



# Anxiety Levels in Pediatric Dental Patients During Conventional Dental Procedures with and Without Audiovisual Distraction Eyeglasses

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## Abstract

**Background:** Dental anxiety (DA) is a psychiatric illness affecting children and adolescents, leading to avoidance of dental treatment and poor oral health. Psychosocial techniques and distraction methods have been explored to reduce anxiety, with limited success. Audiovisual (AV) glasses provide immersive distraction. **Aim:** This study aims to compare anxiety levels in pediatric dental patients during conventional procedures, with and without AV distraction (AVD) eyeglasses. **Methods:** The study included 90 healthy pediatric patients aged 6 to 10 years. AVD eyeglasses and a pulse oximeter were used. Patients were divided into two groups: Group I with AVD eyeglasses and Group II without. Anxiety levels were assessed using pain rating scales and physiological changes were monitored. Data were analyzed and compared. **Results:** Both groups had similar characteristics. Group I showed significantly lower pain ratings and Visual Analog Scale (VAS) scores for all procedures. Pulse rates did not significantly differ between the groups for most procedures, except for restoration. **Conclusion:** AVD eyeglasses show promise in reducing anxiety and improving comfort during pediatric dental procedures. They are particularly useful for children with mild to moderate dental treatment-related anxiety. Further research is needed, but the study's positive outcomes support the effectiveness and suitability of AV eyeglasses for most pediatric patients.

**KeyWords:** Anxiety, Pediatric, Conventional, Dental, Distraction Eyeglasses.

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## Introduction:

According to Shafi et al. (2015), Freud originated the term "anxiety" in psychology in 1936 by translating the German term "Angst." In 2019, Perrotta described anxiety as a non-specific emotional state of dread before a prospect that does not need prior experience and is not proportionate to the individual's response.

"Dental Anxiety (DA)" is a psychiatric illness characterized by anxiety or concern over dental care and a feeling of powerlessness or lack of control. Grisolia et al. (2021) report 5%–20% of children and adolescents have dental anxiety. Physical arousal, cognitive interpretation, and poor behavioral coping strategies may enhance DA (Appukuttan, 2016).

Dental anxiety and avoidance of dental treatment contribute to oral health diseases in persons of all ages, according to Krämer et al. (2020) and Hassan et al. (2022). Recent study suggests that

22% of pediatric dental patients have behavioral difficulties. According to Ainscough et al. (2019), high anxiety levels might reduce patient compliance, making treatment harder for dentists and delaying pathologic process detection.

Early diagnosis of dental anxiety in children is crucial for optimum treatment planning due to its relation to poor oral health outcomes. Several dental anxiety treatments have been studied. Recent dentistry study has shown that psychosocial techniques prepare and treat young children during dental procedures. Psychological and dental literature uses noninvasive methods (Corrêa-Faria et al., 2020).

Distraction reduces kid discomfort and disruptive conduct in medical and dental settings. However, audio and video materials during dental treatment did not reduce distress or increase compliance (Custódio et al., 2020).

AV glasses may improve distraction. AV eyeglasses,



which look like goggles, may be connected to TVs, video game consoles, and DVD players for private media viewing. Clinically, video eyewear distracts with visual and auditory elements, lowering ocular blockage and audio obstruction. AV eyewear is growing more popular, and Custódio et al. (2021) and Alves et al. (2019) have shown its utility in many situations.

The purpose of this study is to examine the effects of audiovisual distraction (AVD) eyewear on the anxiety levels of juvenile dentistry patients undergoing standard dental treatments.

**Material and methods**

The data was collected from 90 healthy pediatric patients. This was a study done in East Riyadh dental center from April 2022 to July 2022.

**Inclusion criteria:**

- Patients requiring oral prophylaxis, restorative, and pulpectomy treatment.
- Patients with a Frankel's behavior rating scale score of 2, 3, or 4.
- Children aged between 6 and 10 years old.

**Exclusion criteria:**

- Children with special healthcare needs.
- Highly uncooperative patients.
- Parents who decline consent for their child's treatment or subsequent visits.
- Medically compromised children.

**List of materials:**

- I. AV eyeglasses with built-in earphones (Eye Mobile Theatre Video Glasses, featuring a 52" virtual screen).
- II. Study pro forma.
- III. Pulse oximeter (Oxi-stat 1010 plus).

**Study Methodology:**

Ninety pediatric patients, who were in good health and aged between 6 to 10 years, were enrolled in the study. The study was conducted at \*\*\* Dental College and Hospital located in Pimpri, Pune. These patients were seeking dental treatment at the aforementioned facility. The parents were granted informed consent. Patients with scores of 3 and 4 were selected using the Frankl's behavior rating scale.

