was conducted in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analyses Statement and has been registered with PROSPERO—the international prospective register of systematic reviews (Reference: CRD42021265350).

Inclusion and exclusion criteria and literature search strategy

Included in our study are: Randomized clinical trials published in English, studies on the effects of distraction as a method of psycho-behavioral approach, on the behavior, anxiety level, and fear in children during dental care.

Systematic reviews and meta-analyses, unpublished manuscripts or theses, and book chapters, studies treating patients with general pathology or in handicap situations, and studies using in combination different sedation techniques (sedative premedication, ENOMO, general anesthesia) were excluded from the present study.

The population, intervention, comparison, and outcome were defined according to the PICO model (Table 1). Afterwards, the terms of the same block were combined with an "OR" and then with an "AND" to assemble the 5 blocks of the PICO to formulate a relevant search equation. As we used several databases, other equations were also created according to the characteristics of the searches of each engine and which allowed reducing the 'noise' as much as possible.

The bibliographic search was conducted by two clinicians in the following electronic databases: PubMed, Science Direct, and Scopus.

Study selection

Two reviewers (specialist and PES in pediatric odontology) independently read all titles and abstracts. If one of the reviewers considered that a publication met the in-

clusion criteria, the full text was searched. Abstracts that were considered potentially eligible or did not contain sufficient information were systematically referred for full-text assessment.

Data extraction

The two reviewers independently extracted the data. Information was retrieved from each study, namely: authors, method of distraction performed, and results.

Assessment of risk of bias

A quality assessment of the studies was performed to assess bias.

As all included studies were randomized controlled trials, the assessment was performed using the tool recommended by the Cochrane Handbook for Systematic Reviews of Interventions "The Handbook" online guide updated by Higgins et al[4] in 2019.

Results

Selection of studies

At the end of the initial search, 279 articles were selected from 3 databases: PubMed, Science Direct, and Scopus (The Prisma Flowchart flow diagram is shown in Fig. 1). These results were de-duplicated leaving a number of 270 Abstracts. Then, 228 Abstracts were excluded from the full-text analysis because they did not fit the central research question or did not meet the inclusion or exclusion criteria. A total of 42 articles were retained for full-text analysis.

After reading, 32 articles were excluded from the survey for various reasons, namely, the use of conscious sedation with ENOMO, the use of sedative premedication, or patients with a general pathology or in a situation of disability.

In the end, 10 articles, answering the central research question, were retained for analysis.

Study characteristics

All studies included in our survey were randomized clinical trials. Table 2 analyzes the characteristics extracted from the included studies.

The sample size varied from 28 to 400 patients depending on the study. The age range of the participants was from 4 years to 11 years. The dental treatments performed in the studies were restoration without local anesthesia (LA) (3 studies), restoration with local anesthesia (2 studies), Pulpotomy and preformed pedodontics cap with LA (2 studies), Pulpal treatment with LA (1 study), Undefined treatment requiring LA (1 study), and patient requiring treatment with and without LA (1 study).

Table 1. List of keywords divided into PICO items and used for database searches

PICO	PICO blocks	Keywords
Patient	Children	Child Children
Investigation	Distraction Psycho-behavior modification techniques	Distraction techniques Behavior control Behavior therapy Child behavior Child psychology Behavior modification
Comparator	Dental treatments performed with and without distraction techniques	Pedodontics Pediatric dentistry Dental care for children
Outcomes	Efficacy	Efficacy Effectiveness Outcomes treatment Behavior
	Dental anxiety	Dental fear Dental anxiety Dental phobia Odontophobia

