

## ORIGINAL RESEARCH

# Effectiveness of Audiovisual Distraction Eyeglass Method Compared to Tell-Play-do Technique among 4–7-year-old Children: A Randomized Controlled Trial

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## ABSTRACT

**Context:** Dental fear and anxiety lead to major obstacles and undesirable distresses such as avoidance of dental treatment. The inability of children to deal with threatening dental stimuli often manifests as behavior management problems. A wide variety of aversive techniques have been used with varying success rates to manage anxious child patients.

**Aims:** The aim of this study was, therefore, to evaluate the effectiveness of viewing videotaped cartoons using an eyeglass system as an audiovisual (AV) distraction technique as compared to customized tell-play-do (TPD) technique on behavior and anxiety in children receiving prophylactic and dental restorative treatment.

**Settings and Design:** A total of 50 dentally naïve children patients aged 4–7 years were enrolled in the study and randomly allocated into two groups. Group I TPD technique was introduced with customized playing dental objects and Group II AV distraction technique followed by oral prophylaxis and rotary restorative treatment. Heart pulse rate, oxygen saturation facial image scale, venhams picture scale, mcDas facial version, and chhota bheem chutki (CBC) anxiety scale were used before, after the intervention, and during dental procedure to quantify the anxious behavior.

**Materials and Methods:** CBC model along with dental imitating instruments introduced in Group I. In Group II AV distraction glasses used wherein dental videotaped material introduced as per the patients preference. Various picture image scales such as venhams picture scale, facial image scale and CBC scale used heart pulse rate, oxygen saturation facial image scale, and anxiety scale were used before, after the intervention, and during dental procedure to quantify the anxious behavior. Pulse oximeter was used for monitoring heart rate.

**Statistical Analysis Used:** The data collected were put for statistical analysis and were compared using independent *t*-test, Mann–Whitney U-test, and Wilcoxon W-tests.

**Results:** The results of our study showed that TPD technique was equally effective as distraction by AV glasses on child anxiety levels and increased the cooperative behavior

during dental treatment among 4–7-year-old children. The difference between group 1 and 2 observed was statistically non significant ( $p > 0.05$ ).

**Conclusions:** TPD is equally effective in reducing children's fear and anxiety about dental treatment as AV distraction aids. Thus, to promote adaptive behavior, TPD could be an alternate behavioral modification technique during pediatric dentistry.

**Keywords:** Audiovisual distraction, Behavior management, Tell-play-do.

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## INTRODUCTION

One of the desires for dental professionals is to treat their patients in an anxiety-free environment along with rendering highest quality of the dental care. To achieve this, we dentists have to implement learned skills, experience, and various behavior management techniques. Dental fear is a common, essential and inevitable reaction that appears as a response to the stress induced by various dental procedures and armamentarium. Its intensity varies from nervousness and anxiety to dental phobia, and it is considered to be the main barrier for successful completion of treatment.<sup>[1,2]</sup> Negative consequences of dental fear may be of an internalizing nature, i.e., psychological or behavioral withdrawal, and eventually avoidance of the dental situation. This will have negative consequences for children's oral health and its dysfunction and may involve other interrelated problems, such as social inferiority. Therefore, good quality dental care for these children is of great importance. In addition, dentists should aim for a reduction in apprehension and fear as well as developing behavioral management strategies for the prevention of dental fear.<sup>[3]</sup>

Distraction technique is a non-aversive behavior management procedure which is widely used and accepted because it is simple, safe, inexpensive along with effectively reducing distress and disruptive behavior in child patients during the invasive dental procedures.<sup>[4]</sup>

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Based on the theory by McCaul and Mallot, a patient's perception of pain is decreased when the patient is distracted from an unpleasant stimulus.<sup>[5]</sup> From this one can understand that the perception of pain is directly associated with the amount of attention a patient pays to an unpleasant stimulus. Several neurophysiological studies have confirmed this theory pointing out the importance of distraction concerning lower levels of pain and anxiety.<sup>[6]</sup> These techniques aim to engage child's attention away from unpleasant stimuli, which help in managing their procedural anxiety, distress, and pain and promoting more positive behavior.

