

## The effects of Audio-Visual Distraction Techniques on dental treatment anxiety during local anaesthetic procedures in children

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### Abstract

Dental fear and dental anxiety is poorly understood in children and which poses a hindrance in rendering dental care. There are also a wide range of factors that influence pre- and intra-treatment dental fear and dental anxiety. To assess the anxiety to local anaesthetic procedures despite using audiovisual distraction technique in children aged between 6-9 years. Children aged between 6 to 9 years who reports to Department of Paediatric Dentistry were assessed for fear and anxiety level in the waiting area using Modified Dental Anxiety Scale (MDAS) and Fear Assessment Questionnaire (FAQ) and children identified as fairly anxious were selected in first phase of sampling. In second phase of sampling forty-five children identified as fairly anxious and required local anaesthetic procedure were selected and divided randomly into three equal groups. (Group 1- no AV distraction technique, Group 2- audio distraction technique and Group 3 - audio-visual distraction technique). The local anaesthetic procedure was performed by single operator and the children were assessed for their anxious levels during local anaesthetic procedures using physiological and psychological parameters in the Doctors Observation Sheet by two observers. The data obtained were subjected to statistical analysis. The anxiety and fear measured during local anaesthetic procedures showed significant difference between the distraction techniques used and without distraction technique. Children in audiovisual group were found to be more relaxed followed by audio group. Audiovisual distraction technique was found to be effective in reducing anxiety and fear during local anaesthetic procedure.

**Clinical Significance:** Audiovisual distraction techniques were found to reduce anxiety during local anaesthetic procedures in children.

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### Introduction

Managing behaviour and anxiety so a child can become a cooperative dental patient is critical to the success of treatment. Although traditional behaviour management techniques can be successful, the attitudes of parents and some dental professionals toward these techniques are changing. For example, immobilization in a papoose board, although effective, has been shown to be unacceptable among a majority of parents. In addition, many parents feel that pharmacological methods of

managing their child are undesirable due to perceived medical risks. For these reasons, clinicians have developed non-aversive behaviour management techniques that may be equally effective and more acceptable to parents, patients and practitioners.<sup>1</sup>

For over a decade, distraction has been successfully applied in clinical practice to reduce pain associated with dental procedures. Successful traditional distraction techniques include, for example, watching movies, listening to music, counting objects in the room, and nonmedical conversation. The application of distraction is based on the assumption that pain perception has a large psychological component in that the amount of attention directed to the noxious stimuli modulates the perceived pain.

Some of these new techniques use only visual stimuli, but the majority apply visual stimuli in combination with audio stimulation and distract

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the patient by exposing him or her to two-dimensional (2-D) or three-dimensional (3-D) videos. These techniques are referred to as virtual reality (VR) audio-visual systems, AV eyeglass systems, or simply A/V distraction.<sup>2</sup>

The findings from other studies on AD technique in anxious paediatric patients during dental treatments are controversial and present heterogeneous methods and results.<sup>3,4</sup> However a recent review on AV technique on anxious paediatric patients' dental treatment was found to be effective.<sup>5</sup> It has been hypothesized that the ideal distractor would require an optimal amount of attention involving multiple sensory modalities (visual, auditory, and kinaesthetic), active emotional involvement, and participation of the patient to compete with the signals from the noxious stimuli. Recently developed distraction techniques that use advanced audiovisual (AV) technology more likely meet these requirements than the traditional distraction methods mentioned earlier.<sup>2</sup>

Child age is an important indicator of fear and the techniques used in conditioning their behaviour. At age 6 children is developing marked curiosity of the environment and fear of dentistry is established by suggestion or from previous experiences. At the age of 7 years improved to resolve fear and at 8-9 years learnt to tolerate unpleasant situations.<sup>6</sup>

The present study was aimed to assess the effectiveness of AV distraction technique during the most anxiety provoking local anaesthetic procedure in an age group of 6- 9 years expected to cope with fear.

## Methods

In this crosssectional survey Children aged between 6 to 9 years were selected using multi-phase sampling method. The duration of the study was six months.

### First phase of sampling

In first phase of sampling informed consent was obtained from the selected children parents visiting for the first time. Children were assessed for fear and anxiety in the waiting area using Modified Dental Anxiety Scale and Fear Questionnaire Form. Each child was allowed to participate in the study only once.