Ninety participants who had Frankl's scores of 3 and 4 were segregated into two groups, with each group comprising 45 individuals. The study involved two groups of 45 subjects each. Group I comprised individuals who wore AVD eyeglasses, while Group II comprised individuals who did not

wear AVD eyeglasses.

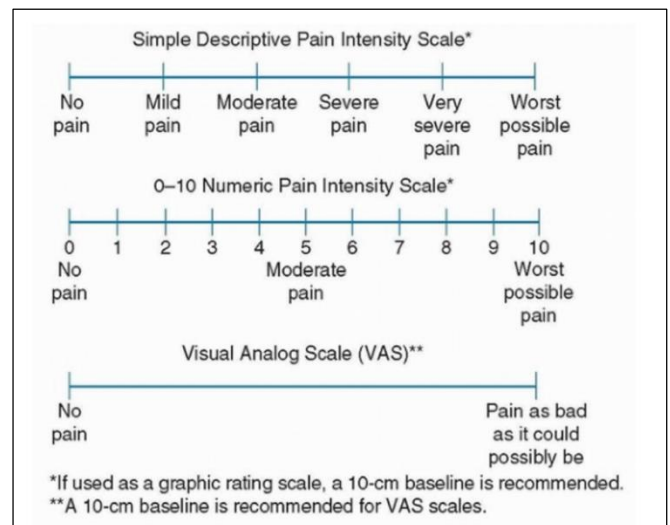
Each participant underwent multiple sessions in which they received oral prophylaxis, restorative therapy, and pulpectomy. To ensure fairness, anxiety levels were assessed using the Wong-Baker's Faces Pain Rating Scale, ensuring a consistent experience for both groups.



**Figure (1):** The Wong-Baker's Faces Pain Rating Scale was utilized to measure pain levels. The scale ranged from 0 to 5, with 0 representing feeling very happy with no pain and 5 indicating experiencing the highest level of pain imaginable.

The Visual Analog Scale (VAS) was utilized to record scores for each subject in both groups. During the treatment procedures, physiological changes in patients were monitored using a pulse oximeter, and the readings were documented.

The Wong-Baker's Faces Pain Rating Scale, VAS, and pulse oximeter scores were subjected to comparative analysis, assessment, and tabulation.



**Figure (2):** Visual analog scales used for ranking pain.

**Ethical Approval:**

Prior to their participation, all individuals were provided with detailed information about the study's objectives and procedures. In accordance with the guidelines set forth by the university's ethics board, participants provided informed consent by signing a permission form. The study adhered to the principles outlined in the Declaration of Helsinki, which serves as an



internationally recognized standard for ensuring the ethical conduct of medical research involving human subjects.

**Statistical Analysis:**

The data analysis was conducted using IBM-SPSS version 24 (May 2016). Various statistical tests, including the Kruskal-Wallis test, the Wilcoxon

test, Spearman correlation, and logistic regression, were employed to determine statistical significance. Each variable was analyzed based on the nature of the data, utilizing either parametric or nonparametric methods. Findings were considered statistically significant when the p-values were less than 0.05 (five percent).

**Results:**

**Table (1):** Fundamental characteristics of topics considered in both groupings

Parameter	Group A (N = 45)		Group B (N = 45)		P. Value
	Mean	SD	Mean	SD	
Age (years)	7.99	1.23	7.62	1.14	0.146
Sex					
• Male	22	48.89	20	44.44	0.6726
• Female	23	51.11	25	55.56	
Residence					
• Urban	21	46.67	18	40	0.5234
• Rural	24	53.33	27	60	

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In terms of Basal features, neither group differed significantly from the other.

**Table (2):** Group A and Group B patients' Wong-Bakers facial pain rating scores before and after oral prophylaxis, restoration, and pulpectomy/RCT.

Dental Procedure	Group A (N = 45)		Group B (N = 45)		P. Value
	Mean	SD	Mean	SD	
Oral Prophylaxis	0.35	0.59	1.09	1.04	0.00015*
Restoration	1.23	1.09	2.02	1.26	0.00269*
Pulpectomy/RCT	2.17	1.45	3.49	1.22	0.00003*

The lower pain rating scores in Group A compared to Group B for all three procedures are statistically significant, as indicated by the small p-values (0.00015\*, 0.00269\*, 0.00003\*).

**Table (3):** Quantitative analysis of symptoms (VAS) comparing lax is restoration (Group A) and pulpectomy/RCT (Group B) for mouth pain.

Dental Procedure	Group A (N = 45)		Group B (N = 45)		P. Value
	Mean	SD	Mean	SD	
Oral Prophylaxis	0.41	0.74	1.22	1.31	0.00078*
Restoration	1.32	1.36	3.35	1.98	<0.0001*
Pulpectomy/RCT	2.96	2	4.89	1.73	0.00001*

The lower VAS scores in Group A compared to Group B for all three procedures are statistically significant, as indicated by the small p-values (0.00078\*, <0.0001\*, 0.00001\*).

