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Effect of audiovisual distraction on children's behaviour, anxiety and pain in the dental setting

ABSTRACT

Aim *To evaluate whether the parental perception of the patient's anxiety, children's anxiety, pain, behaviour and heart rate of paediatric patients improves when an audiovisual technique is used as a distraction method during dental treatment.*

Materials and methods *This non-randomised crossover trial was performed with 34 patients aged 6–8 years, who required a minimum of two treatment visits for restorative therapy. During the last visit, the patient was shown a cartoon film.*

Results *There was a significant improvement in the global behaviour when children were shown a cartoon film ($P < 0.001$). A significant increase in heart rate was recorded in both visits ($P = 0.0001$) when the anaesthetic was injected. A 97% of the sample would like to continue seeing their chosen film during subsequent visits. No statistically significant differences were found ($P > 0.05$) between the visits in terms of parental perception of the patient's anxiety, or the patient's self-reported anxiety, pain and heart rate.*

Conclusions *The use of the audiovisual material used as a method of distraction produces a global improvement in patient behaviour, but not in parental perception of the patient's anxiety, self-reported anxiety, pain or heart rate according to the measurement scales used. This material is also highly accepted by paediatric patients.*

Keywords *Anxiety; Audiovisual distraction; Behaviour; Child management; Pain.*

Introduction

Dentistry exposes patients to an environment and particular experiences that trigger a natural response of fear in many people. This might lead to difficulties in persuading patients to accept certain types of treatment [Barber, 1982].

Managing the behaviour of paediatric patients requires continuous interaction with the patient and their parents for the purpose of communication. A key aim of any dentist when managing patient behaviour is to reduce fear and anxiety, while promoting good dental health and strategies to achieve this [Li and Lopez, 2005]. According to Wright et al. [1983], all dental health teams should have 2 main objectives: to carry out dental treatment effectively and efficiently; and to encourage a positive attitude in children. However, these objectives conflict with the anxiety that many children experience when confronted with certain aspects of dentistry. It is important that dentists are able to evaluate anxiety in their patients, in order to identify children who require special care with regard to fear [Buchanan and Niven, 2002]. Many professionals consider that children who show uncooperative behaviour are one of the greatest problems in their practice [Ingersoll et al., 1984a].

Given the need to reduce anxiety in these children, many techniques have been developed with this consideration in mind. Among the most common concerns in relation to behaviour management techniques, are parental acceptance, legal and ethical aspects, feasibility, and access when carrying out some of these techniques. These concerns have led to the modification of techniques to address behaviour management over recent years [Corah et al., 1979; Ingersoll et al., 1984a; Ingersoll et al., 1984b; McTigue, 1984; Davila and Menendez, 1986; Sullivan et al., 2000; Aitken et al., 2002; Luis de Leon et al., 2010]. For example, paediatric dentists have had to limit the use of certain techniques that are efficient but are not considered to be acceptable by parents (e.g., passive restraint and hand-over-mouth techniques) [Murphy et al., 1984; Lawrence et al., 1991; Luis de Leon et al., 2010]. Other techniques which are considered more acceptable have had to be promoted [Corah et al., 1979; Murphy et al., 1984; Davila and Menendez, 1986; Lawrence et al., 1991; Gatchel, 1992; Luis de Leon et al., 2010].

Techniques or methods that enable the drug-free management of children's behaviour include distraction using audiovisual equipment, music, hypnosis, and the help of child psychologists [Parkin, 1981; Venham et al., 1981; Ingersoll et al., 1984a; Ingersoll et al., 1984b; Stark et al., 1989; Baghdadi, 2000; Sullivan et al., 2000; Frere et

