

# Effectiveness of Virtual Reality Glasses Digital Screens and Verbal Command as a Method to Distract Young Patients during Administration of Local Anesthesia

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## ABSTRACT

**Aim and objective:** The study investigates the effect and compares three techniques-video-eyeglasses earphone system, Digital screens and verbal methods as distracting technique to assess dental pain reaction in children during administration of local anesthesia (LA).

**Materials and methods:** Pain or its anticipation can cause fear and anxiety in a child which could complicate further dental treatment. This cross-sectional study consists of 97 children of age-group 4–8 years who required local anesthesia for their dental treatment were selected. Children were randomly allocated into three groups namely- Verbal method (group A), video eyeglass/earphone system (group B) and digital screens (group C). In group A, instructions were given to the patient by the dentist while administering local anesthesia. In group B, VR box was used to show age appropriate videos according to subjects' choice. In group C, digital screens were placed on dental chair for patient to watch while nerve block was administered. Pain was measured using face, legs, activity, cry, consolability (FLACC) scale behavioral anxiety/pain assessment scale.

**Results:** FLACC score was found to be significantly different among three groups. The mean FLACC scale score for pain was less in video eyeglass/earphone (1.94) than digital screens (3.67) and highest in Verbal group (6.88).

**Conclusion:** Video eyeglasses/earphone method proved to be most effective as a distraction method in children and helped in reducing children's disruptive behavior in the dental setting.

**Clinical significance:** This study was conducted to find a better distraction technique among video eyeglasses/earphone system, digital screens and Verbal command that will make child less apprehensive during administration of local anesthesia.

**Keyword:** Audiovisual distraction, Dental anxiety, Pain, Verbal command.

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## INTRODUCTION

Pain is defined by the International Association of the Study of Pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage."<sup>1</sup> Pediatric patients have a huge fear of needle sticks due to which they are scared to visit a dentist which will lead to unfavorable consequences such as lack of patient's cooperation during the procedure, anxiety, leading to increased procedural time, reduces success, and diminished child and family satisfaction. A patient with dental anxiety may show troublesome behavior during dental treatment, which will make it difficult for the dentist to provide optimum dental services and it will lead the children to avoid meeting their dentist. "DISTRACTION" is recognized as one of the most favorable and acceptable non-pharmacological behavior management technique to reduce pain, anxiety and fear in children. It is defined as a "tactic to divert a patient's attention from what may be perceived as an unpleasant procedure." The principle behind its effectiveness is it hinders the ability to pay attention to unpleasant stimuli and shifts a child's focus to engaging and fascinating distracters.<sup>2</sup> Thus, owing to its intuitive nature, distraction as a method for behavior management can be recognized as one of the most acceptable strategy thereby, influences the pain perception.

The aim of the study was to assess dental pain reaction in children during administration of local anesthesia using verbal method, video eyeglasses/earphones system, digital screens as distracting technique.

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**Conflict of interest:** None

## MATERIALS AND METHODS

Children were selected from the Department of Pediatric and Preventive Dentistry of the institution.

Selection criteria:

### Inclusion Criteria

- Presence of Pulpally involved teeth where need of extraction or Pulpal therapy necessitating a nerve block.
- Cooperative children (Frankel's Positive + and Definitely Positive ++) were included in the study.

- No previous experience with intraoral injections.
- No allergy to Lignocaine Hydrochloride.
- No history of systemic illness.
- Written informed consent should be taken from the parents.

### Exclusion Criteria

- Children who are unable to place video eyeglasses/earphone system on their eyes.

### METHODOLOGY

The study was conducted among 97 children of 4-8 years of age. Cases were selected based on inclusion and exclusion criteria.

The clinical examination of the subjects was carried out by adopting the method of Kerr, Ash, Millard<sup>3</sup> and on the same visit fluoride therapy was done to assess behavior of the child. Depending on chit system, 97 subjects were placed in three different groups.