### 1. Assessment of Dental Anxiety Using Modified Dental Anxiety Scale (MDAS)

MDAS this is a brief five item questionnaire, which is used to help objectively identify patient anxiety levels. We incorporated pictorial representations to this scale for better understanding and identification of the emotions corresponding to their uneasiness.

The MDAS contained 5 questionnaires with an fixed alternative answers ranging from not anxious to extremely anxious on a likert-type scale starting from 1 (not anxious) to 5 (extremely anxious). Children and their parents were explained about the questions in MDAS in the waiting room in the local languages (Kannada or Malayalam or Coorgi) by the examiner to ensure that the scale was assessed accurately that which they purport to measure. The total score of MDAS in each child was calculated and inferred based on the interpretation of the clinical psychologist as 0-10 (good); 11-15 (fair); 16-20 (bad); 21-25 (poor).

### 2. Assessment of Dental Fear Using Fear Questionnaire Form (FQF)

After the assessment of dental anxiety the children were subjected to assessment of dental fear using Fear questionnaire form. FQF for fear consisted of eight questions related to dental environment with a simple yes or no answer. Children and their parents were explained about the questions in FQF in the waiting room in the local languages (Kannada or Malayalam or Coorgi) by the examiner to ensure that the scale was assessed accurately that which they purport to measure. The respondent replied to these questions either yes or no and the same was recorded by the examiner appropriately. The score for each question was either 0 or 1 ie.'0' for no and '1' for yes. Then the total score ranged from '0' to 10. The scores for fear in each child was calculated and inferred based on the clinical psychologists interpretation as 0-3 (good); 4-6 (fair); 7-8 (bad).

### Second phase of sampling

45 children who were in the 'fair' category of anxiety and fear or only in anxiety or only in fear and required local anesthetic technique were selected for second phase of sampling.

Children thus selected were further divided by picking the lots into three equal groups:

- Group 1- without any audio-visual distraction technique (Control Group).
- Group 2- with audio distraction technique.
- Group 3- with audio-visual distraction technique.

The patients in the audio and audiovisual groups listened and viewed to choice based audio (either English or Hindi or Malayalam or Kannada songs or Nursery Rhymes) and audio-visual (either English or Hindi or Malayalam or Kannada short dramatic clips, video songs and cartoons) presentations through headphones through-out the treatment procedures. Audio visual distraction was achieved using Micromax Canvas P290 tablet with headphones.

The local anaesthetic procedure was performed by single operator, while the physiological and psychological parameters in the Doctors Observation Sheet were recorded by two observers at the time of local anaesthetic procedure. The examiners were trained and inter examiner variability was done; the kappa value was 0.412 and non-significant.

#### **Assessment of fear and anxiety during local anaesthetic procedure**

Doctors Observation Sheets (Dos) developed by Clinical Psychologist consisting of physiological and psychological parameters was used to observe fear and anxiety during local anaesthetic procedure. The physiological parameters were eye closure, facial expression, presence or absence of vocal signs, presence or absence of noticeably increased respiratory changes, presence or absence of tremble and any others. In eyes it was observed for partial or complete closure and normal eye opening. In facial expression it was further examined for either smile or stoic or grimace or whimper or crying. The psychological parameters comprised the feelings of relaxed or little uneasy or so uneasy that break out in to sweat and physically sick. The observations were scored for physiological and psychological parameters.

#### **A. In physiological parameters**

- i. For the eye closure it was scored as follows:  
0- Normal eye closure;  
1- Partial eye closure;  
2- Complete eye closure.
- ii For vocal signs:  
0- Absent;  
1- Present.
- iii Respiration rate:  
0- Normal respiratory rate;  
1- Increased respiratory rate.

The rest of the physiological observations, ie tremble or any other was not seen in any of the children during the treatment. Thus the total score in physiological observations ranged from 0 to 5.

#### **B. The scoring for psychological observation**

- i. Overall:  
0-Relaxed;  
1- Little uneasy;  
2- So anxious that they broke into sweat and physically feel sick.
- ii Based on facial expression as:  
0- Smile;  
1- Grimace;  
2- Whimper (short outcry);  
3- Crying.