al., 2001; Aitken et al., 2002; Prabhakar et al., 2007; Ram et al., 2010; El-Sharkawi et al., 2012; Hoge et al., 2012]. During the second half of the 20th century, numerous studies [Venham et al., 1981; Ingersoll et al., 1984a; Ingersoll et al., 1984b; Stark et al., 1989; Baghdadi, 2000; Sullivan et al., 2000] were carried out using audiovisual materials that were aimed at achieving cooperation of paediatric patients during dental treatment. The results of these studies are controversial. Much of the equipment evaluated did not cause substantial changes in behaviour [Venham et al., 1981; Sullivan et al., 2000]. In contrast, the 4 studies that did observe an improvement in behaviour upon the use of audiovisual material recommended the application of such techniques on a routine basis [Ingersoll et al., 1984a; Ingersoll et al., 1984b; Stark et al., 1989; Baghdadi, 2000]. However, during recent years, very few studies have been published on this subject, despite changes in society that have modified the perception and acceptance of management techniques by parents [Prabhakar et al., 2007; Ram et al., 2010; El-Sharkawi et al., 2012; Hoge et al., 2012].

The aim of the present study was to assess whether the parental perception of the patients' anxiety, children's anxiety, pain, behaviour and heart rate of paediatric patients during dental treatment improves when a cartoon film is considered as a method of distraction.

Materials and methods

This non randomised crossover trial was approved by the Ethics Committee of the Universitat Internacional de Catalunya (D-06-LBD-10), and was conducted from January 2010 to July 2013 at the Department of Paediatric Dentistry of the Faculty of Dentistry. The study design followed the 22-item checklist of the TREND Statement, which was specifically developed to guide standardised reporting of non randomised controlled trials [Des Jarlais et al., 2004]. The parameters used for the calculation of sample size were a 95% confidence interval (CI), 80% statistical power, SD of 2.90 points [Hoge et al., 2012] and minimal difference of 2 points in the self-reported pain score detected between the two treatment visits. A minimum of 34 subjects was determined. This number was increased to 42 to make up for cases that might be lost to follow-up (–20%). Thus, 43 healthy and cooperative patients aged 6–8 years (22 males and 21 females) were recruited. Each required a minimum of 2 visits for restorative treatment in a mandibular quadrant and had undergone a previous restorative dental experience in the above-mentioned department. All parents or guardians of the children who participated in the study were informed about the study before enrolment, and gave their voluntary consent. All of those chosen agreed to participate in the study. Patients with reduced audiovisual capabilities and psychological disorders were excluded from the study.

Data were collected and corroborated throughout the study by the same paediatric dentist. One experienced paediatric dentist trained the operator to apply the Frankl Behaviour Rating Scale trials [Frankl et al., 1962]. This was accomplished by performing 30 observations of children (who did not participate in the study) in the clinic over the course of 1 month (Kappa statistic = 0.83). Each visit lasted approximately 35 minutes and involved restorative treatment in a mandibular quadrant with an alveolar nerve block. The parents were not present in the operating room during the treatment. The maximum time between

This questionnaire asking the parents to circle the answers that most closely fit their child's attitude	
1	If your child have to go to the dentist tomorrow, how would be feel about it?
a)	He would look forward to it as a reasonably enjoyable experience
b)	He wouldn't care one way or the other
c)	He would be a little uneasy about it
d)	He would be afraid that it would be unpleasant an d painful
e)	He would be frightened of what the dentist might do
2	When be is waiting in the denrist's office for his turn, how does he feel?
a)	Relaxed
b)	A Little uneasy
c)	Tense
d)	Anxious
e)	So anxious that he sometimes breaks out into a sweat, or almost feels physically sick
3	When he is in the dentist's chair waiting while the denrist gets the drill ready to begin working on his teeth, how does he feel?
a)	Relaxed
b)	A Little uneasy
c)	Tense
d)	Anxious
e)	So anxious that he sometimes breaks out into a sweat, or almost feels physically sick
4	When he is waiting in the dentist's chair to have bis teeth cleaned and the denrist is getting the instruments he will use to scrape the teeth around the guns, how does he feel?
a)	Relaxed
b)	A Little uneasy
c)	Tense
d)	Anxious
e)	So anxious that he sometimes breaks out into a sweat, or almost feels physically sick
Patient's Name: . . . . . Date of Birth: . . . . . Sex: . . . . . Score: a=l, b=2, c=3, d=4, e=5	

TABLE 1 Modified Corah Anxiety Scale Questionnaire.