**Table (4):** Pulse rates before and after oral prophylaxis, restoration, and pulpectomy/RCT were compared in Groups A and B.

Dental Procedure	Group A (N = 45)		Group B (N = 45)		P. Value
	Mean	SD	Mean	SD	
Oral Prophylaxis	110.02	18.85	107.41	14.43	0.46471
Restoration	115.16	7.56	120.24	14.74	0.04563*
Pulpectomy/RCT	123.6	8.41	127.13	13.52	0.14409

For oral prophylaxis and pulpectomy/RCT, there are no statistically significant differences in pulse rates between Group A and Group B, as indicated by the p-values (>0.05). However, for the restoration procedure, there is a statistically significant difference in pulse rates between the two groups, as indicated by the small p-value (0.04563\*).



## Discussion

Dental anxiety has no known cause. Behavioral strategies to lessen children's discomfort and anxiety during invasive dental treatment have been studied (Appukuttan, 2016).

Modeling, relaxation, deep breathing, diversion, and self-talk are commonly used to reduce nervous and disruptive behavior. Identifying components of treatments that decrease anxious and disruptive behavior may minimize intervention time and improve management techniques (Segers et al., 2022).

Distraction may be worth investigating. "Distraction is a strategy to distract a patient from their current behavior." Video games, sound, TV, movies, cartoons, and audiobooks are all distractions. Distraction is used because pain perception has a substantial psychological component and attention to unpleasant stimuli affects pain (Liu et al., 2019).

Virtual reality and AV video eyewear are newer. AVD is a potential nonpharmacological sedation method that reduces dental anxiety in children and adults. It is a potent distraction because it enjoyably controls hearing and vision (Chaturvedi et al., 2016).

It also partly isolates the patient from the medical environment (Alshatrat et al., 2022).

The research included 6-10-year-olds, who commonly exhibit disruptive or negative behavior and are difficult to control. The most crucial criterion was their cognitive capacity to coordinate with the AV eyewear. AV eyewear reduced anxiety on the VAS and Wong-Bakers Faces Pain Rating Scale during oral prophylaxis ( $P < 0.05$ ). The group using AV eyewear during oral prophylaxis had less anxiety since video distracted them and eliminated unpleasant dental noises like handpiece noise.

One of the primary reasons for the effectiveness of using movies as a distraction tool in the initial therapy session is their ability to divert the child's attention from anxiety-inducing stimuli, resulting in a more relaxed and pleasant experience. The analysis of physiological measurements, specifically pulse rate, during oral prophylaxis did not yield statistically significant results. Similar findings were observed by Al-Khotani et al. (2016) in their study on distraction techniques in adult patients using audiovisual eyewear during dental prophylaxis. In the case of children wearing audiovisual eyeglasses, lower anxiety levels were

reported during cavity preparation and restoration visits ( $P < 0.05$  based on the Wong-Baker's Faces Pain Rating Scale and  $P < 0.001$  based on the Visual Analog Scale). This positive outcome can be attributed to the masking effect of cartoons or videos, which effectively concealed the sound and sight of the dental handpiece. Notably, a statistically significant difference in pulse rate was observed during restorative therapy with the use of spectacles, as highlighted by Alshoraim et al. (2018).

Pulpectomy/RCT, which requires needle-administered local anesthetic, causes anxiety to peak on the final visit. Cianetti et al. (2017) found this. The sight of the injection might potentially cause anxiety during pulpectomy/RCT. Group I children using AV eyewear had less anxiety owing to the diversion and masking of injection. The elevated pulse rate during pulpectomy injection suggests psychological cause. The anticipation of injection may cause sympathetic activation and catecholamine release, which increases pulse rate but is statistically nonsignificant when assessed as a physiologic metric. AVD eyeglasses do not alleviate chronic oral pain. Local anesthetic does. This research found that although pulse rate decreased oxygen saturation, there was no statistically significant difference between oral prophylaxis and pulpectomy. Yelderman et al. had previously found a similar trend, as did Janani et al. (2020).

The same operator conducted all three operations in both groups, eliminating operator bias. An impartial observer recorded pulse oximeter and VAS/WBFPRS scale values. Cassidy et al. (2002) and Al-Halabi et al. (2018) found that viewing cartoons did not distract or minimize needle injection discomfort in youngsters. In the current investigation, youngsters were separated from their surroundings by the AV glasses and watched a more striking film than on ordinary TV. AV eyeglasses decreased local anesthetic injection pain, according to Asvanund et al. (2015).