Tell-show-do (TSD) technique introduced by Addelston in 1959 dictates that before any procedure is done, the child is to be well informed and a demonstration should be given using a simulator exactly what will happen before the procedure is started. TSD technique is based on the principle of learning theory and is performed by the dentists themselves in the operatory room.<sup>[7,8]</sup> Rather than explaining, demonstrating, or observing a model, making them play with dental imitating instrument toys, provides a more explanatory concept. With this idea, TSD technique was modified into tell playdo (TPD) technique, using the concept of learning by doing in reducing children's fear and anxiety of dental treatment and promoting adaptive behavior.<sup>[9]</sup>

The aim of this study was to evaluate the effectiveness of TPD in comparison with AV distraction technique among 4–7-year-old children during oral prophylactic and rotary restorative dental treatment.

## MATERIALS AND METHODS

This randomized clinical trial study to compare the effectiveness of AV distraction technique as compared to TPD technique was approved by the Ethics Committee of DY Patil University School Of Dentistry and Hospital and conducted in the Department of Pediatric and Preventive Dentistry from October to November 2017.

Among the patients referred to the pedodontics and preventive dentistry department, 50 children aged 4–7 years ( $\pm 4$  months) with Frankl rating 3 (children who accept treatment with cautious behavior at times; willing to comply with the dentist, at times with reservation, but follow the dentist's direction cooperatively), were enrolled in the study based on the eligibility criteria. Children with initial caries cavity lesion (not involving pulp) in one of the primary mandibular molars and needed a restoration were included in the present study. It was confirmed that they had no previous experience of hospitalization and dental visit. The children with systemic diseases and developmental disorders were excluded from the study. The examination was completed, and the necessary radiographs were prescribed.

Each child's parents were explained in detail about the study and written informed consent was obtained. Required and relevant information pertaining to study was collected by taking history.

Study subjects were randomly allocated into two groups.

### Group I (AV Distraction)

AV eyeglasses, to the eyeglasses with a choice of cartoon shows and movies, were presented to subjects. The glasses partially occlude the environment and involve children in seeing and hearing a movie according to their preference. The acclimatization of the patient, dental prophylaxis was performed using an ultrasonic scaler followed using a slow-speed handpiece with a rubber cup and prophylaxis paste. Then, the occlusal cavity was prepared for the restoration of the teeth using Airotor and restored using glass ionomer cement (GIC) restoration (GC type IX) which was done for all the subjects in the study. The duration of the whole procedure was standardized for 30 min [Figure 1].

### Group II (TPD Group)

The child was introduced to customized dental instrument toys and a cartoon character (chhota bheem) with teeth visible and accessible [Figures 2 and 3]. The trained dental personnel explained all the customized dental objects using appropriate euphemisms and procedures in phrases appropriate to the developmental level of the child and allowed to hold dental imitating instruments to play and perform a dental procedure on the cartoon character. The Airotor sound was also incorporated in the dental object resembling Airotor clinical sound effect. In the patient, dental prophylaxis was performed using an ultrasonic scaler followed using a slow-speed handpiece with a rubber cup and prophylaxis paste.



**Figure 1:** Audiovisual distraction glasses used and oral prophylactic procedure performed and pulse oximeter reading being recorded

Then, the occlusal cavity was prepared for the restoration of the teeth using Airtor and restored using GIC restorative material. The duration of whole procedure was standardized for 30 min.

In all children, parameters such as the attending dentist, his/her assistant, the working environment, time and duration (30 min for each child) of work, and the type of dialogues, and euphemisms were all the same.

A child entered the clinical area, team received the child and made to sit on a dental chair. The present study investigated two physiological parameters of stress-pulse rate and oxygen saturation. Measured with pulse oximeter after 1 min heart rate (using Gibson finger oximeter), FIS,<sup>[10]</sup> Venham scale (VS),<sup>[11]</sup> and chhota bheem chutki scale (CBC)<sup>[12]</sup> were noted.

The respective child received the particular intervention (AV distraction/TPD). Then, again, all parameters were noted. The child was taken for oral prophylaxis and rotary restorative procedure, and during this procedure, all parameters were noted.

All children were independently evaluated for anxiety reaction by two calibrated pediatric dentists who were blind to the grouping of the children. [Figure 4] shows all the armamentarium used in the study as described above.

**Statistical Analysis**

The data collected were put to statistical analysis.

