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RESEARCH ARTICLE

COMPARATIVE EVALUATION OF ANXIETY LEVELS IN CHILDREN PREPARED FOR CONVENTIONAL DENTAL TREATMENT PROCEDURES USING THREE BEHAVIOR SHAPING TECHNIQUES

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ABSTRACT

Purpose: To evaluate and compare anxiety levels in children prepared for oral prophylaxis and topical fluoride varnish application using three behavior shaping techniques- tell-show-do, live modeling and filmed modeling.

Methods: Sixty three subjects (7-9 years) with Frankl's score 3 and 4 were allocated in three groups using randomized block design, each group having 21 patients. Group I-children prepared for oral prophylaxis and topical fluoride varnish application by means of tell show do (TSD) technique; Group II- children prepared for oral prophylaxis and topical fluoride varnish application by means of live modeling; Group III-children prepared for oral prophylaxis and topical fluoride varnish application by means of filmed modeling. Facial Image Scale with image scores and heart rate were used to record the anxiety. Scores were taken before, during and after the dental treatment procedures.

Results: It was observed that, before, during and after oral prophylaxis and topical fluoride varnish application procedures, highest anxiety score was seen in Group I, followed by Group II whereas least anxiety score was seen in group III.

Conclusion: Filmed modeling can be an efficient method in pre-appointment preparation of children during dental treatment procedures.

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INTRODUCTION

The primary emotions of a child while entering a dental clinic are anxiety and fear. (Sharath *et al*., 2009) Dental fear among children is an issue of great concern to both dentists and parents. (Mungara *et al*., 2013) Anxiety and fear are developed mainly due to sight and noise of the equipments used in the dental practice. If this fear, developed by dental equipments is not managed at an early stage of dental treatment, it can result in an uncooperative behaviour. Most of the times, uncooperative behaviour cannot be managed by conventional behaviour management techniques and might require pharmacological interventions. Most recommended techniques for preparing the child for dental treatment includes various forms of pre-exposure to the dental setting and procedures in a sequential manner. (Mungara *et al*., 2013) Behaviour shaping is a non-pharmacological technique based on the established principle of social learning. (Howard and Freeman, 2009)

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Commonly used behaviour shaping techniques includes tell-show-do (TSD) and modeling. Modeling was described by Bandura in 1963. (Bandura *et al*., 1968) It is the process of acquiring behaviour through observation of a model. In 1969, the first study of modeling in pediatric dentistry was reported by Greenbaum and Melamed. (Greenbaum and Melamed, 1988; Allen *et al*., 1990; Wilson and Cody, 2005) Initially, live modeling was found to be effective in decreasing children's fear and anxiety of dental treatments in children and promoting adaptive behavior in them. (Greenbaum and Melamed, 1988; Allen *et al*., 1990; Baghdadi, 2001) Further, it was modified by introducing filmed modeling technique as the live model might not be always available in the operatory. TSD is a regularly used behaviour shaping technique and has been widely accepted amongst all behaviour shaping techniques used for managing pediatric dental patients. According to a study conducted by Saleh Muhammad *et al*, most parents preferred the non-pharmacological techniques of behaviour management (positive reinforcement, effective communication, TSD, distraction, modeling and nonverbal communication) as compared to pharmacological techniques of behaviour management (nitrous oxide sedation, general anaesthesia and

conscious sedation). (Muhammad *et al*., 2011) This was because, the parents felt that the TSD technique enabled the dentist to explain the procedure to the child using a simple language that the child could understand. (Muhammad *et al*., 2011) Aversive conditioning is gradually losing its social acceptance and parents are now reluctant towards pharmacological techniques. A study of 20,000 pediatric dental cases done under general anaesthesia by Cohen and Cameron showed that the intubation of children with respiratory tract infections (URI) increased the risk of airway complications like obstruction and bronchospasm, by 11-folds. Airway complications associated with intubation of children with URI during general anaesthetic procedures is a common occurrence and has been studied extensively. (Cohen and Cameron, 1991) With this background, we undertook a clinical study with the aim of evaluating and comparing anxiety levels in children prepared for conventional dental procedures using three behaviour shaping techniques namely, TSD, live modeling and filmed modeling. The objectives of this study was to evaluate and compare anxiety levels in children undergoing for oral prophylaxis and topical fluoride varnish application prepared and managed by using the three behaviour shaping techniques (TSD , live modeling and filmed modeling). The outcome of this study will help us to find out a solution for preparing the child for dental treatment.