PICO: Patient, Investigation, Comparator, Outcomes

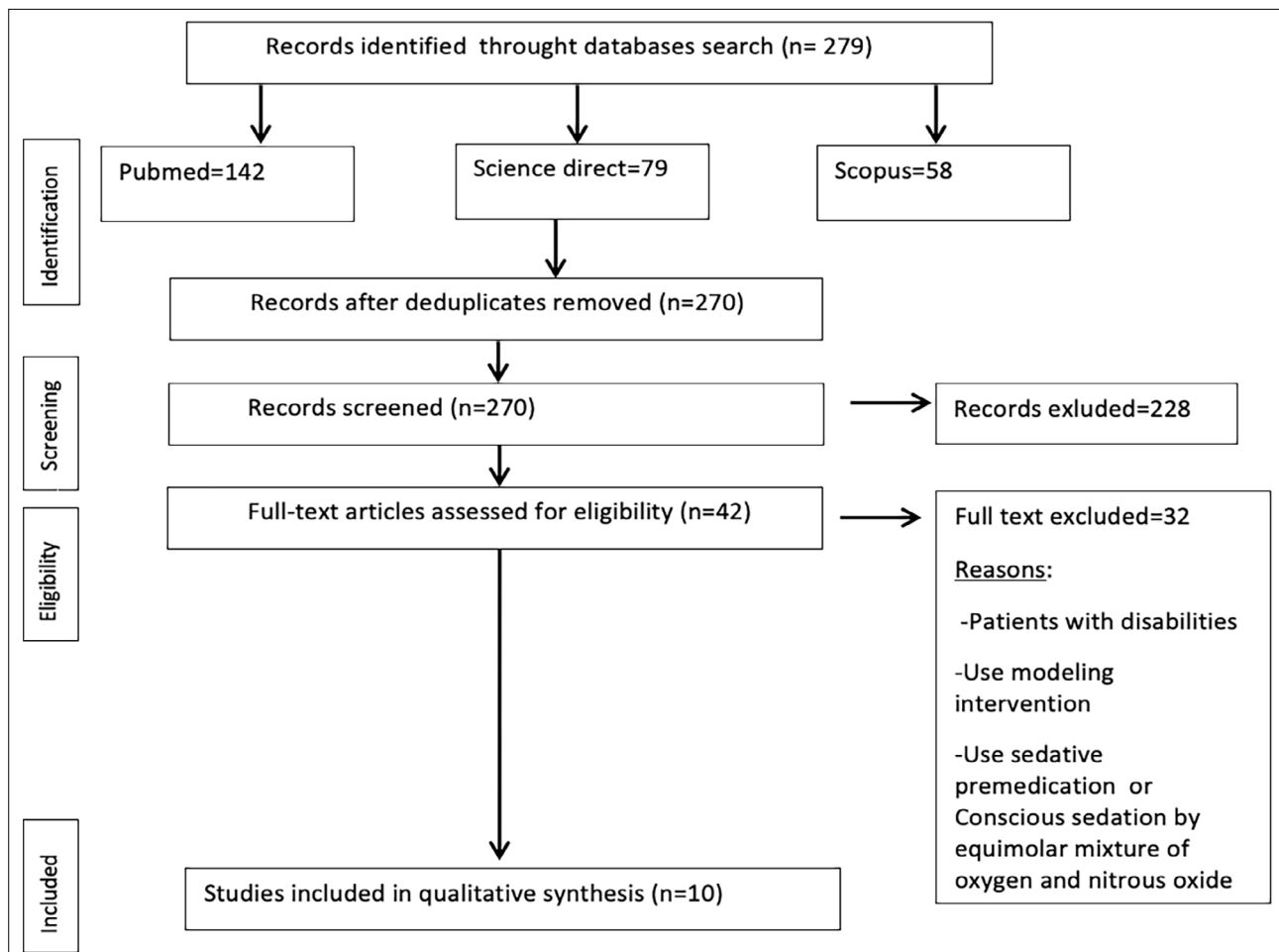


Figure 1. PRISMA search

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Table 2. Characteristics from the included studies

