

Comparative Evaluation of Effectiveness of Various Distraction Techniques on Pain and Anxiety Levels in 6–9-year-old Children

Andole Harika*, Sarada Penmetcha, Silla Swarna Swathi, Ch. Sampath Reddy, Ziauddin Mohammad, Anusha Gollapalli

Department of Pedodontics and Preventive Dentistry, Sri Sai College of Dental Surgery, Sangareddy, Telangana, India.

Abstract

Background: The aim of the study was to compare and evaluate the effectiveness of tell-show-do, eye movement distraction (EMD), audio distraction, and audio-visual distraction techniques on pain and anxiety levels in 6–9 year old children. **Materials and Methods:** A total of 120 children aged between 6 and 9 years were divided into four groups: Group 1 (control), Group 2 (EMD), Group 3 (audio distraction), and Group 4 (audio-visual distraction). The pain and the anxiety levels were measured by FLACC scale and Venham's Picture Test, respectively. **Results:** Children in Group 1 who were treated without using any distraction technique experienced high levels of pain and anxiety followed by children in Group 2, Group 3, and Group 4. **Conclusion:** Among the various distraction techniques, audio-visual distraction was found to be most effective. The pain and anxiety levels were least in children who were treated using audio-visual distraction and highest in children who were treated without using any distraction technique.

Keywords: Audio distraction, Audio-visual distraction, Eye movement distraction, FLACC scale, Venham's scale.

INTRODUCTION

Dental anxiety (DA) refers to abnormal fear or anxiety of visiting the dentist and anxiety over dental procedures.^[1] If not properly managed it often leads to uncooperative behavior among children and adolescents before or during dental procedures, resulting in stressful and unpleasant experiences for both the child and the dentist.^[2] It might be responsible for delaying or avoiding the dental treatment.^[3] DA can be associated with certain triggers such as needles, drills, or dental setting in general.^[4]

DA can be managed with behavior modification and shaping by various behavior management techniques.^[5] A wide variety of behavior management techniques are available which are non-pharmacological and pharmacological.^[6] Non-pharmacological methods include communication, tell-show-do (TSD), modeling, positive and negative reinforcement, distraction, voice control, retraining, hand over mouth exercise, and physical immobilization. Pharmacological methods include premedication, conscious sedation, and general anesthesia.^[7] Although behavior management can be achieved easily with pharmacological methods, the risks associated with these methods is changing the parents and dental professional perspective toward these techniques and now non-aversive techniques like distraction are becoming more popular and often practiced.^[8]

Distraction techniques which are a part of the non-pharmacological methods address psychological components of pain by diverting the focus of the child from the anxiety-evoking procedures. Distraction techniques include eye movement distraction (EMD), audio distraction, and audio-visual distraction. EMD concept is derived from Shapiros EMDR therapy, this theory states that alternating eye movement can reduce the fear and anxiety.^[9] Audio distraction includes music, audio presentation through headphones, and storytelling.^[10] This technique partially occludes the environment, while allowing child-clinician communication. It is a simple technique that does not interfere with the dental treatment. It is widely accepted by children and easy to execute.^[11] Audio-visual distraction includes television, chair mounted devices, 3D video glasses, and virtual reality (VR) glasses used with headphones. Selected cartoon films are

Address for correspondence: Dr. Andole Harika,
Department of Pedodontics and Preventive Dentistry, Sri Sai College
of Dental Surgery, H-no 3-10, Beside Hanuman Temple, Isnapur,
Patancheru mandal, Sangareddy - 502 307, Telangana, India.
Email: harikaandole@gmail.com

Received: Jul. 03,2023; **Accepted:** Aug. 04, 2023; **Published:** Sep. 05, 2023

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

How to cite this article: Harika A, Penmetcha S, Swathi SS, Reddy CS, Mohammad Z, Gollapalli A. Comparative Evaluation of Effectiveness of Various Distraction Techniques on Pain and Anxiety Levels in 6–9-year-old Children. J Res Adv Dent 2023;14(6):1-5.

Access this article online

Website:
www.jrad.co.in

DOI:
<https://doi.org/10.53064/jrad.2022.14.6.414>

played in the device which has been proved to reduce fear and anxiety levels during the procedure.^[12]

Aim of the study

The aim of the study was to compare and evaluate the effectiveness of various distraction techniques on pain and anxiety levels in 6–9-year-old children.