FIG. 1 Venham Picture Test.

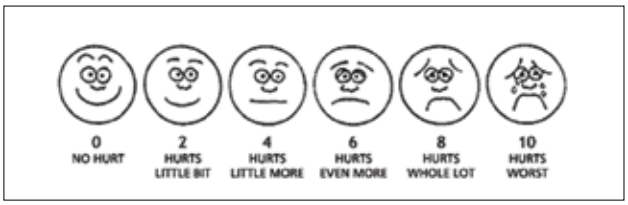

FIG. 2 Wong-Baker Faces Scale.

the 2 treatment sessions was 2 weeks. Before the start of each treatment session, as a part of the standard process of a paediatric dental visit, the child was given an explanation as to what the visit would comprise, with the aim of interrupting the treatment as little as possible. The children knew at the beginning of the first appointment (control) that they would be able to watch a movie during their next visit (test).

Parents were asked to fill in the Modified Corah Dental Anxiety Scale [Corah et al., 1978] (tab. 1) during the control visit to assess their perception of the patient's anxiety before the child entered the operating room. A score of 4 indicated the lowest possible level of anxiety and a score of 20 the highest possible level of anxiety. After treatment, the child completed the Venham Picture Test [Venham and Gaulin-Kremer, 1979] (Fig. 1) to evaluate their perceived anxiety during treatment. The score ranged from 0 (not anxious) to 8 (extremely anxious). The Wong-Baker Faces Scale [Wong and Baker, 1988] (Fig. 2) was also completed by the child at the end of the control visit to register self-reported pain during treatment. The Wong-Baker Faces Scale is a 6-point scale ranging from 0 (no pain) to 10 (worst pain). For the scores to be as exact as possible, detailed explanations were given to the child about the significance of each drawing on the scales.

Heart rate was measured with a digital Onyx® pulse oximeter (NONIN, Plymouth, MN, USA) throughout the visits at the following time points: during the 3 minutes before application of topical anaesthesia; during application of topical anaesthesia; during injection of local anaesthesia; during placement of the clamp and rubber dam; and during the onset of caries removal with rotary instruments. Mean heart rate was calculated for each period by averaging all values of beat-to-beat heart rate within the period. The data described were registered on a sheet to enable the collection of information. Heart rate was used as an objective measure to evaluate the degree of pain of the child.

Once the visit was over, the operator filled in the Frankl Behaviour Rating Scale [Frankl et al., 1962] to assess the global behaviour of the patient from 1 (worst behaviour) to 4 (best behaviour). Once all of the necessary tests were completed, the patient was asked to choose the film that they wanted to see on their second treatment visit. The available selection comprised 20 cartoon films that were suitable for all audiences.

During the experimental visit, all the tests that had been conducted during the control visit were repeated. The patient's heart rate was also measured. Heart rate was measured in the same way as during the first visit, and the values were recorded on the data collection sheet. The cartoon film was started 3 min before topical anaesthesia was applied and it was stopped as soon as dental treatment concluded. The screen was attached to the ceiling, just above the dental chair, so that the patient could see it at the correct angle, and so that the movements of the operator did not interfere with the patient's line of sight (Fig. 3). The volume of the film was such that the child could hear it correctly while, at the same time, the operator could give the patient necessary instructions. For this purpose, earphones were used. Given the nature of the study design, blinding was impossible. During the experimental appointment, the operator had no access to the results of the measurements obtained at the control appointment.

After the second treatment visit, the child was asked to answer the following two questions to determine the degree of acceptance of the product by the paediatric patient: "Did you enjoy seeing the cartoon film during the dental visit?" (Yes/No); and "Would you like to continue seeing films during your next visits?" (Yes/No).

The data were analysed using the statistical software Statgraphics® Plus version 5.1 (Statpoint Technologies, Warrenton, VA, USA). The Repeated Measures ANOVA test was used for the visit factor, the one-way ANOVA test was used for the age factor and the Student's t test was used for the sex factor. $P \leq 0.05$ was considered statistically significant.