The score for psychological parameters ranged from 0 to 5.

Inference of child's fear and anxiety to local anaesthetic procedures in the distraction technique groups (Group -2 & Group -3) and without distraction technique (Group-1) was made based on the physiological and psychological parameters:

- i. Inference from physiological parameters:  
0 (good);  
1 (fair);  
2-3 (bad);  
4-5 (poor).
- ii. Inference for psychological parameters:  
0 (good);  
1-2 (fair);  
3-5 (poor).

Thus, obtained data was subjected to statistical analysis using Turkey post-hoc test and Oneway ANOVA in SPSS Software.

## Results

Statistically highly significant difference in the physiological parameters between the control group and audiovisual distraction group ( $p < 0.001$ ) was observed. Significant difference between AV distraction and audio distraction groups ( $p < 0.05$ ) was observed but there was no significant difference ( $p < 0.13$ ) between control group and audio distraction group. (Table 1 and Graph 1)

Statistically highly significant difference in the psychological parameters between the control group and audiovisual distraction groups ( $p < 0.001$ ) was observed. Significant difference ( $p < 0.05$ ) between AV and audio distraction groups and between control group and audio distraction group ( $p < 0.017$ ) was observed (Table 2 and Graph 2). From these observations AV distraction was found to be more effective in reducing anxiety of children during local anaesthetic procedure as compared to audio distraction and no distraction technique.

Groups	Mean	Std. Deviation	F value	p value and Significance
Control	1.73	0.798		
AVD	0.40	0.828	12.372	<0.001 HS
AUDIO	1.20	0.560		

P<0.05, HS – Highly Significant.

Group	Compared	Mean Difference	Sig.
Control	AVD	1.33*	.000
	AUDIO	0.53	.131 NS
AVD	AUDIO	0.80*	.014

\*. The mean difference is significant at the 0.05 level. NS – Non-Significant

**Table 1.** Comparison of Mean Physiological Score Between Control, Audio Visual and Audio Groups During Local Anaesthetic Procedure.

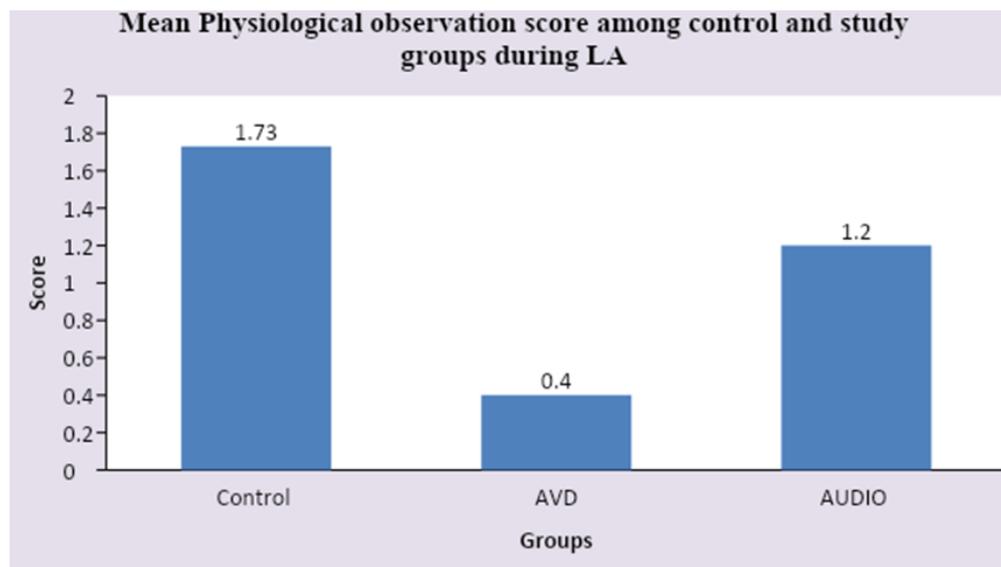
Groups	Mean	Std. Deviation	F value	p value and Significance
Control	2.40	0.632		
AVD	0.66	0.816	19.326	<0.001 HS
AUDIO	1.60	0.828		

P<0.05, HS – Highly Significant.