In the second appointment, Patch test was performed to assess any allergy to local anesthetic agent using RosanLazzarini, Ida Duarte<sup>4</sup> method. After that, Topical anesthesia was applied using John G. Meechan<sup>5</sup> method to children with negative Patch test followed by administration of local anesthesia using Orrett E, Ogle criteria<sup>6</sup>. Same technique was used in all the three groups:

Group A- Verbal method (Patient's were asked to raise his/her right and left leg monologously by the clinician for a minute and then nerve block was administered).

Group B- Video eyeglass/earphone system (Patient's were sensitized to the VR box first and then age appropriate videos according to subjects choice was played and after that local anesthesia was administered).

Group C- Digital screens (Patient's were asked to watch digital screens placed on dental chair and then nerve block was administered) (Figs 1 to 3).

### Statistical Analysis

All the data were collected and tabulated with Microsoft excel and analyzed using SPSS (Statistical Package for Social Sciences). The data was analyzed by using both parametric and non-parametric tests of significance. Kruskal-Wallis test was used for intergroup comparison, gender-wise comparison & age group wise comparison of FLACC scale. The level of significance was set at  $p < 0.05$ .

### RESULT

A total of 97 subjects fulfilling the inclusion criteria were part of the study. They were divided into three groups: Group A - Verbal method, Group B - Video eyeglass and earphone system, Group C - Digital screens. The mean value of males were more than females (Table 1 and Fig. 4) In group A and B out of 32 children 19 males (59.4%) and 13 females (40.6%) were there. In group C total of 33 children which comprised 17 males (51.5%) and 16 females (48.5%). The mean age was higher in group A (6.13 yrs) than in group B (5.75 yrs) and C (5.73 yrs). In group A out of 32 children mean age was found to be 6.13 years with a standard deviation of 1.238. In group B in total of 32 children mean age was 5.75 years with a standard deviation of 1.078 while in group C mean age was found to be 5.73 years with a standard deviation of 1.281 in 33 children included. (Table 2 and Fig. 5) The mean FLACC scale score for pain was found to be significantly more in group A (6.88) followed by group C subjects (3.67) and then group B(1.94) (Table 3 and Fig. 6). The mean value of pain perception (4.30) in 4-6 age group is more



Fig. 1: Video eyeglass/earphone system



Fig. 2: Patient undergoing LA administration using verbal method

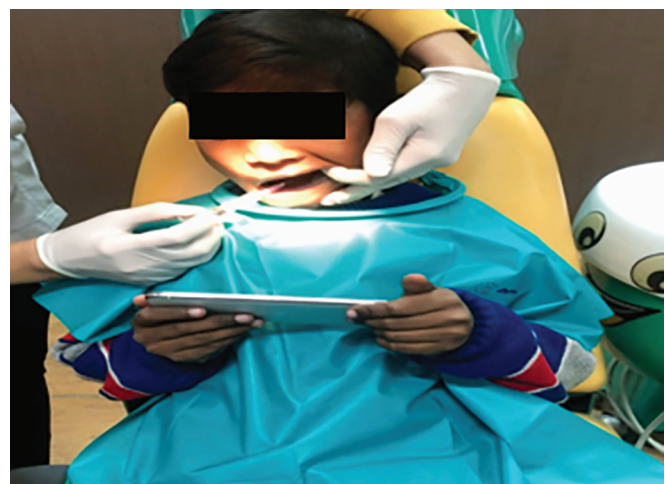


Fig. 3: Patient undergoing LA administration using digital screen

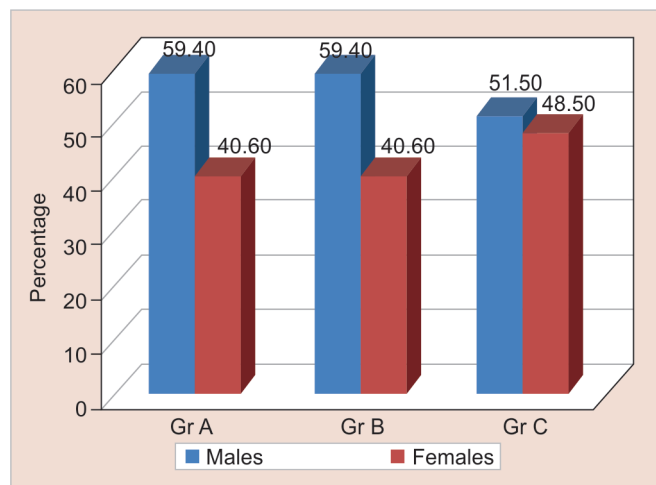
than in 7-8 years of age group (3.83) (Table 4 and Fig. 7). However, there is no statistically significant difference ( $p = 0.520$ ) found in pain perception in both the age groups.