MATERIALS AND METHODS

A total of 120 children aged 6–9 years undergoing dental treatment at Department of Pedodontics and Preventive dentistry, Sri Sai College of Dental Surgery, Vikarabad who required the administration of local anesthesia were recruited into the study after obtaining an informed consent from parents. Children were randomly divided into four groups: Group 1 who were treated under normal dental setup without using any distraction technique (control), Group 2 (who were treated using EMD), Group 3 (who were treated using audio distraction), and Group 4 (who were treated using audio-visual distraction). Inclusion criteria: Children with dental procedures which require local anesthesia administration, children without any special health-care needs, and children who do not have a history of previous dental visit.

For the children in the Group 2, children were asked to close their eyes and perform deep breathing followed by rotation of eyes in alternative clockwise and anticlockwise directions. The children were then instructed to count the number of rotations with their finger to distract them during administration of local anesthesia.

For the children in the Group 3, audio distraction was used during the treatment procedure. The device consists of headphones and a connector which has to be connected to the mobile for the music. Children were given the option of selecting their choice of music to be played throughout the procedure.

For the children in the Group 4, video distraction glasses were used during the treatment procedure. The device consists of eyewear display glasses, headphones, and pre-loaded videos. Children were given the option of selecting their choice of videos to be played throughout the procedure.

Pain and anxiety levels were measured using FLACC scale and Venham's picture scale, respectively, immediately after administration of LA. The data were collected and subjected to statistical analysis using Statistical Package for the Social Sciences version 20.0. One-way ANOVA was used for intergroup comparison. Tukey's test was used for *post hoc* analysis.

OBSERVATIONS AND RESULTS

Observations from Table 1 and Graph 1

The mean age of children in Group 1, Group 2, Group 3, and Group 4 was 7.47 years, 8 years, 7.83 years, and 7.53, respectively.

Observations from Table 2 and Graph 2

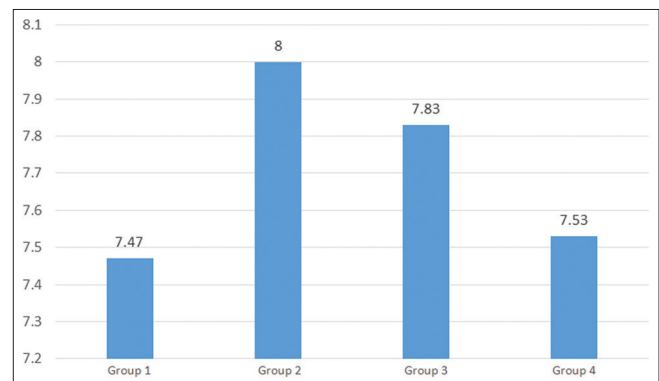
The mean FLACC score in Group 1, Group 2, Group 3, and Group 4 was 4.47 ± 3.06 , 2.2 ± 1.94 , 1.67 ± 1.49 , and 1.13 ± 1.46 , respectively. Intergroup comparison showed a statistical significant difference (<0.001) between Group 1 when compared with Group 2, 3, and 4. No statistically significant difference was seen among groups 2, 3, and 4 ($1>2\approx 3\approx 4$).

Observations from Table 3 and Graph 3

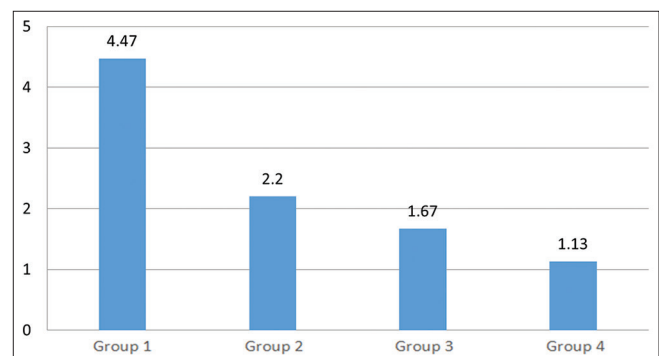
The mean Venham's anxiety score in Group 1, Group 2, Group 3, and Group 4 was 3.27 ± 2.23 , 1.73 ± 1.70 , 1.4 ± 1.45 , and 1 ± 1.58 , respectively. Intergroup comparison showed a statistical significant difference (<0.001) when scores of Group 1 were compared with Groups 2, 3, and 4. No statistically significant difference was seen among Groups 2, 3, and 4 ($1>2\approx 3\approx 4$).