The use of audiovisual spectacles has been demonstrated in many trials to significantly lessen patients' perceptions of pain and anxiety during dental treatments. The findings corroborate previous research showing that AVD in conjunction with eyewear improves the experience of traditional dental treatments, such as dental restorative procedures, for children. These results are consistent with those observed by Al-Khotani et al. (2016), who used AV eyewear

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as a distraction technique to lessen patients' perception of pain and discomfort during dental procedures.

AVD has been shown to improve relaxation and pulse amplitude just before dental treatments in past research. When it comes to calming young kids' nerves during dental procedures, AVD has shown to be more helpful than other distraction strategies like music. Patients have also said how much they enjoyed the music and how they want to hear more of it at future sessions.

When comparing the audio group to the control group on the second visit, Kaur et al. (2015) found statistically significant changes. However, the use of video eyewear technology can further improve the patient experience by isolating the child from the sounds and sights of dental instruments like needles, clamps, rubber dams, and drills while simultaneously immersing them in a movie of their choosing. Asvanund et al. (2015) and Hoge et al. (2018) discovered that AV eyewear reduced anxiety and enhanced behavior in pediatric dental patients undergoing local anesthesia injections, dental restorative procedures, and other conventional dental procedures. Maintenance and the dearth of small-faced children's eyewear are limitations for AVD eyewear. To control for bias, participants initially wore AV eyewear without viewing movies. After numerous attempts, the majority of people were uneasy and horrified. Since the development of AV spectacles, diversion strategy has relied on a program played without any accompanying visuals. It will be difficult for pediatric patients to wear spectacles during dental treatment. Before providing the patient with AVD spectacles, the practitioner must play the film and provide the minor with the smallest measurement available. The participant in the investigation chose distraction.

Stegemann et al. (2019) say this will help youngsters regulate unpleasant stimuli and feel at home. It is unclear if the video eyewear, the fact that participants had a choice of what to view, the masking of the dental environment, or any combination contributed to overall happiness. The examiner or dentist should determine whether video eyewear or the movie promotes a favorable dental attitude. The operator's expertise and behavior management strategy for pediatric patients are crucial, thus our approaches and techniques may affect the outcomes. AV spectacles made some kids miss the clinician. However, the AV system may have saved time during traditional

dental operations by reducing social contact. AV eyewear may not save time for short operations or new patients since verbal preparation, discussion of results, and communication are required. The AV system may save time for extended operations or treatment of patients who are returning or habituated to procedure patterns. The children's AV glasses videos varied in the research. The operator should show all youngsters the same demonstration clip to reduce AV device variability. However, in clinical applications, patients should be able to select whether to use the AV eyeglasses and whether to watch a practitioner-provided movie or one they brought in after being informed about them.

According to Bassi et al. (2004), the use of audiovisual (AV) distraction may not effectively distract patients with severe gag reflexes from stimuli that trigger their reflexes or cause anxiety. In such cases, strong gag reflexes may interfere with the effectiveness of AV distraction. Identifying individuals with these characteristics and excluding them from screening processes could reduce unnecessary apprehension and optimize the efficiency of AV device utilization during the orientation phase. Additionally, Custódio et al. (2020) found that virtual reality, which serves as an interactive diversion during dental treatment, did not impact patients' behavior or anxiety significantly but did result in a significant reduction in their pulse rate.

Once a patient's trust has been established, this study suggests the implementation of audiovisual distraction (AVD) during dental consultations to improve patient attitudes towards the dental experience. It is important to note that AVD should not replace essential elements such as trust-building communication, aversive conditioning, or other behavior management techniques. However, for children who respond negatively to aversive conditioning, are not suitable candidates for sedation or general anesthesia, or face communication barriers with the clinician due to language limitations, AVD eyeglasses can serve as an alternative relaxation technique.

## Conclusion

The utilization of AVD (Audio-Visual Distraction) with video spectacles in pediatric dentistry introduces a novel and promising approach as a distraction tool. This innovative technique aims to alleviate the discomfort typically experienced



during dental procedures and promote a state of calmness in children. The findings of the study provide strong evidence in favor of using AVD video spectacles as a nonpharmacological method of distraction, which can significantly enhance comfort levels, cooperation, and reduce anxiety among pediatric patients undergoing routine dental treatments. Furthermore, when considered alongside previous research, the results suggest that employing AVD systems for children with mild to moderate levels of dental treatment-related fear and anxiety could be a valuable option. Although this investigation is still in the exploratory stage, the overwhelmingly positive responses from the participants support and build upon existing research, underscoring the effectiveness and suitability of AV eyeglasses systems for the majority of pediatric patients.

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**Author contribution:** Each of the authors made an equal contribution to the final product.

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