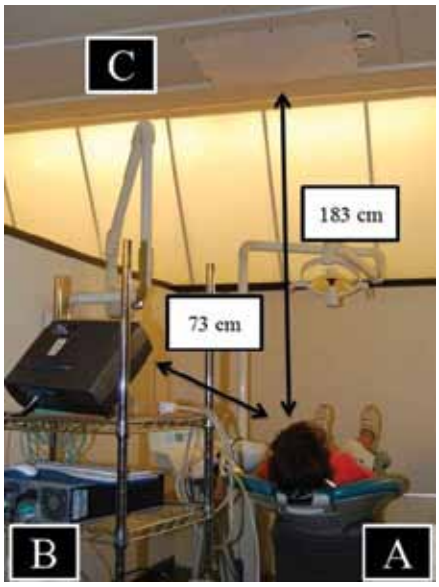

FIG. 3 Photograph of a child in the audiovisual distraction setup before treatment. A: Dental chair. B: Projector placed 73 cm behind the patient's head. C: Screen situated 183 cm above the dental chair.

Results

Nine of the 43 subjects failed to attend the second treatment visit and had only 1 visit, leaving a total of 34 subjects in the present study group (17 female, 17 male) aged 6–8 years, with a mean age of 6.91 ± 0.79 years. Table 2 shows the mean scores and standard deviation (SD) for each variable measured during the control and experimental visits.

Parental perception of patients' anxiety

There were no significant differences between the visits with regard to parental perception of the patients' anxiety (P = 0.07), as determined by the Modified Corah Dental Anxiety Scale, although the mean score for the experimental visit was lower than that for the control visit. No significant differences were observed with regard to age (P = 0.52) or sex (P = 0.16).

Self-reported anxiety measures

There were no significant differences in the measures of anxiety obtained with the Venham Picture Test between the 2 visits (P = 0.30, although the values for the control visit were higher), or between sexes (P = 0.40) and ages (P = 0.72).

Self-reported pain measures

There were no significant differences between the visits in relation to pain (P = 0.90) or age (P = 0.17) with the Wong–Baker Faces Scale. With regard to sex, the girls had a higher mean than the boys, and this difference was significant (P = 0.03).

Global behaviour measures

There were significant differences between the visits with regard to the global behaviour of the patient (P < 0.001), as determined by the Frankl Scale. No significant differences were observed with regard to age (P = 0.28) or sex (P = 0.41).

Heart rate

There were no significant differences in heart rate between the 2 visits at any time point (P = 0.24). With regard to the different times at which heart rate was registered, for both visits, a significant increase in heart rate was seen at the time at which the anaesthetic was injected (P = 0.001) (Fig. 4). There were no significant differences in heart rate with regard to age (P = 0.37). With regard to sex, the girls had a higher mean heart rate than the boys, and this difference was significant (P < 0.001).

Postoperative questions

When the children were asked whether they had enjoyed seeing the cartoon film during the visit, 33/34 (97%) responded positively. Furthermore, 33/34 (97%) responded that they would like to see films during their next visits.

Discussion

In relation to the self-reported anxiety, 79% (27/34) of the sample scored 0 in the Venham Picture Test at the end of the control visit. Perhaps, during the test, the children were guided more by their personal preferences than by their feelings at that moment (i.e., they chose those figures in the test that looked happier and more relaxed). Given that the levels of self-reported anxiety were so low in a large proportion of patients, a dramatic change in self-reported anxiety in response to the distraction

Variable	Control visit	Experimental visit	F-value	P-value
	Mean ± (SD)	Mean ± (SD)		
Modified Corah Dental Anxiety Scale	9.29 ± 3.39	8.55 ± 3.32	3.47	0.07 NS
Venham Picture Test	0.47 ± 1.46	0.17 ± 0.75	1.07	0.30 NS
Wong-Baker Faces Scale	1.41 ± 2.17	1.35 ± 2.29	0.01	0.90 NS
Frankl Behaviour Rating Scale	2.79 ± 1.12	3.41± 0.85	15.27	0.001*
Heart rate	103.22 ± 14.92	100.92 ± 13.37	1.37	0.24 NS
* Statistically significant (P < 0.05). NS, Nonsignificant value (P > 0.05).				