MATERIALS AND METHODS

Sixty three healthy pediatric dental patients visiting the Dept. Of Pedodontics and Preventive Dentistry at the Dr. D.Y. Patil Dental college and Hospital, Pimpri, Pune were selected for the study according the following inclusion and exclusion criteria:

Inclusion criteria

1. Children in the age group of 7 to 9 years old.
2. Patients giving a Frankl's behaviour rating scale with score of 3 and 4. (Frankl *et al*., 1962)
3. Child having understanding of Marathi language (local language of Maharashtra state of India).
4. Patients requiring oral prophylaxis and topical fluoride varnish application.

Exclusion criteria

1. Highly uncooperative patient. (Frankl's score 1 and 2) (Frankl *et al*., 1962)
2. Parents declining consent for the course of treatment of the child.
3. Children who are unable to communicate.

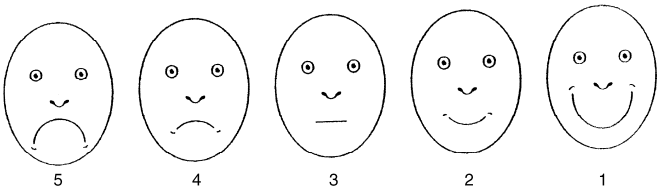
Methodology of study

The institutional scientific and ethical committee approved the study design. The selected subjects were selected and equally allocated in three groups I, II and III using randomized block design. Each group had 21 subjects. Written informed consent was taken from the parents/guardians/caretakers of the subjects after explaining the dental treatment procedure to them. Consent was also taken from the parents/guardians/caretakers of the children who participated as live model, and from the parents/guardians/caretakers of children who participated in video recording in the filmed modeling group.Oral prophylaxis and topical fluoride varnish application was completed for each subjects in one dental visit. For each procedure, children were prepared and managed by any of the three different behaviour shaping techniques as follows:

Group I- children prepared for oral prophylaxis and topical fluoride varnish application by using of TSD technique.
Group II – children prepared for oral prophylaxis and topical fluoride varnish application by means of live modeling technique.
Group III- children prepared for oral prophylaxis and topical fluoride varnish application by means of filmed modeling technique.

Subjects in the TSD group were explained and shown the operation of the instruments which were to be used during oral prophylaxis and topical fluoride varnish application in a sequential manner, in a language they would understand before commencing the dental treatment. Subjects in the live modeling technique were prepared by showing them the treatment of oral prophylaxis and topical fluoride varnish application being performed on a cooperative child patient of age group 7-9yrs. For subjects who were in the filmed modeling technique group, a pre-recorded video clip was shown, of intended treatment being performed on a child of the same age group on a tablet (Samsung Galaxy tab E).The 10-minute video clip was made in Department of Pedodontics in Dr. D.Y. Patil Dental College and Hospital, Pimpri prior to the study with the help of professional photographer. The video showed a cooperative child patient of the age group 7-9yrs undergoing oral prophylaxis and topical fluoride varnish application. Facial Image Scale with image scores as given by Buchanan H[12,13] and heart rate (heart beats/min) was recorded for each subject before, during and after the dental treatment procedure in all the three groups. Facial Image Scale (FIS) was used to record the anxiety scores of the child.

Facial Image Scale (FIS) with image scores, 1– 5 (Buchanan and Niven, 2002; Buchanan, 2003)



1 would mean: very happy
2 would mean: happy
3 would mean: in between
4 would mean: unhappy
5 would mean: very unhappy
(Buchanan and Niven, 2002; Buchanan, 2003)

Heart rate has been used as a reliable physiological parameter for measuring anxiety. (Mc Hayleh *et al*., 2009) Pulse oximeter was used to record the heart rate, for all the subjects in three groups before, during and after the treatment procedure. Image scores obtained on the basis of Facial Image Scale and heart rate were tabulated, evaluated and compared. The data was analyzed using SPSS software Version 17 for Windows. Mean and standard deviation was calculated for each group separately for before, during and after dental treatment. One-way ANOVA was used to test the hypothesis that there was no difference between the anxiety level in children prepared and

managed by the three different behavioural techniques. Level of confidence was set at 95%. The p value of less than or equal to 0.05 was considered significant.