Study	Participants	Treatment	Mode of distraction	Results
Kaur et al[5]	60 patients aged between 4 and 8 years	1. First visit: Screening or diagnosis. 2. Second visit: Cavity preparation without the need of administration of local anesthesia. 3. Third visit: Administration of local anesthesia for invasive procedures like extraction or endodontic procedure.	Passive distraction: Audio visual distraction and audio distraction	Audiovisual distraction was found to be a more effective mode of distraction in the management of anxious children in both the age groups when compared to audio distraction. In both the age groups, a significant effect of the visit type was also observed.
Garrocho-Rangel et al[6]	36 children aged 5–8	Bilateral deep carious cavities in two upper or lower primary molars : cavity preparations, pulpotomies/metallic preformed crowns, under local anaesthesia.	Distraction passive: Audiovisual distraction by using of Video Eyeglasses/Earphones Systems (VEES) Vs traditional non-aversive behavioural techniques.	There were no statistical differences between the results of the two interventions (VEES vs. no VEES/behavioural management).
Khandelwal et al[7]	400 children, age group of 5 to 8 years	Dental restorative procedure (Initial caries cavity lesion in primary mandibular molar	Passive distraction: • Audiovisual distraction: cartoons and animated clips on laptop with earphones • Tell show do	<ul style="list-style-type: none"> The AVD is more capable of reducing anxiety than TSD for patients undergoing dental treatment in their first visit. Combination of TSD and AVD had an additive effect in reduction of anxiety level and it proved to be more effective. Anxiety scales showed similar trends between each other. They also showed similar trends with physiological parameters like blood pressure, PR, and SpO₂.
Azher et al[8]	48 children aged between 6 and 8 years	Restorations (ICDAS 3) without local anesthesia.	<ul style="list-style-type: none"> Active distraction: Bubble Breath Play Therapy Technique de Tell show do 	The BBPT acts as a distraction and can be considered a child-friendly method to enhance rapport with the children; however, it does not allay the fears; while the TSD technique is successful in achieving this. Hence, the BBPT can aid in relaxing the child and thereby help in desensitizing the child's fear by using appropriate behavior shaping strategies.
Buldur et al[9]	76 children aged 7 to 11 years old	Restorative treatment for the first mandibular permanent molar tooth with occlusal dentine caries in each mandibular quadrant with a bilateral inferior alveolar nerve block.	Passive distraction: Using virtual reality (audiovisual).	Virtual reality significantly reduced pain and anxiety during local anesthesia in children undergoing dental treatment.
Kamath[10]	160 patients aged between 4 and 8 years.	Traitement sous anesthésie locale	Distraction active: Writing in the air using leg (WITAUL).	The WITAUL technique appears to be a simple and effective method of distraction during local anesthesia administration in pediatric patients.
Niharika et al[11]	40 children aged between 4 and 8 years	Pulp therapy treatment	Passive distraction: Virtual reality eyeglasses.	VR distraction is a clinically viable technique with a high potential to alleviate pain and anxiety associated with various dental procedures.

Table 2. Cont.

Study	Participants	Treatment	Mode of distraction	Results
Ghadimi et al[12]	28 children (4–5 years)	Local anaesthesia, pulpotomy and PMCs treatment of mandibular primary molar	Distraction passive: Visual distraction by watching a cartoon.	Dental anxiety was reduced significantly by virtual distraction compared to conventional tell show do.
Al-Khotani et al[13]	56 children aged between 7 and 9 years	Dental restorative procedure.	Passive distraction: Audio visual, video-taped cartoons using an eyeglass system (i-theatre™).	AV distraction seems to be an effective method in reducing fear and anxiety in children during dental treatment. Further, children who used eyeglass goggle display as a distraction tool during dental treatment reported not only less anxiety than control groups but also showed more positive responses after injection with local anesthesia.
Sayed et al[14]	90 pediatric patients aged between 7 and 9 years	Restorative treatment	Passive distraction DOM: - Live display of the procedure was shown to the patient using video output of the DOM displayed on a 72-inch LCD monitor, angled for best visibility of the child	There is a reduction in anxiety from the first visit to the second visit for restorative treatment when the DOM is used.