TAB. 2 Means, SD, and ANOVA for each variable measured in the study.

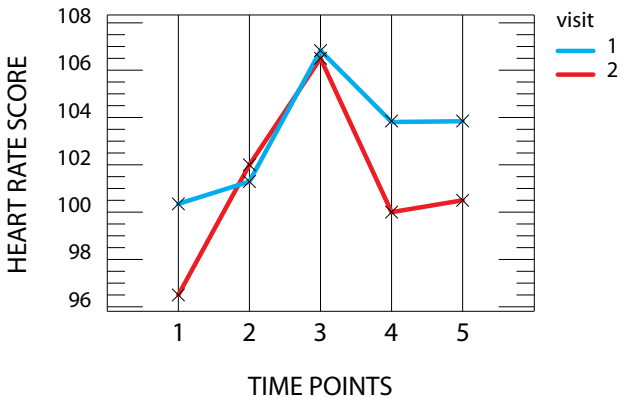

FIG. 4 Plot of heart rate measured with the pulse oximeter at each time point throughout the control and experimental visits. 1. 3 min before application of topical anaesthesia; 2. Application of topical anaesthesia; 3. Injection of local anaesthesia; 4. Placement of the clamp and rubber; 5. Onset of caries removal with rotary instruments.

technique cannot be expected.

With regard to self-reported pain during treatment, the results for the Wong-Baker Faces Scale did not show any significant differences between the 2 visits (P = 0.90). As with the Venham Picture Test, the values at the end of the control visit were very low: 56% (19/34) of the sample said they had not felt pain after the control visit, and it was difficult to identify significant differences. Overall, the participants did not report experiencing very much pain, perhaps reflecting that, for the most part, dentists manage pain quite well. The results of Aitken et al. [2002], who used music with younger children (4–6 years) and the results of Hoge et al. [2012], who used a video eyewear as a distraction method with children aged 4–16 years, were similar to those obtained in the present study. In contrast, Baghdadi [2000] found a difference in self-reported pain during dental treatment between exposure-to-audio analgesia and a control situation. This difference might be explained by the fact that the children in the earlier study were aged 9–12 years, and were able to distinguish the sensation of pain more clearly than the younger children described herein.

In the present study, the Wong–Baker Faces Scale was a difficult scale to evaluate and understand for paediatric patients. The children were unable to assess their feelings of pain during treatment once the treatment had concluded. It is possible that too much time elapsed between the perception of pain and the scale being applied, by which time the children had forgotten about the pain. Alternatively, they might have been carried away by the enthusiasm of having finished the dental visit and had forgotten what had happened previously when the scale was applied. It might be advisable to apply the pain scale and the Venham Picture Test at specific times during a dental visit, for example, immediately after administration of local anaesthesia or after placement of the clamp and rubber dam. As a consequence, the results for both variables (self-reported anxiety and pain measures) should be more precise. Baghdadi [2000] used this approach, applying the scale for self-reported pain when the dentin–enamel area was reached during cavity preparation, because this is the moment during treatment when most pain is felt. El-Sharkawi et al. [2012] also obtained statistically significant differences by applying the scale measuring pain just after the time of injection of local anaesthesia, using a video eyewear device as a method of distraction in children aged 4–6 years.

With regard to global behaviour (as evaluated using the Frankl Scale), the results showed that there were significant differences between the 2 visits (P <0.001); this was consistent with previous studies [Ingersoll et al., 1984a; Ingersoll et al., 1984b; Baghdadi, 2000; Ram et al., 2010; Hoge et al., 2012]. Some 38% of the participants showed improved behaviour following distraction with the cartoon film. Similarly, Ingersoll et al. [1984b] obtained a 44% reduction in uncooperative behaviour after the contingent viewing of cartoon films (as reinforcement). However, they did not find any significant differences when the product was used non-contingently (as a method of distraction).

