

# Impact of Virtual Reality Distraction Technique on Dental Anxiety during Short Dental Procedure among 5-8 Years Children: A Non-Randomised Clinical Trial

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## Abstract

**Introduction:** An effective dental treatment revolves around the efficient management of dental related stress and anxiety of the patient. The development of Virtual Reality (VR) has been paving its way on dental treatments and in patient education. VR helps in forgetting the likely environment and it creates an anxiety free environment. Thus the study aims to assess the impact of virtual reality distraction technique on dental anxiety using facial image scale during short dental procedure in pediatric patients. **Material & Methods:** The study is a non-randomized clinical trial. 75 children in the age group of 5 year to 8 year requiring class I restoration in mandibular primary molars were selected. The child's anxiety was recorded using the facial image scale before and after the restorative procedure using VR glasses. Pre and post interventional anxiety level was analyzed statistically using version SPSS version 20.0. ANOVA was used for intra group comparison. Paired student t-test was used to compare the pre and post interventional anxiety level. P value was set at 0.05. **Results:** The results showed that there exists a statistically significant difference between the pre and post anxiety level of the child when using of virtual reality glasses. **Conclusion:** The usage of VR as a distraction tool helps the child to overcome dental anxiety during minor dental procedure. It can be used as a best tool to rapport patient cooperation and establishes a better bond between the patient and the pediatric dentist.

**Keywords:** Dental anxiety; Virtual reality glasses; Facial image scale

## Introduction

An effective dental treatment revolves around the efficient management of dental related stress and anxiety of the patient. The prevalence of dentistry related stress and anxiety is relatively high among pediatric patients as this forms the important component of the primary emotions. [1,2] Once patient gets anointed, it invokes other psychological and behavioural consequences. [3] The clinic's environment, the clinician and the instruments are such anxiety provoking factors for a child. In order to manage them, there are various behaviour shaping techniques available which helps in providing quality care to the child. [2] In modern pediatric dentistry, the use of distracters has proven its effect in child management besides it being safe and economical. As the result of digital dentistry evolution the development of Virtual Reality (VR) has been paving its way on dental treatments and in patient education. [4] VR helps in forgetting the likely environment and it takes the child into a computed generated stress free atmosphere thereby it stands advanced than other distracting techniques. [5]

In recent days, number of researches has been conducted based on behavioral pattern in VR and virtual world. It cheers and distracts from pain perception and allows the patients to be drowned in the virtual stimulated world by utilizing advanced technologies. [6] By using a virtual reality glass, the child's senses

like vision, hearings are actively engaged there by distracting the child from anxiety.

Assessing the dental anxiety of the child before the start of the treatment is an important step to be followed by the clinician as it provides him/her with a means by which he or she may judge the child's ability to respond to dental treatment. Amongst the vast number of options, assessment tools can be grouped into four major types based on the type of informant or information gathered. [7] They are self-report assessment, parental proxy assessment, observation-based assessment, and physiological assessment. Among this, the self-reporting assessment system helps the child in expressing his own anxiety level rather than others being proxy for the child's anxiety e.g. dental subscale of the children's fear survey schedule, modified dental anxiety scale, venham picture test, children's dental fear picture test, facial image scale etc. The facial image scale is a very simple and effective scale used in younger children consisting of a

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range of five faces with facial expressions ranging from very unhappy to very happy. [8] A child simply needs to point to the cartoon that best represents himself or herself at that moment. The scale is scored by giving a value of one to the most positive affect face and five to the most negative affect face.

This study aims to assess the impact of virtual reality distraction technique on dental anxiety using facial image scale during short dental procedure in pediatric patients.

## Materials and Methods

A non-randomized clinical trial was conducted in the department of Public health dentistry, Vivekanandha dental college for women, Namakkal. Informed consent was obtained from children's parents or guardians before participation in the study. Participant's confidentiality was assured with an identity number and the records were maintained only by the researcher. A total number of 75 children within the age group of 5 year to 8 year inclusive of both the genders were selected by simple random sampling method (*i.e.* a total of 134 children who fall under the inclusion criteria were included by convenience method for a duration of 3 months from this 134 samples a sample of 75 were randomly selected by simple random sampling technique-computer generated table of random numbers). Children who require class I restoration in mandibular primary molars with no medical history were included in the study. Children who had previous dental visits, challenged/ compromised children, children's of parents who didn't give informed consent to participate in the study were excluded from the study.

The facial image scale was used to assess the anxiety levels before and after the treatment. The facial image scale consists of 5 facial expressions. The facial expressions range from a score of 1 to 5, with score 1 indicating "Very happy", 2: "Happy", 3: "Moderate", 4: "Unhappy" and 5 indicating "Very unhappy". [2]

Before the start of the treatment, as the child is made to sit on the dental chair, the child was shown the facial image scale and asked to point out the facial image which co-relates with his present state of mind [Figure 1].

Later the child was given a virtual reality glasses along with an in-built ear phones (virtual private theatre system). The child was allowed to choose his favourite cartoon video from a set of 5 [Figure 2].

After a period of 5 minutes from the start of the video, the restorative procedure was initiated and carried out. All the procedure was done by a single trained operator [Figure 3]. After the procedure is completed, the child was again asked to point out the facial image in the facial image scale which co-relates with his current state of mind.

Pre and post interventional anxiety level of the child was recorded and analysed statistically using version SPSS version 20.0. The data followed a standard normal distribution when tested for normality by Saphiro's Wilks test so the following parametric tests were used. ANOVA was used for intra group comparison. Paired student t-test was used to compare the pre and post interventional anxiety level. P value was set at 0.05.