**Table 1:** Gender-wise distribution of study population among three study groups

Groups		Gender		Total
		Males	Females	
Group A	N	19	13	32
	%	59.4	40.6	100.0
Group B	N	19	13	32
	%	59.4	40.6	100.0
Group C	N	17	16	33
	%	51.5	48.5	100.0
Total	N	55	42	97
	%	56.7	43.3	100.0
p value		0.760, Non- Significant		

**Table 2:** Intergroup comparison of mean age of study participants

Groups	N	Mean	Std. deviation	95% Confidence interval for mean			
				Lower bound	Upper bound	Minimum	Maximum
Group A	32	6.13 years	1.238	5.68	6.57	4	8
Group B	32	5.75 years	1.078	5.36	6.14	4	8
Group C	33	5.73 years	1.281	5.27	6.18	4	8
p value		0.334, NS					

**Fig. 4:** Gender-wise distribution of study population among three study groups

## DISCUSSION

McElory stated that "Although operative dentistry may be perfect, the appointment is a failure if a child departs in tears." It stresses the importance of behavior management over technical excellence in pediatric dentistry.<sup>7</sup> "Dental fear usually refers to a normal unpleasant emotional reaction to specific threatening stimuli occurring in situations associated with dental treatment, while dental anxiety is an excessive and unreasonable negative emotional state experienced by dental patients."<sup>8</sup> Fear and anxiety are often associated with the child's first dental visit and have a negative impact on child's psychology making the dental appointment an unpleasant one. Dental anxiety leads to increase the pain perception of the pediatric patient, irrespective of the anesthetic devices used. Conversely, uncomfortable dental treatments can also result in increased dental anxiety. The target of any dental

treatment should be to prevent the patient from adopting negative dental care behavior.<sup>9</sup>

Behavior guidance techniques are taken into consideration by the number of pediatric dentist to "alleviate anxiety, fear, phobia and pain and to nurture a positive dental attitude for infants, children, adolescents, and persons with special health care needs."<sup>10</sup> It is the process by which "practitioners help patients identify appropriate and inappropriate behavior, learn problem solving strategies, and develop impulse control, empathy, and self-esteem."<sup>10</sup>

Distraction serves as an effective tool in the management of pain in pediatric patients and it is defined as "diverting the patient's attention from what may be perceived as an unpleasant procedure or shift the focus away from pain." This behavior management technique distracts the patient away from the stimuli causing anxiety thereby relaxing the patient and reducing anxiety throughout the dental procedure.<sup>11</sup> Distraction can be of two types; the active form of distraction involves multiple sensory components such as virtual reality, guided imagery and interactive toys to encourage child's participation. Whereas, the passive form of distraction is achieved by making the child observe an activity or stimulus such as watching cartoons or listening to music.<sup>12</sup> The active distraction technique used in this study was the verbal method and the other two techniques namely, video-eyeglasses earphone system and digital screens were passive forms of distraction.