The results of the present study differed from those of previous studies [Venham et al., 1981; Sullivan et al., 2000; Aitken et al., 2002] that did not find significant differences in patients' global behaviour after the use of audiovisual materials. Sullivan et al. [2000] developed a product that was based on the use of virtual reality. They concluded that anticipation and negative emotions increase in children when they cannot see or hear what is happening around them. In the present study, the volume of the film allowed the patients to see and hear what was happening around them all of the time. It is possible that this important variation led to the differences in patient behaviour between the 2 studies. Aitken et al. [2002] did not find any differences upon the application of a product that was based only on music. We think that the use of an audiovisual product improves the behaviour of paediatric patients considerably, because it is of far greater appeal to them than music alone.

Another important difference between the present and previous studies [Venham et al., 1981; Sullivan et al., 2000; Aitken et al., 2002] was that our patients selected the audiovisual material used during their procedure. Several authors [Silberstein, 1977; Ingersoll et al., 1984a] have reflected on the importance of children choosing audiovisual material themselves and how this influences their behaviour. It is possible that, if they are allowed to choose the audiovisual material, they feel that they have some control over the dentist's behaviour, which reduces their level of stress. Normally children do not have any control over what occurs when they are in the dental chair; hence, having control over the music and/or film can be beneficial. None of the studies that failed to give paediatric

patients the opportunity to select audiovisual materials observed an improvement in patient behaviour [Venham et al., 1981; Sullivan et al., 2000; Aitken et al., 2002].

Another element that was considered when the improvement in global behaviour during dental treatment was analysed in the present study was the "novelty factor" of the cartoon films. We believe, as did Parkin [1981], that any new or special element can improve patient behaviour. The change in attitude in many of the children during the period between the first and second treatment visits should be pointed out. Some patients even came to their appointment 30 min early because, according to their parents, they were looking forward to seeing the film that they had chosen for their dental treatment. In addition, 97% of the sample indicated that they had enjoyed seeing the cartoon film during the dental visit and that they would like to continue seeing films during subsequent visits. It will be important to determine whether this improvement in behaviour continues during subsequent visits, once the film has been viewed and distraction is no longer provided. To test this, the sample size should be increased and the order of the visits changed. In other words, the cartoon film should be viewed during the first treatment visit, and behaviour should be monitored during the subsequent control visit to see whether the ensuing "positive" behaviour is repeated. An assessment should be made to determine whether any differences arise depending on the order in which the audiovisual material is viewed.

Conclusions

- The use of the audiovisual material used as a method of distraction improves the global behaviour of children aged 6–8 years but does not reduce their parent's perception of the patients' anxiety, or the patient's self-reported anxiety, pain or heart rate according to the measurement scales used.
- This type of product is widely accepted among paediatric patients. It is also easy to apply.

Conflict of interest

The authors declare that no conflict of interest exists.