Group	Compared	Mean Difference	Sig.
Control	AVD	1.73*	.000
	AUDIO	0.80*	.017
AVD	AUDIO	0.93*	.005

\*. The mean difference is significant at the 0.05 level. NS – Non-Significant

**Table 2.** Comparison of Mean Psychological Score Between Control, Audiovisual and Audio Groups During Local Anaesthetic Procedure.



**Graph 1.** Showing Comparison of Mean Physiological Score Between Control, Audio-Visual and Audio Groups During Local Anaesthetic Procedure.



**Graph 2.** Showing Comparison of Mean Psychological Score Between Control, Audio-Visual and Audio Groups During Local Anaesthetic Procedure.

### Discussion

Fear of unknown provokes anxiety in dental clinic, new patients anxiety can be due to the uncertainty they feel about what awaits them after initial appointment check-up.<sup>7</sup>

Fear can be a very powerful and unpleasant emotion; it includes physiological and psychological response at the same time. Psychophysiological activity, such as increased heart rate, sweating and elevated blood pressure occurs when anxious. Psychological events include feeling emotionally overwhelmed, having

high levels of anxiety and even feeling terrified and physiological response to fear include a faster heart rate, shallow breathing and similar effects.<sup>8</sup> Physiological parameter test requires special equipments and this itself could affect results because the equipment could provoke anxiety<sup>9</sup> and also time-consuming method. Also, these physiological parameters change in the body at such time, do not make the patient a dentally anxious patient. Hence in our study in physiological parameter, physical and behavioural pattern were observed.

The psycho physiological measures may

be subjected to misinterpretation unless they are utilized by individuals who are skilled and knowledgeable in their usage. To measure the fear and anxiety during treatment procedure the Doctor Observation Sheet (DOS) used comprised of physiological and psychological parameters was developed. Although to manage anxious children many management techniques are successful, but the attitude of the parents and dental professionals towards aversive techniques is changing and because of litigation concerns, the popularity of non-aversive techniques like distraction becoming high among the dental professional to make cognitive orientation and promote coping ability for a positive dental response. "Distraction" is a tactic designed to divert a patient attention away from their current behaviour to focus their interest in something else. It is a behavioural strategy useful in helping patients cope with brief stress. Distractors are stimuli that may gain some control over a patient's responding that is incompatible with disruptive behaviour. Different means of distraction includes video games, and sound, watching video and television, pictures, cartoons and audio taped stories etc.<sup>10</sup> A cartoon video or video game on a mobile phone was found to be effective to most children during local anaesthetics and extraction procedure as they are easy to implement, portable, and effective method to reduce anxiety in the preoperative area and during injection of local anaesthesia.<sup>11</sup>

In an comparative efficacy of audio (music) and AV (3D video glasses) distraction in reducing the dental anxiety of children during local analgesia (LA) administration showed a highly significant reduction in the anxiety of audiovisual group, which might be due to the partial visual obstruction of the operating environment.<sup>12</sup> Similar findings were observed from the present study that distraction techniques reduced the anxiety and audio-visual was better than audio distraction technique in children aged 6-9 years to local anaesthetic procedures during their first visit. This might be due to the reason that the child while watching the cartoon movie or other AV distraction aids, concentrated on the screen, thereby screening out the sight of dental treatment. Audio distraction techniques was found not be significantly effective when compared to no distraction technique<sup>13</sup>. In the present study there was significant difference between audio group and no distraction group.

This might be due to child listening to music tends to close his or her eyes thereby screening out the sight. Moreover, music helped to cut down the unpleasant noise of hand pieces or other anxiety inducing stimuli and these two advantages coupled with the effect of choice-based music provided relaxation might be due to playing familiar songs helped child gain control over the unpleasant stimulus and gave them a feeling of being in the familiar environment.

## Conclusion

In conclusion, a distraction technique was effective in reducing the anxiety of children to local anaesthetic procedures during their first visit. Audio-visual distraction technique was more effective in managing anxious paediatric dental patient as compared to audio distraction technique and normal. Doctors Observation Sheet (DOS) was useful in assessing the anxiety level during dental operatory procedures specific to local anaesthetic procedures.

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