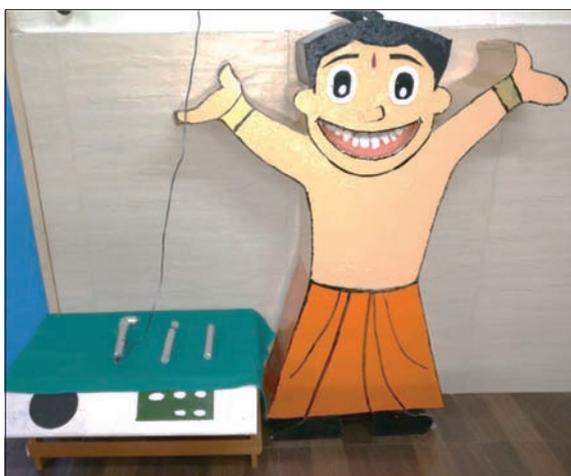
Data analysis was performed using software package of statistical analysis (SPSS15, SPSS Inc., Chicago, IL, USA). *P* < 0.05 was considered statistically significant. This study used independent *t*-test (parametric test) and Mann-Whitney U-test (non-parametric test) in addition to confirm the significance of the difference.

**RESULTS**

A total number of 50 children, 20 boys and 30 girls participated in the study and were randomly allocated in the study between AV distraction (*n* = 25) and TPD (*n* = 25) groups. Data revealed that both groups were



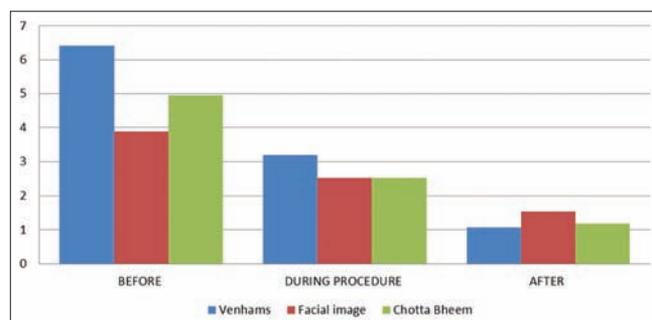
**Figure 2:** Customized tell-play-do intervention and child playing with dental objects performing dental procedures



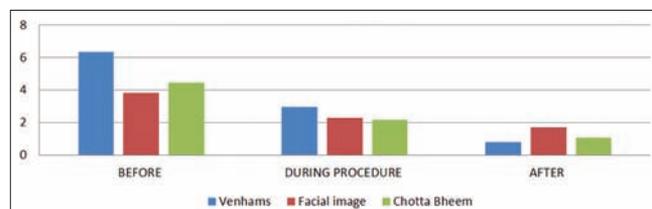
**Figure 3:** Customized dental imitating objects along with cartoon character chhota bheem



**Figure 4:** Armamentarium used for the study



**Graph 1:** Group 1 audiovisual distraction



**Graph 2:** Group 2 tell-play-do

**Table 1:** Independent *t*-test for pulse recordings

Pulse value	<i>t</i> -test	df	<i>P</i> value	Mean difference	Interpretation
Before	-0.912	48	0.366	-0.17949	NS
During procedure	-0.53	48	0.599	-0.10256	NS
After	0.629	48	0.532	0.11538	NS
Difference	-1.528	48	0.133	-0.29487	NS

Table 1 for pulse recordings using Independent *t*-test shows no significant difference between group 1 and 2 (*p*>0.05)

**Table 2:** Mann–Whitney U-test result for pulse recording

Pulse value	Mann–Whitney U	Wilcoxon W	Z	<i>P</i> value	Interpretation
Before	273	624	-0.772	0.44	NS
During procedure	270	621	-0.828	0.407	NS
After	262.5	613.5	-0.974	0.33	NS
Difference	277.5	628.5	-0.683	0.495	NS

Table 2 for pulse recordings using Mann-Whitney U-test shows no significant difference between group 1 and 2 (*p*>0.05)

**Table 3:** Independent *t*-test result for Venham scale

Venhams scale	<i>t</i> -test	df	<i>P</i> value	Mean difference	Interpretation
Before	0.289	48	0.774	0.08974	NS
During procedure	0.581	48	0.564	0.23397	NS
After	0.952	48	0.346	0.28526	NS
Difference	-0.64	48	0.525	-0.19551	NS