AVD: Audiovisual distraction, TSD: Tell show do, PR: Pulse rate, SpO₂: Peripheral oxygen saturation, BBPT: Bubble breath play therapy, PMCs: Preformed metal crowns, DOM: Dental operating microscope, LCD: Liquid crystal display

8 studies used passive distraction techniques, compared to 2 studies that used active distraction techniques: Bubble Breath Play Therapy (BBPT) and Writing in the Air Using Leg (WITAU).

All distraction techniques were performed intraoperatively. For those that were audio-visual or visual, no patient had access to the method in advance or at home to prepare.

Summary of results

The results were analyzed according to the effectiveness of the distraction methods used.

The evaluation of the effect of active distraction (WITAU technique) was recorded during the injection of local anesthesia. The results showed a positive effect in the reduction of anxiety and pain in children.

For the passive audiovisual distraction, used in most of the selected studies, allowed a significant reduction of anxiety and pain during the realization of dental care sometimes requiring the injection of local anesthesia.

The study by Kaur et al[5], which compared the efficacy of audiovisual and audio distraction, showed a superior efficacy of AV distraction.

The comparison between active and passive distraction and conventional approach techniques was made in several studies, namely that of Garrocho-Rangel et al[6], Khandelwa et al[7], and Azher et al.[8]. The results of the first two studies confirm the superiority of the effectiveness of distraction compared to conventional approach techniques, in particular the tell-show-do technique. As for Khandelwal's study,[7] it showed a superior efficacy in the management of anxiety when combining the two techniques (distraction and conventional approaches).

However, Azher's study[8], which also compared the effect of distraction with conventional approaches, showed a lesser effectiveness of distraction compared to other conventional approaches.

Risk of bias within the studies

The results of the risk of bias assessment, using the Cochrane Handbook for Systematic Reviews guidelines, are shown in Table 3.

These results showed that all the selected studies had a low risk of bias for the following domains: "Random sequence generation, allocation concealment, blinding of participants and personnel, and binding of participants and personnel," and an unclear risk of bias for the domain "Selective reporting." For the "Incomplete data"

Table 3. Assessment of Risk of Bias of included studies

	Buldur et al[9]	Azher et al[8]	Khandelwal et al[7]	Ghadimi et al[12]	Garrocho-Rangel et al[6]	Niharika et al[11]	Al-Khotani et al[13]	Sayed et al[14]	Kaur et al[5]	Kamath [10]
Random sequence generation	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Allocation concealment	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Blinding of participants and personnel	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Blinding of outcome assessment	High risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk	High risk
Incomplete outcome data	Unclear risk	Low risk	Low risk	Low risk	Low risk	Unclear risk	Low risk	Unclear risk	Low risk	Low risk
Selective reporting	Unclear risk	Unclear risk	Unclear risk	Unclear risk	Unclear risk	Unclear risk	Unclear risk	Unclear risk	Unclear risk	Unclear risk
Other sources of bias	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk

domain, the risk of bias was considered low for 7 studies and unclear for 3 studies. However, the "Binding of outcome assessment" domain was rated as high risk for all included studies.

Discussion

The main objective of all pedodontists is to ensure that children receive dental care in favorable conditions, far from anxiety and discomfort. This implies the use of different psycho-behavioral approach techniques, in particular distraction.

The present study highlighted the role of different distraction techniques in the management of anxiety, pain, and behavior during dental care in children. Several distraction techniques were used in the ten clinical trials included in this systematic review:

Active distraction: Which consists of encouraging the child to participate in the various dental procedures, such as:

- The Writing in the air using leg (WITAIL): the technique involves lifting the right or left leg and using it to write in the air.
- The bubble breath play therapy (BBPT) is a simple and concrete relaxation method designed to teach children deep and controlled breathing while creating an awareness in them of their own mind-body connections.