Video-eyeglass/earphone system was used as a distraction technique in this study as children find VEER system a very fascinating device. VEER box displays 3D pictures which were projected right in front of the eyes of child which block out the real world and engross his mind to the virtual reality during the dental treatment. Since it is an audiovisual device it increases the detachment of the patient from sight or noise of the dental procedures being carried out on them.<sup>13</sup>

Use of digital screen was done as it is very feasible method of distraction; in fact dental chairs are equipped with inbuilt screens these days. In spite of playing outdoor games children now a day spending there most of the time with phones watching cartoons, movies and

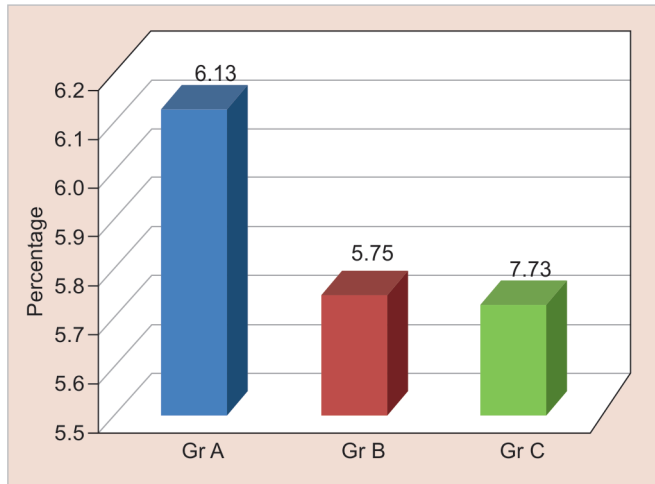


Fig. 5: Intergroup comparison of mean age of study participants

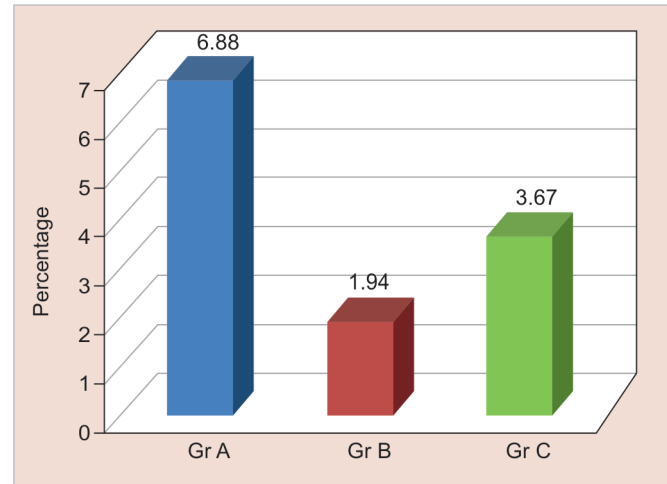


Fig. 6: Intergroup comparison of mean FLACC score of study participants

Table 3: Intergroup comparison of mean FLACC score of study participants

FLACC scale							
95% Confidence interval for mean							
	N	Mean	Std. deviation	Lower bound	Upper bound	Minimum	Maximum
Group A	32	6.88	2.637	5.92	7.83	1	10
Group B	32	1.94	2.299	1.11	2.77	0	8
Group C	33	3.67	2.769	2.68	4.65	0	10
p value	<0.0001, Significant						
Post hoc pair-wise comparison	Group A * Group B - <0.0001, S Group A * Group C - <0.0001, S Group B * Group C-0.022, S						

Table 4: Distribution of FLACC scale score for pain among the age groups 4–6 years and 7–8 years

FLACC Scale				
Age-group	N	Mean	Std. deviation	p value
4–6 years	67	4.30	3.451	0.520, NS
7–8 years	30	3.83	2.854	

playing games. Using digital screens as a distracting method makes child focus to move on screens placed rather than on pain.

Verbal form of distraction used because firstly it helps to develop a good rapport with the child and it's an active form of distraction as the dentist gives instructions to the child in whom child has to participate and be actively involved. This participation helps the child to put all their focus on the task given to them and since in this study they were asked to raise a leg, the site of the task is the distal most area which is very far from the oral cavity where the procedure has to be done. Hence, it facilitates in distracting the child from pain and anxiety of the procedure.

Pain was measured using face, legs, activity, cry, consolability (FLACC) scale behavioral anxiety/pain assessment scale.<sup>12</sup>

The study was undertaken to compare and evaluate the effect of verbal method, video-eyeglasses earphone system, Digital screens as distracting technique to assess dental pain reaction in children during administration of local anesthesia.