**Table 4:** Mann–Whitney U-test result for Venham scale

Venhams scale	Mann–Whitney U	Wilcoxon W	Z	<i>P</i> value	Interpretation
Before	302	653	-0.208	0.835	NS
During procedure	287.5	587.5	-0.489	0.625	NS
After	258	558	-1.137	0.255	NS
Difference	266	617	-0.935	0.35	NS

Table 3 ( independent *t*-test ) and Table 4 ( Mann-Whitney U-test ) for venhams scale show no significant difference between group 1 and 2 (*p*>0.05)

**Table 5:** Independent *t*-test result for FIS

Facial image scale	<i>t</i> -test	df	<i>P</i> value	Mean difference	Interpretation
Before	0.198	48	0.844	0.05128	NS
During procedure	1.114	48	0.271	0.24679	NS
After	-0.859	48	0.395	-0.16987	NS
Difference	0.85	48	0.399	0.22115	NS

**Table 6:** Mann–Whitney U-test result for FIS

Facial image scale	Mann–Whitney U	Wilcoxon W	Z	<i>P</i> value	Interpretation
Before	305.5	605.5	-0.133	0.894	NS
During procedure	272.5	572.5	-0.849	0.396	NS
After	276	627	-0.773	0.44	NS
Difference	269	569	-0.882	0.378	NS

Table 5 ( independent *t*-test ) and Table 6 ( Mann-Whitney U-test ) for FIS show no significant difference between group 1 and 2 (*p*>0.05)

similar in demographic characteristics including sex and age range [Tables 1-8 and Graphs 1 and 2].

Graphs 1 and 2 depict the difference in the before during and after values for VPS, FIS, and CBC. There is an overall reduction in the before intervention anxiety values for VPS, FIS, and CBC as compared to after values for Groups 1 and 2. However, when compared between Group 1 and 2, there is no statistical difference, and hence both the techniques are

equally effective in reducing anxious behavior in the children.

## DISCUSSION

This study was designed to evaluate and compare the efficiency of AV distraction and TPD technique in reducing child anxiety during dental treatment.

The results of this study showed that TPD technique was equally effective as AV distraction on child anxiety

**Table 7:** Independent t-test result for chhota bheem chutki (CBC)

Chhota bheem chutki scale	t-test	df	P value	Mean difference	Interpretation
Before	1.506	48	0.139	0.50321	NS
During procedure	1.726	48	0.091	0.37179	NS
After	1.101	48	0.277	0.10897	NS
Difference	1.077	48	0.287	0.39423	NS

**Table 8:** Mann–Whitney U-test result for CBC

Chhota bheem chutki scale	Mann–Whitney U	Wilcoxon W	Z	P value	Interpretation
Before	256	556	-1.139	0.255	NS
During procedure	246	546	-1.406	0.16	NS
After	278	578	-1.098	0.272	NS
Difference	269	569	-0.874	0.382	NS

CBC: Chhota bheem chutki. Tables 7 (independent t-test) and 8 (Mann-Whitney U-test) for CBC scale show no statistical significant difference between Groups 1 and 2 ( $p > 0.05$ )

levels and increased the cooperative behavior during dental treatment among 4–7-year-old children.

This is one of a kind study wherein TPD has been used and compared with AV technique.

Analysis of FIS, VS, and CBC revealed that fear perception range by Group 2 (TPD) was similar significantly compared to Group 1 (AV). Child's behavior reactions were quantified by two unaware observers using FIS, VS, and CBC as these are easy and quick methods with reliability and validity for statistical analysis.<sup>[10]</sup>

First dental visit of a child is an important molding factor for rendering a successful as well as a quality dental treatment in children. The impact of first dental visit stays with the child for all of the future dental visits; hence, the aim of dentists should be a positive, successful first visit.

TPD technique was successful in reducing anxiety levels in this study. TPD technique is based on learning theory where the exchange of thoughts and two way interchange of information takes place, by performing dental treatment on dental imitating toys where child understands the dentist's frame of reference and feels more comfortable and develops cooperative behavior and also develops a sense of confidence along with reduction in fear and anxiety.