Passive distraction (auditory or audio-visual): Which consists of watching videos, listening to music, reading a book to the child, or telling him a story to divert the child's attention.

Of the included studies, eight clinical trials used both passive audio-visual and auditory distraction. Both types of distraction were found to be more effective than behavioral approaches,[9,10] with the exception of the study by Garrocho-Rangel et al[6], which found no significant difference between the two techniques in managing dental anxiety in children. The comparison between audiovisual distraction (AVD) and auditory distraction (AD) as in the study Kaur et al[5] raised the superior role of AVD in reducing anxiety values compared to AD. The authors explain the superior benefits of VAD by the fact that VAD focuses the child's full attention and allows the child to forget the stress of dental care.[5]

As for active distraction, two selected studies used it as a method of anxiety management.[8,10] Kamath PS study [10] compared the WITAIL technique with a deep

breathing relaxation technique, and Azher's study [8] compared the Bubble Breath play therapy (an exercise that allows the child to focus on his or her breathing, which must be deep, thanks to the creation of air bubbles by bubble breath solutions) with the Tell show do technique. The findings of the two clinical trials showed that active distraction is effective in reducing anxiety and managing the child's behavior in the dental setting.

However, the second study, which compared active distraction (BBPT) with the tell-show-do technique, showed that BBPT was effective in managing dental anxiety in children but not in a stable manner compared to the tell-show-do technique.[8]

It should be noted that there is heterogeneity in the evaluation parameters of the effectiveness of distraction methods in the selected clinical trials. Some studies evaluated only anxiety (psychological or physiological tests) or pain (FPS-R, Modified Toddler Preschooler Postoperative Pain Scale...) or behavior (Frankl Behavioral Scale, FLACC...), while others evaluated two or three parameters at the same time. In addition, for the same parameter assessed, measurement techniques differed from one study to another.

The present investigation included studies of children with different age ranges from 4 years to 11 years. Indeed, the age of the child and his or her level of maturity influence his or her behavior, perception of pain, and anxiety level. Consequently, these factors will systematically influence the psychobehavioral approach chosen.[15]

Thus, children between the ages of 4 and 6 years have a high level of dental anxiety, which manifests itself in more disruptive behaviors and is therefore more difficult to control and manage during dental care. This factor is even more critical when using distraction since the child's attention is required to successfully complete the technique.

Unlike children between 6 and 8 years of age who are considered mature enough to interact with these techniques, thus allowing for better anxiety management and a smooth dental care session.[15,16]

The comparison of our results with the conclusions of other systematic reviews, dealing with the same subject, showed similar conclusions. Indeed, the systematic review carried out by Prado et al[17], which deals with the same subject, showed that distraction can be effective in managing children's and adolescents' dental anxiety and fear during dental treatment with very low certainty of evidence.

Despite this heterogeneity, which is as evident in the protocol as it is in the overall study design, the results of all the clinical trials included in this review converge on the effectiveness of both active and passive distraction in managing anxiety, pain, and behavior in children during dental care. However, for more conclusive and credible results, standardized studies (the size and age of the sample, the means of distraction used, the types of parameters studied as well as the means deployed to evaluate them) must be undertaken.

Conclusion

Dental anxiety is a factor that complicates the doctor-child relationship and prevents the proper conduct of dental care or outright management of the patient. It is therefore essential to manage this anxiety and thus gain the child's trust. According to this systematic review, both active and passive distraction is a method of behavioral approach that can positively improve the course of dental care. However, further research with more homogeneous methodological characteristics and comparing different distraction techniques is desirable in order to have relevant conclusions.

Financial Disclosure: Nil.

Conflict of Interest: None declared.

Use of AI for Writing Assistance: Not declared.