Table 1: Distribution of study participants based on age

Age	Group 1		Group 2		Group 3		Group 4	
	n	%	n	%	n	%	n	%
6	8	26.7	5	16.7	5	16.7	6	20.0
7	6	20.0	5	16.7	8	26.7	9	30.0
8	10	33.3	5	16.7	4	13.3	8	26.7
9	6	20.0	15	50.0	13	43.3	7	23.3
Total	30	100.0	30	100.0	30	100.0	30	100.0
Mean Age	7.47		8.00		7.83		7.53	



Graph 1: Distribution of participants based on mean age



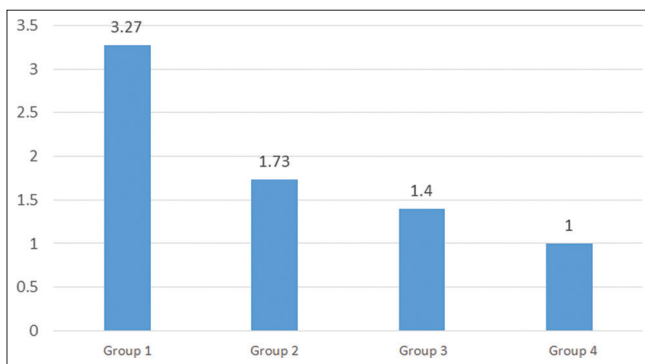
Graph 2: Mean FLACC total pain scores in various study groups

Table 2: Mean FLACC Total Pain Scores in various study groups

Variable	Group	n	Mean	SD	Minimum	Maximum	P-value	Post hoc
FLACC total pain score	1	30	4.47	3.06	0	10	<0.001*	1>2≈3≈4
	2	30	2.20	1.94	0	7		
	3	30	1.67	1.49	0	6		
	4	30	1.13	1.46	0	5		
	Total	120	2.37	2.43	0	10		

Table 3: Mean Venham's Scores in various study groups

Variable	Group	n	Mean	SD	Minimum	Maximum	P-value	Post hoc
Venham's anxiety score	1	30	3.27	2.23	0	8	<0.001*	1>2≈3≈4
	2	30	1.73	1.70	0	6		
	3	30	1.40	1.45	0	5		
	4	30	1.00	1.58	0	5		
	Total	120	1.85	1.94	0	8		

**Graph 3: Mean Venham's Scores in various study groups**

DISCUSSION

Dental fear and DA are used to denote early signs of dental phobia. DA and fear in children have been recognized in many countries as a public health dilemma and have been studied at length.^[13] The role of a dentist in managing a child with anxiety is twofold – first, to control and treat the problem with which the child reports and second, to teach the child appropriate ways of managing the anxiety.

Dentists use a wide variety of behavior management techniques to manage a child with anxiety which includes non-aversive techniques such as TSD, relaxation, distraction, systematic desensitization, modeling, audio analgesia, hypnosis, and behavior rehearsal.^[17] A few aversive techniques such as voice control, hand over mouth, and use of restraints are also available. Among all these techniques, papoose board and hand over mouth technique can be successful, but the attitude of parents and dental professional toward these techniques is changing, and now non-aversive techniques like distraction are becoming more popular.^[14] The age group of the patients selected for the present study was 6–9 years as this is the age group, which shows most disruptive or negative behavior and is considered most difficult to manage.

Treatment procedures requiring local anesthesia administration were chosen because the sight of the needle is considered as one of the most fearful, anxiety provoking stimuli among children. In the present study, various distraction techniques such as EMD, audio distraction, and audio-visual distraction were used. EMD addresses the psychological component of DA. It does not require any additional equipment or materials. It is not technique-sensitive and can be taught and performed chair side easily; hence, EMD technique was used in the present study.^[9] In the present study, the pain and anxiety levels were found to be less in children who were treated using EMD group when compared to the control group. A similar finding was observed in a study conducted by Tirupathi *et al.* (2019) where EMD was used as an effective distraction modality to reduce anxiety during local anesthesia administration in needle-phobic children when compared to the control group.^[9]