TSD technique remains the most commonly used technique in pediatric dentistry and is still considered the technique with which the dentists and the parents are comfortable<sup>[13-15]</sup> and justifies being the method of choice as the backbone of child education and behavior guidance during the first dental visit.<sup>[16]</sup>

Vishwakarma *et al.*, in 2017, compared and evaluated the effectiveness of customized TPD technique with live modeling for behavior management of children resulted that TPD is effective in reducing children's fear and anxiety about dental treatment, children enjoy playing with the customized dental object and is in accordance with this present study.<sup>[9]</sup>

Sharma and Tyagi in 2011 have reported that techniques such as live modeling and TSD are very effective in modifying a child's behavior.<sup>[17]</sup>

By simple modification, TPD can have a greater impact on younger children, so that they can feel comfortable, accept the dental treatment and also promote adaptive behavior for future dental interventions.

AV distraction has been used widely and successfully to achieve adaptive behavior during various dental procedures. When compared to similar behavior management techniques, such as music relaxation, storytelling, listening to the audio by headphones, playing video games, and watching television, the AV eyeglass system has been shown to minimize not only the children's anxiety toward dental treatment but, in turn, also enhances the children's cooperative behavior,<sup>[18]</sup> which is in consistency with the results of the present study. As observed in this study, Filcheck *et al.* reported that the display of attention-grabbing videotaped material had an effect in distracting the children from the fearful stimuli and that it was considered as one of the most attractive methods for modifying children's behavior during dental treatment.<sup>[19]</sup> Furthermore, a study by Prabhakar *et al.* reported results coinciding with the present study.<sup>[20]</sup> They found that the use of AV distraction during dental treatment was more effective in managing the children than using audio distraction solely. In a study by Ram *et al.*, the use of AV eyeglass system was shown to be more efficient than a regular television screen, and it also could be used instead of nitrous oxide gas.<sup>[21]</sup> El-Sharkawi *et al.* found that AV eyeglasses<sup>[22]</sup> effectively reduced pain during the local anesthetic injections.<sup>[23]</sup> Chaturvedi *et al.*<sup>[24]</sup> stated that AVD system may be a beneficial option for patients with mild to moderate fear and anxiety associated with dental treatment in children. Florella *et al.*, Aminabadi *et al.*<sup>[25]</sup> Hoge *et al.*,<sup>[19]</sup> Fakhruddin *et al.*,<sup>[26]</sup> Kaur *et al.*,<sup>[27]</sup>

Khotani *et al.*,<sup>[28]</sup> and Panda *et al.*<sup>[29]</sup> stated that AV distraction seems to be an effective method in reducing fear and anxiety in children during dental treatment and can be successfully used to distract children and decrease the amount of pain perceived by them during dental procedures. The results of this study differ from those of a study conducted by Sullivan *et al.*,<sup>[30]</sup> who found that the use of AV during dental treatment had NS effect on the behavior (measured using the Frankl behaviour rating scale) or anxiety (measured using the Koppitz method of evaluating drawings) in 26 children aged 5–7 years, however, significantly reduced the pulse on injection of local anesthesia in children wearing AV glasses as compared to children without AV glasses. The difference in results could be due to the difference in measuring scales used. The need for maintenance and the un-availability of eyeglasses for children with small faces limit the use of AVD eyeglasses. Audiovisual eyeglasses also become a technical obstacle at times, limiting the access to patients mouth. Efforts to ensure correct positioning of the eyeglasses hampers accessibility to the teeth and reduces the ease of work. Hence, the patients might not have been completely distracted from the procedures performed in the oral cavity. Although previous research has shown that distraction in children as being a highly acceptable technique in helping divert their attention, anxiety, and helping them relax, some factors may cause hinderance.

Further, it has been shown that children showed more distress and uncooperative behavior when the dental procedure went beyond 30 min. However, to prevent these behavior changes of the children during dental procedures, the length of the visits in the present study was kept no longer than 30 min.<sup>[31]</sup>

A larger sample size might have elucidated better and more conclusive results. However, this was chosen to achieve a homogeneous group as possible to be able to draw fair conclusions.

## CONCLUSION

According to our study TPD technique was equally efficient as AV distraction technique to control 4–7-year-old children's anxiety and to achieve cooperative behavior during dental treatment.

Therefore, it is suggested that both AV and TPD may be considered a good alternative in managing anxious child patients in dental operatory and are techniques worth practicing in pediatric dentistry.

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