Analysis

The readings of heart rate and Facial Image Scale scores of three groups were compared by analysis of variance (ANOVA) test.

RESULTS

Table 1 shows the readings of FIS for oral prophylaxis and fluoride application before, during and after procedure in the three groups. It was observed that during treatment highest score was observed in TSD group, followed by live modeling whereas least score was seen in filmed modeling group ($p<0.05$). Heart rate recorded for oral prophylaxis and fluoride application in the different study groups is presented in Table 2. It was observed that before, during and after oral

Table 1. FIS score for oral prophylaxis and fluoride application in the different study groups (n=21)

Treatments	Group I Mean±SD	Group II Mean+SD	Group III Mean±SD	*P*-value
Oral prophylaxis				
Before	1.52±0.60	1.19±0.40	1.38±0.49	0.11
During	2.90±0.54	2.52±0.68	2.43±0.50	0.024
After	1.52±0.51	1.24±0.54	1.24±0.44	0.11
Fluoride application				
Before	1.52±0.51	1.29±0.56	1.19±0.51	0.12
During	2.43±0.51	2.19±0.60	2.00±0.32	0.023
After	1.48±0.51	1.19±0.40	1.14±0.36	0.03

*SD, Standard Deviation

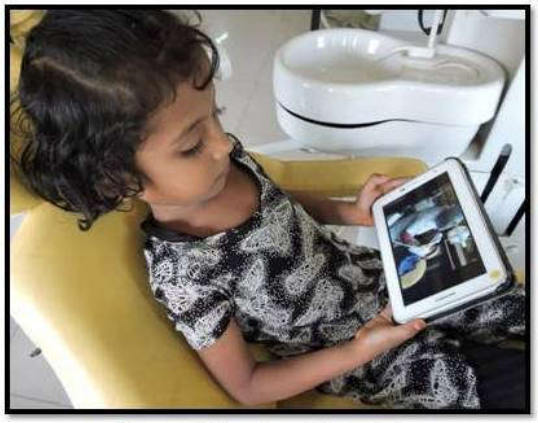
Table 2. Heart rate recorded for oral prophylaxis and fluoride application in the different study groups (n=21)

Treatments	Group I Mean±SD	Group II Mean±SD	Group III Mean±SD	*P*-value
Oral prophylaxis				
Before	97.38±12.25	92.9±8.7	90.71±8.1	0.091
During	109.81±12.38	100±9.76	98.1±9.34	0.001
After	99.05±11.91	92.05±9.02	90.76±8.91	0.021
Fluoride application				
Before	97.00±11.44	93.00±9.95	90.19±9.28	0.11
During	104.95±10.54	99.33±11.01	95.10±9.56	0.012
After	97.76±9.94	91.71±10.61	90.43±9.89	0.051

*SD, Standard Deviation

Group I- Tell show do technique

Group II- live modeling technique



Group III- filmed modeling technique

prophylaxis and fluoride application, highest heart rate was seen in TSD group, followed by live modeling group whereas least heart rate was seen in filmed modeling group ($p<0.05$). The results suggest that, filmed modeling is the most effective behaviour shaping technique for preparing the children for oral prophylaxis and topical fluoride varnish application as compared to TSD and live modeling.