Audio distraction is a simple and low-cost technique that does not interfere with the dental treatment. This technique partially occludes the environment, while allowing child-clinician communication. It is widely accepted by children and is easy to execute; hence, audio distraction was used in the present study.^[11] In the present study, the pain and anxiety levels were less in children who were treated using audio distraction group when compared to the control group. A similar finding was observed in a study conducted by Gupta and Rajan (2021) evaluated the effect of audio distraction on anxiety of pediatric patients during dental treatment in a 50 children of 4–8 years and concluded that the audio distraction was effective in alleviating anxiety of pediatric dental patients when compared to control group.^[15] Contrasting results were observed from the study by Aitken *et al.* (2002) whose aim was to determine if audio distraction could decrease patient anxiety, pain, and disruptive behavior during pediatric dental procedures. Forty-five children between the ages of 4–6 years had two visits each involving restorative dentistry with local anesthesia in a mandibular quadrant. Visit #1 was a baseline session for all

patients. During visit #2, the children were assigned to either an upbeat music group, a relaxing music group, or a no music group and concluded that audio distraction was not an effective means of reducing anxiety, pain, or uncooperative behavior during pediatric restorative dental procedures. However, patients did enjoy listening to the music during their visits.^[16]

Audiovisual (AV) distraction involves the concept of imagery and distraction delivered through AV aids, thereby removing the focus on the dental procedures, avoiding anxiety provoking stimuli, and providing a relaxing experience throughout the procedure. The goals of AV distraction are imagination (helps in distracting children from present situation), engagement (enables children's attention to focus on a single thing), and motivation (helps children to encourage getting treated for dental problems in future); hence, audio-visual distraction video glasses were used in the present study.^[6] In the present study, the pain and anxiety levels were least in children who were treated using audio-visual distraction as calculated from the FLACC scale and Venham's picture scale when compared to children who were treated using audio distraction, EMD and control group. The reason for the least pain and anxiety scores in the audio-visual distraction group during local anesthesia administration could be due to the fact that the videos were effective in distracting the attention of the child by eliminating the sight of anxiety-provoking stimuli as well as providing a relaxing and pleasant effect. This finding is in accordance to a study conducted by Prabhakar *et al.* (2007) where AV distraction technique was more effective in managing anxious pediatric dental patient as compared to audio distraction technique.^[8] It is also in accordance to a study conducted by Al-Khotani *et al.* (2016) showed that AV distraction using the eyeglass system i-theater seems to be effective in reducing observer-rated DA and keeping good cooperative behavior in children during restorative dental treatment. There was a marginal difference in the observed mean cooperative behavior and anxiety between those who used AV distraction and those who did not and concluded that AV-group showed more positive responses after injection with local anesthesia.^[17] This finding is in accordance to a study conducted by Khandelwal *et al.* (2019) where Ceiling-mounted audio visual distraction was found to be the most effective in reducing the anxiety followed by chair-mounted audio visual distraction. Audio distraction was found to be the least effective but was better than the control group.^[18] Similar finding was observed in a study conducted by Gs *et al.* (2022) where children in the age-group of 6–8 years, with moderate level of anxiety, (measured with M-DAS), requiring inferior alveolar nerve block for mandibular tooth extraction were selected. Selected children were allocated randomly into three groups VR distraction group, audio distraction group, and TSD group. Pre- and post-distraction anxiety level of children was measured subjectively with facial image scale and objectively with pulse rate and oxygen saturation (measured with pulse oxymeter) concluded that children were most relaxed in VR group, followed by audio group and were least relaxed in TSD group during dental

visits. Hence, VR distraction can be considered as a useful technique for behavior management of pediatric patients during a conventional dental treatment.^[19] Contrasting results were observed from the study by Shah and Bhatia (2018) which evaluated the effectiveness of viewing videotaped cartoons using an eyeglass system as an AV distraction technique as compared to customized tell-play-do (TPD) technique on behavior and anxiety in children receiving prophylactic and dental restorative treatment and concluded that TPD is equally effective in reducing children's fear and anxiety about dental treatment as AV distraction aids.^[20] Contrasting results were also observed from the study by Custódio *et al.* (2021) who tested the efficacy of distraction using AV eyeglasses (AVE) during dental procedures. Forty-four 6–9-year-old children with low/moderate anxiety and who needed restorative treatment or exodontia of the primary molars were randomly allocated into two groups: The AVE (experimental) and the conventional behavior management techniques (control) groups and concluded that the AVE achieved similar results to the basic behavior management techniques, with good acceptance by the children.^[21]

On comparison among four groups, a statistical significant difference (<0.001) was seen when scores of Group I (control group) compared with Group II (EMD), Group III (audio distraction), Group IV (AV distraction), respectively. No statistically significant difference was seen among Group II, III, and IV ($1>2\approx3\approx4$). Based on the results from the present study, among the various distraction techniques, audio-visual distraction was found to be most effective when compared to audio distraction, EMD, and control group. The pain and anxiety levels were least in children who were treated using audio-visual distraction and highest in children who were treated without using any distraction technique.