References

1. Fox C, Newton JT. A controlled trial of the impact of exposure to positive images of dentistry on anticipatory dental fear in children. *Community Dent Oral Epidemiol* 2006;34:455-9.
2. Clinical Affairs Committee-Behavior Management Subcommittee, American Academy of Pediatric Dentistry. Guideline on behavior guidance for pediatric dental patients. *Pediatr Dent* 2015;37:57-70.
3. Law EF, Dahlquist LM, Sil S, Weiss KE, Herbert LJ, Wohlheiter K, et al. Videogame distraction using virtual reality technology for children experiencing cold pressor pain: the role of cognitive processing. *J Pediatr Psychol* 2011;36:84-94.
4. Higgins J, Thomas J, Chandler J, Cumpston M, Li T, Page M, Welch V. *Cochrane Handbook for systematic reviews of interventions*. United Kingdom: Monash University; 2019.
5. Kaur R, Jindal R, Dua R, Mahajan S, Sethi K, Garg S. Comparative evaluation of the effectiveness of audio and audiovisual distraction aids in the management of anxious pediatric dental patients. *J Indian Soc Pedod Prev Dent* 2015;33:192-203.
6. Garrocho-Rangel A, Ibarra-Gutiérrez E, Rosales-Berber M, Esquivel-Hernández R, Esparza-Villalpando V, Pozos-Guillen A. A video eyeglasses/earphones system as distracting method during dental treatment in children: A crossover randomized and controlled clinical trial. *Eur J Paediatr Dent* 2018;19:74-9.

7. Khandelwal D, Kalra N, Tyagi R, Khatri A, Gupta K. Control of anxiety in pediatric patients using "Tell Show Do" method and audiovisual distraction. *J Contemp Dent Pract* 2018;19:1058–64.
8. Azher U, Srinath SK, Nayak M. Effectiveness of bubble breath play therapy in the dental management of anxious children: A pilot study. *J Contemp Dent Pract* 2020;21:17–21.
9. Buldur B, Candan M. The effectiveness of audiovisual distraction behavior guidance technique in children with dental anxiety. *Pesqui Bras Odontopediatria Clin Integr* 2021;21:e0082.
10. Kamath PS. A novel distraction technique for pain management during local anesthesia administration in pediatric patients. *J Clin Pediatr Dent* 2013;38:45–7.
11. Niharika P, Reddy NV, Srujana P, Srikanth K, Daneswari V, Geetha KS. Effects of distraction using virtual reality technology on pain perception and anxiety levels in children during pulp therapy of primary molars. *J Indian Soc Pedod Prev Dent* 2018;36:364–9.
12. Ghadimi S, Estaki Z, Rahbar P, Shamshiri AR. Effect of visual distraction on children's anxiety during dental treatment: A crossover randomized clinical trial. *Eur Arch Paediatr Dent* 2018;19:239–44.
13. Al-Khotani A, Bello LA, Christidis N. Effects of audiovisual distraction on children's behaviour during dental treatment: A randomized controlled clinical trial. *Acta Odontol Scand* 2016;74:494–501.
14. Sayed A, Ranna V, Padawe D, Takate V. Effect of the video output of the dental operating microscope on anxiety levels in a pediatric population during restorative procedures. *J Indian Soc Pedod Prev Dent* 2016;34:60–4.
15. Patel A, Schieble T, Davidson M, Tran MC, Schoenberg C, Delphin E, et al. Distraction with a hand-held video game reduces pediatric preoperative anxiety. *Pediatr Anesth* 2006;16:1019–27.
16. Barreiros D, Oliveria D, Queiroz A, Silva R, Paul-Silva F, Kuchler E. Audiovisual distraction methods for anxiety in children during dental treatment: A systematic review and meta-analysis. *J Ind Soc Ped Prev Dent* 2018;36:2–8.
17. Prado IM, Carcavalli L, Abreu LG, Serra-Negra JM, Paiva SM, Martins CC. Use of distraction techniques for the management of anxiety and fear in paediatric dental practice: A systematic review of randomized controlled trials. *Int J Paediatr Dent* 2019;29:650–68.