Ram D et al. evaluated that AVD eyeglasses facilitates cooperative behavior and achieves a high level of patient satisfaction. It highly satisfies, most of the parents, all the pediatric dentists, and most of the student dentists.<sup>14</sup> Similarly, 32 cases in this study showed that audio visual distraction helps in reducing pain and anxiety in children with a mean FLACC scale score for pain 1.94.

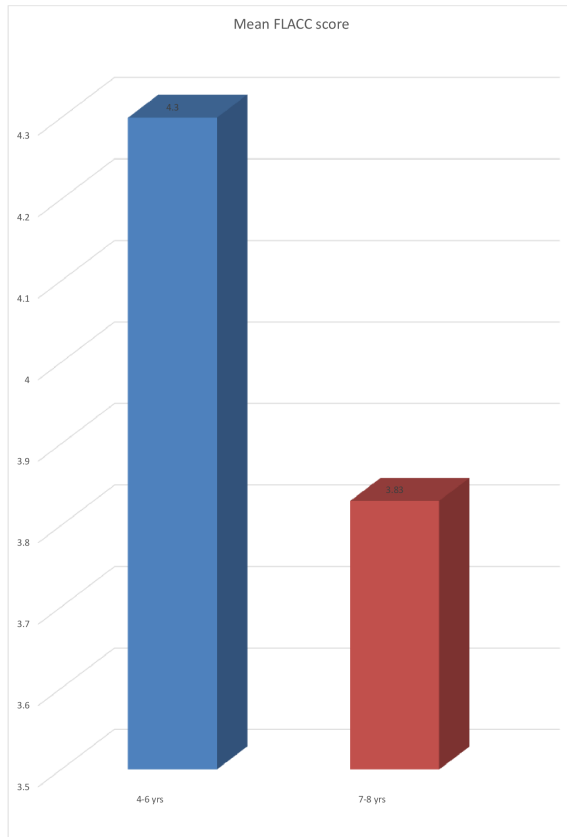
Jimeno FG et al. conducted a non-randomized crossover trial on 34 patients aged 6–8 year and used audiovisual technique as a distraction method during dental treatment. They required a minimum of two treatment visits for restorative therapy. The patient was shown a cartoon film during the last visit. Result showed the use of the audiovisual material as a method of distraction produced a global improvement in patient behavior.<sup>15</sup>

Tanja-Dijkstra K et al done a research on 80 children of age 6-9 years to study whether the use of VR during dental treatment can improve the recollections of treatment for patients and overall dental experience and explored if it helps in breaking the negative cycle of memories of anxiety. The study concluded that VR improves the dental experience for children and helps in mitigating discomfort.

Jimeno et al. concluded that when children were shown a cartoon film their disruptive behavior decreases. Incontrast, Hoge et al. indicated that children who wore video-eyewear while dental treatment shown less anxious behavior.

Gangwal et al. stated that when children were shown positive images anxiety level decreases, while Ramos-Jorge ML et al. contradicts this study by evaluating no difference in the anxiety levels of children exposed to positive image.





**Fig. 7:** Distribution of FLACC scale score for pain among the age groups 4–6 years and 7–8 years

Greenbaum PE et al. stated that use of voice control as a distraction method while dental treatment aids in decreasing apprehensive behavior of children similar study was done by Di Lorenzo et al. and results showed that comparatively loud voice during verbal commands were more effective than normal voice in suppressing children's disruptive behavior during dental treatment. While in the present study verbal method was not found to be more effective in pain management in children while administration of local anesthesia.

The results of above studies are in consistence with that of the present study, which states that "the most preferred form of distraction technique in children while administrating local anesthesia was video/eyeglass-earphone system." This method helps in reducing anxiety, pain and sense of fear in children.

## CONCLUSION

The data collected were tabulated and statistically analyzed and it was concluded that Video-eyeglasses/earphone method

proved to be highly effective in reducing children's disruptive behavior. This method helps in reducing anxiety, pain and sense of fear in children.

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