CONCLUSION

Based on the present study, the following conclusions were drawn

1. Among the various distraction techniques, audio-visual distraction was found to be most effective.
2. The pain and anxiety levels were least in children who were treated using audio-visual distraction and highest in children who were treated without using any distraction technique.

REFERENCES

1. Seligman LD, Hovey JD, Chacon K, Ollendick TH. Dental anxiety: An understudied problem in youth. *Clin Psychol Rev* 2017;55:25-40.
2. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: A review of prevalence and concomitant psychological factors. *Int J Paediatr Dent* 2007;17:391-406.
3. Pohjola V, Lahti S, Vehkalahti MM, Tolvanen M, Hausen H. Association between dental fear and dental attendance among adults in Finland. *Acta Odontol Scand* 2007;65:224-30.
4. Oosterink FM, de Jongh A, Aartman IH. What are people afraid of during dental treatment? Anxiety-provoking capacity of 67 stimuli

- characteristic of the dental setting. *Eur J Oral Sci* 2008;116:44-51.
5. Burns LE, Worsley JL. Behaviour Therapy in the 1970s: A Collection of Original Papers. United Kingdom: Butterworth-Heinemann; 2016.
 6. Swarna K, Prathima GS, Suganya M, Sanguida A, Selvabalaji A. Recent advances in non-pharmacological behaviour management techniques in children-an overview. *IOSR J Dent Med Sci* 2019;18:18-21.
 7. Roberts JF, Curzon ME, Koch G, Martens LC. Review: Behaviour management techniques in paediatric dentistry. *Eur Arch Paediatr Dent* 2010;11:166-74.
 8. 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;25:177-82.
 9. Tirupathi S, Krishna N, Rajasekhar S, Nuvvula S. Eye movement distraction: A New distraction technique for management of dental anxiety during intraoral local anesthesia administration in children. *Int J Clin Pediatr Dent* 2019;12:507-9.
 10. Filcheck HA, Allen KD, Ogren H, Darby JB, Holstein B, Hupp S. The use of choice-based distraction to decrease the distress of children at the dentist. *Child Fam Behav Ther* 2005;26:59-68.
 11. Guinot Jimeno F, Mercadé Bellido M, Cuadros Fernández C, Lorente Rodríguez AI, Llopis Pérez J, Boj Quesada JR. Effect of audiovisual distraction on children's behaviour, anxiety and pain in the dental setting. *Eur J Paediatr Dent* 2014;15:297-302.
 12. Nuvvula S, Alahari S, Kamatham R, Challa RR. Effect of audiovisual distraction with 3D video glasses on dental anxiety of children experiencing administration of local analgesia: A randomised clinical trial. *Eur Arch Paediatr Dent* 2015;16:43-50.
 13. Alvesalo I, Murtomaa H, Milgrom P, Honkanen A, Karjalainen M, Tay KM. The Dental Fear Survey Schedule: A study with Finnish children. *Int J Paediatr Dent* 1993;3:193-8.
 14. 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;13:151-5.
 15. Gupta N, Rajan M. Effectiveness of audio distraction technique in management of anxious of pediatric dental patients-a randomized control trial. *Ann Rom Soc Cell Biol* 2021;25:2958-64.
 16. 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;24:114-8.
 17. 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.
 18. Khandelwal M, Shetty RM, Rath S. Effectiveness of distraction techniques in managing pediatric dental patients. *Int J Clin Pediatr Dent* 2019;12:18-24.
 19. Gs G, George S, Anandaraj S, Sain S, Jose D, Sreenivas A, *et al.* Comparative evaluation of the efficacy of virtual reality distraction, audio distraction and tell-show-do techniques in reducing the anxiety level of pediatric dental patients: An *in vivo* study. *Int J Clin Pediatr Dent* 2021;14:S173-8.
 20. Shah U, Bhatia R. Effectiveness of audiovisual distraction eyeglass method compared to tell-play-do technique among 4-7-year-old children: A randomized controlled trial. *Int J Oral Care Res* 2018; 6:1-7.
 21. Armfield JM. How do we measure dental fear and what are we measuring anyway? *Oral Health Prev Dent* 2010;8:107-15.