Figure 1: Subjects expressing the level of anxiety using facial image scale.



Figure 2: Expression of the subject while using VR glass.

## Results

Table 1 shows the pre-interventional age wise mean anxiety level of the children. Before the intervention there exists a statistical significant difference between the age group (p value=0.31). Before the intervention, 5 year kids were more anxious than 8 year old kids. Table 2 shows the comparison of post-interventional age wise mean anxiety level of the children, which was found to be not statistically significant.

Table 3 shows the pre-interventional gender wise mean anxiety level of the children. Before the intervention there exists

a statistical significant difference between the genders (p value=0.09). It is found that females were more anxious than the male children. Table 4 shows the post- interventional gender



**Figure 3:** Investigator performing procedure on the subject while using VR glass.

Table 1: Pre intervention comparison of mean anxiety scores among different age group of children.	
Age group	Mean ± SD
5 Yrs	4.5 ± 0.54
6 Yrs	3.8 ± 0.75
7 Yrs	3.3 ± 1.21
8 Yrs	2.8 ± 1.06
P value	0.031*

Table 2: Post intervention comparison of mean anxiety scores among different age group of children.	
Age group	Mean ± SD
5 Yrs	2 ± 0.89
6 Yrs	1.8 ± 0.75
7 Yrs	1.3 ± 0.81
8 Yrs	1.1 ± 0.37
P value	0.146NS

Table 3: Pre intervention comparison of mean anxiety among different gender.	
Sex group	Mean ± SD
Male	3.3 ± 1.12
Female	3.8 ± 1.02
P value	.009*

Table 4: Post intervention comparison of mean anxiety among different gender.	
Sex group	Mean ± SD
Male	1.6 ± 0.76
Female	1.5 ± 0.79
P value	0.979NS

Table 5: Comparison of anxiety score between pre and post intervention among children by using virtual reality glasses.		
Group	Mean ± SD	P value
Pre intervention	3.6 ± 1.08	.03*
Post intervention	1.5 ± 0.76	

wise mean anxiety level of the children, where no statistically significant difference exists between the genders (p value=0.979).

Table 5 shows the level of anxiety pre and post usage of virtual reality glasses. There exist a statistically significant difference existing between the pre and post usage of virtual reality glasses with the pvalue=0.03.

## Discussion

Anxiety is an emotion which is directly proportionate to an unpleasant dental experience in the child. Children with dental anxiety keep avoiding the necessary dental treatment thereby leading to disease progression and more expensive treatment. It is the foremost duty of a pediatric dentist to make the child's dental visit more pleasing. There by making the child less anxious towards dental treatment in the future.

Though there are various methods of reducing the anxiety of child in a dental setup, a more joyful way of distracting the child from anxiety is in demand. Virtual reality is gaining its fame in the field of pediatric dentistry by making the child's dental treatment more enjoyable.

Virtual reality is a computer based technology which presents an artificial 3-dimensional fantasy stimulated atmosphere. The working mechanism of virtual reality is rather simple as it works connected to phone or a computer. It includes a display within the goggle which is to be mounted in head. Additional feature of the headphone cuts the child's from the dental environment virtually. Thus this setup creates a virtual space where they no longer mentally present in the current atmosphere. The application of virtual reality is wide enough in entertainment purpose, but its therapeutic use in treating pediatric patient, as a tool for distraction and behaviour management is recently been explored. [7] By making the child's dental experience more positive, it will help the child to walk-in to the dental office more willingly during next visit.

Children of age group 5 year to 8 year were included in this study, as children of younger age group exhibit more anxiety during dental treatment and displays signs of troublesome behaviour. According to Kesang et al., by the age of 5 years, the children have the cognitive ability to express their feelings, which justifies the choice of this age group for anxiety related studies. [9,10]

The reason behind using FIS to assess the dental anxiety in this study is that, by using this scale the child will be able to reflect the best state of his/her emotion by just pointing out a facial image during each stage of treatment as the verbal skill of the children is limited in younger ages. [11] Various validation studies have proved that FIS is a suitable measure for assessing dental anxiety in very young children. [12]

In the present study the female children were found to be more anxious than male children which is in accordance to the study conducted by Gaber et al. and the dental anxiety decreases with increase in age which is in concordance with the findings reported on a general decrease of childhood fears with increasing age. [13-16] This can be viewed from a developmental perspective.

In this study, there was no statistical significant difference in

the level of anxiety among various age groups and among the genders with the usage of virtual reality glasses. This shows the effectiveness of virtual reality glasses in respect to anxiety among various age groups and genders. [6-8]

In the present study, in the inter group comparison, there is a statistical significant reduction in level of anxiety before and after the usage of virtual reality glasses while performing a restorative procedure, this indicates the marked reduction in the anxiety level of the child which was similar to the results of the study conducted by Niharika et al. [17] The child's attention is more focused on what is happening in the virtual world rather than on the surrounding environment. [18] These benefits may be substantiated to the headsets which project the images in front of the eyes and block them out from real-world stimuli.

### Limitations of the Study

The limitation of the study includes the small sample size and a narrow range of age group from 5 years to 8 years. Increase in sample size and a wide range of age group would have helped in validating the usage of virtual reality glasses in various age groups.

### Conclusion

VR glass is a potential, safe and non-invasive technique to distract children during dental procedure. Within the limitations of the present study, the usage of VR as a distraction tool helps the child to overcome dental anxiety during minor dental procedure. It can be used as a best tool to rapport patient cooperation and establishes a better bond between the patient and the pediatric dentist.

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