References

› Aitken JC, Wilson S, Coury D, Moursi AM. The effect of music distraction on pain, anxiety and behavior in pediatric dental patients. Pediatr Dent 2002; 2: 114-118.
› Baghdadi ZD. Evaluation of audio analgesia for restorative care in children treated using electronic Dental anesthesia. J Clin Pediatr Dent 2000; 1: 9-12.
› Barber T. Pediatric Dentistry. St Louis: Mosby; 1982.
› Buchanan H, Niven N. Validation of a Facial Image Scale to assess child dental anxiety. Int J Paediatr Dent 2002; 12: 47-52.
› Corah NL, Gale EN, Illig SJ. Assessment of a dental anxiety scale. J Am Dent Assoc 1978; 97: 816-819.
› Corah NL, Gale EN, Illig SJ. The use of relaxation and distraction to reduce psychological stress during dental procedures. J Am Dent Assoc 1979: 98: 390-394.
› Davila JM, Menendez J. Relaxing effects of music in dentistry for mentally handicapped patients. Spec Care Dentist 1986; 6: 18-21.
› Des Jarlais DC, Lyles C, Crepaz N, and the TREND Group. Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: The TREND statement. Am J Public Health 2004; 94: 361-366.
› El-Sharkawi HF, El-Housseiny AA, Aly AM. Effectiveness of new distraction technique on pain associated with injection of local anesthesia for children. Pediatr Dent 2012; 34: 142-145.
› Frankl SN, Shreve FR, Fogels HR. Should the parent remain within the dental operatory? J Dent Child 1962; 29: 150-163.
› Frere CL, Crout R, Yorty J, McNeil DW. Effects of audiovisual distraction during dental prophylaxis. J Am Dent Assoc 2001; 132: 1031-1038.
› Gatchel RJ. Managing anxiety and pain during dental treatment. J Am Dent Assoc 1992; 123: 37-41.
› Hoge MA, Howard MR, Wallace DP, Allen KD. Use of video eyewear to manage distress in children during restorative dental treatment. Pediatr Dent 2012; 34: 378-382.
› Ingersoll BD, Nash DA, Gamber C. The use of contingent audiotaped material with pediatric dental patients. J Am Dent Assoc 1984a; 109: 717-719.
› Ingersoll BD, Nash DA, Blount RL, Gamber C. Distraction and contingent reinforcement with pediatric dental patients. ASDC J Dent Child 1984b; 51: 203-207.
› Lawrence SM, McTigue DJ, Wilson S, Odom JG, Waggoner WF, Fields HW Jr. Parental attitudes toward behavior management techniques used in pediatric dentistry. Pediatr Dent 1991; 13: 151-155.
› Li HC, Lopez V. Children's emotional manifestation scale: development and testing. J Clin Nurs 2005; 14: 223-229.
› Luis de León J, Guinot Jimeno F, Bellet Dalmau LJ. Acceptance by Spanish parents of behaviour-management techniques used in paediatric dentistry. Eur Arch Paediatr Dent 2010; 11: 175-178.
› McTigue DJ. Behavior Management of Children. Dent Clin North Am 1984; 28: 81-93.
› Murphy MG, Fields HW Jr, Machen JB. Parental acceptance of pediatric dentistry behavior management techniques. Pediatr Dent 1984; 6: 193-198.
› Parkin SF. The effect of ambient music upon the reactions of children undergoing dental treatment. J Dent Child 1981; 48: 430-436.
› Prabhakar AR, Marwah N, Raju OS. A comparison between audio and audiovisual distraction techniques in managing anxious pediatric dental patients. J Indian Soc Pedod Prev Dent 2007; 25: 177-182.
› Ram D, Shapira J, Holan G, Magora F, Cohen S, Davidovich E. Audiovisual video eyeglass distraction during dental treatment in children. Quintessence Int 2010; 41: 673-679.
› Silberstein CM. Sone-aural dentistry-an overview. J Am Analg Soc 1977; 15: 6-10.
› Stark LJ, Allen KD, Hurst M, Nash DA, Rigney B, Stokes TF. Distraction: its utilization and efficacy with children undergoing dental treatment. J Appl Behav Anal 1989; 22: 297-307.
› Sullivan C, Schneider PE, Musselman RJ, Dummett CO Jr, Gardiner D. The effect of virtual reality during dental treatment on child anxiety and behavior. ASDC J Dent Child 2000; 67: 193-196.
› Venham LL, Gaulin-Kremer E. A self-report measure of situational anxiety for young children. Pediatr Dent 1979; 1: 91-96.
› Venham LL, Goldstein M, Gaulin-Kremer E, Peteros K, Cohan J, Fairbanks J. Effectiveness of a distraction technique in managing young dental patients. Pediatr Dent 1981; 3: 7-11.
› Wong DL, Baker CM. Pain in children: comparison of assessment scales. Pediatr Nurs 1988; 14(1): 9-17.
› Wright GZ, Strakey PE, Gardner DE. Managing Children's Behavior in the Dental Office. St Louis: Mosby, 1983.