DISCUSSION

Dental anxiety and fear appears to be a widespread in children .Its prevalence in children and adolescents ranges from 5 percent to 20 percent (Klingberg and Broberg, 2007; Lee *et al*., 2007; Chhabra *et al*., 2012). Child develops fear and becomes uncooperative during dental treatment mainly due to direct exposure to sight and noise of the equipments used in dental practice. This is because most of the times dental equipments are used directly without preconditioning the child to dental operatory setup. A variety of strategies have been explored for making the child understand the dental procedures which helps in managing their dental fear and anxiety. Some methods improve the communication process, while some are intended to reduce anxiety or eliminate inappropriate behaviour. Most recommended techniques for preparing child for dental treatment involves various forms of pre-exposure to the dental setting and procedures. (Mungara *et al*., 2013) The three behaviour shaping techniques used in this study – i.e. TSD, live modeling and filmed modeling introduce the dental equipments to the child in a sequential manner in order to shape their behaviour. This behaviour shaping helps the operator to improve the communication process with the child and to give the child appropriate coping strategies. (Sharma *et al*., 2014) The operator bias was reduced to a great extent in the present study as the same operator introduced the child to all three behaviour shaping techniques. Same videos of oral prophylaxis and topical fluoride varnish application were shown to all the children of the filmed modeling group. The readings of FIS as well as the pulse oximeter readings were recorded-before, during and after dental procedures by an independent observer who was constant throughout the study. The age group of the patients selected for this study was 7 to 9 years because by this age the child develops sufficient communication skills to understand the behaviour shaping techniques. The most important factor of this age group is the cognitive ability to understand the filmed modeling and live modeling techniques. Children with Frankl's behaviour rating score 3 and 4 were chosen (positive and definitely positive) so that effective communication can be achieved between patient and operator. (Frankl *et al*., 1962) In this study, FIS was used to record the anxiety of the child. It was introduced by Buchanan in 2002 as a suitable measure for assessing children's state of dental anxiety. (Buchanan and Niven, 2002; Buchanan, 2003) Heart rate, measured by a pulse oximeter was used as a physiologic parameter for determination of anxiety. (McHayleh *et al*., 2009) The results of our study were similar to study conducted by Melamed (1975). Also the results of our study are in conjugation with the study conducted by Mungara *et al*. (2013). They concluded that filmed modeling resulted in a significant decrease in overall fear as well as specific fear in relation to most of the dental instruments. (Mungara *et al*., 2013) In this study, it was observed that the anxiety scores in filmed modeling group were found to be the least. The reduction of anxiety in filmed modeling group may be due to the observation of a filmed model that depicted positive behaviour during dental treatment. Exposure to the modeling film may have familiarized the children to the sights, sounds and procedures that they will be subjected to. Hence, threat of the unknown was reduced or eliminated amongst the children. Filmed modeling was found to be more effective than TSD. This may be attributed to the fact that TSD technique depends more on communication skills of the operator which cannot always remain constant. Whereas, in the filmed modeling group, the same film of dental treatment procedures is performed on the cooperative patient of same age group (7-9yrs) was shown to all children. In filmed modeling, there is more about direct learning by watching the film with no other mediator. In this study, as the film was made with the help of professional photographer, the film quality and clarity were additional factors that helped the child to understand the dental treatment procedures more easily. In this study, filmed modeling was found to be more effective than live modeling, in anxiety reduction. This may be because, in filmed modeling group, same video of cooperative child was shown to the child. Therefore there was a consistency in the message. In live modeling this consistency was less because different children were used depending upon their appointments, and therefore live model varied. In live modeling, the child may not be able to connect to the live model which was selected, as the social skills a variable parameter with every child. Also in routine dental practice, a cooperative live model may not be always available for behaviour shaping of the child and it is also time consuming technique. Videos can be shown to the child in the waiting room to make the child familiar with the dental operatory.

Children are more familiar with the electronic gadgets and they like to watch video on tablets. In our study the children watched the dental treatment procedures shown on a tablet more attentively as compared to that of observing a live model. According to the results of this study, the overall acceptance to the treatment by the patient after watching the filmed video was observed to be better. Another advantage of filmed modeling in this study was that the child in the video was of the same age and ethnicity. The video was made in local language so that it would be easier for the patient to understand. In previous published literature, for filmed modeling, the video of dental procedures was shown to a child on television. (Melamed *et al*., 1975) However, in this study we have used a tablet (Samsung Galaxy tab E) to show the child videos of the dental procedures. Tablet is one of the latest technologies and most of the children are exposed and attracted towards it at an early age of life. Hence, we recommend more use of technical advances such as tablets and other latest gadgets as a mode of communication for video modeling during child's first exposure to the dental operatory. This method of behaviour shaping also has a wide scope in making the child familiar with routine medical diagnostic procedures. It is also recommended to use this tool in behaviour shaping techniques to reduce the use of aversive conditioning and pharmacological techniques.

Conclusion

Filmed modeling can be an efficient method for preparing the child for routine dental treatment procedures. Currently, use of filmed modeling in behaviour shaping is limited in the dental practice. The scope of this technique of behaviour shaping is extensive and hence should be used on a regular basis to manage the child's behaviour in dental operatory.

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