

Original Article

Comparison Between Jacobson's Progressive Muscle Relaxation Technique and Audio-Visual Distraction Technique in Comparison to Tell-Show-Do Technique in Reducing Dental Anxiety in Children During Dental Visit: A Randomized Clinical Trial

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Abstract

Background: Dental fear and anxiety directly affect children's oral health and dentist's clinical management. The presence of dental fear and anxiety in childhood might track into adulthood causing avoidance of treatment and more prominent dental phobia.

Aim: To compare the cooperation of an anxious child after performing different behavior management techniques: Jacobson's progressive muscle relaxation, audio-visual distraction, and tell-show-do techniques.

Methods: 30 pediatric dental patients from 6 to 9 years old were randomly assigned into three groups. Each group was managed using either: Jacobson's progressive muscle relaxation technique, audiovisual distraction technique or tell-show-do technique. Facial image scale was used to assess dental anxiety of children before and after dental treatment. Modified Venham rating scale was used to assess cooperation of children during administration of local anesthesia.

Results: Before dental treatment: there was no significant difference in facial image scale values between tested groups. After dental treatment: all the performed behavior management techniques in the three groups showed reduction in dental anxiety assessed by facial image scale. After performing the behavior management techniques: There was no significant difference in modified Venham rating scale values between tested groups.

Conclusions: Jacobson's progressive muscle relaxation technique and audiovisual distraction has been found to be useful in reducing dental anxiety and increasing cooperation of children during dental visit.

Keywords: dental anxiety, fear, relaxation, behavior

I. Introduction

Dental fear presents negative feelings associated with dental treatment. The presence of dental fear during childhood might persist during adulthood showing a more prominent dental phobia¹. Dental fear and dental anxiety are multifactorial conditions. It's been related to child's age, personal traits, increased general fear, past difficult dental encounters and increased parental fear².

The first dental visit is significant for children's oral health care and success of subsequent dental visits. Early dental visits familiarize children with dental environment, help establishing positive dentist-patient relationship and reduce dental fear. Therefore, dentists should be aware of the different behavior management techniques to deal with various behavior patterns of pediatric dental patients³.

Behavior management techniques are a set of procedures intended to improve children's coping skills and get them to accept dental care completely. These techniques are employed by dental practitioners to establish communication, reduce fear and anxiety, facilitate delivery of quality dental care, build a trusting relationship between dentist, child, and parent, and promote the child's positive attitude towards oral/ dental health⁴.

Relaxation techniques are suggested to reduce dental fear and anxiety. Once a person is physically relaxed, it is impossible to be psychologically upset at the same time. Anxiety-inducing stimuli cause physical tension, which increases the individual's perception of anxiety. Dentists need to familiarize themselves with these techniques and if required undergo special training before they can implement them in practice⁵.

Jacobson's progressive muscle relaxation is a procedure for reaching a state of deep relaxation

of the whole body through the voluntary and conscious tensing and relaxing of specific muscle groups. Initially, the individual muscle parts are tensed in a certain order; the muscle tension is held for a brief time and then released. This technique aims to continuously reduce tension in the individual muscle groups of the apparatus. Repeated use teaches the patient to be sensitive to the body and to feel the tiniest tension in order to know where to relax. It was suggested that progressive muscle relaxation therapy enables successful management of dental anxiety⁶.

This study aimed to compare between cooperation of anxious child after performing different behavior management techniques: Jacobson's progressive muscle relaxation technique, audio-visual distraction technique and tell-show-do technique.

II. Subjects and Methods

A. Study design

The current study was a randomized controlled trial with three parallel groups and allocation ratio 1:1:1

B. Setting, participants and sample size

The study was carried out on 30 anxious pediatric dental patients from 6 to 9 years old who attended outpatient dental clinic in Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University. This trial was registered on clinicalTrials.Gov, under ID: (NCT 03923088).

C. Sample size determination

A power analysis was designed to have adequate power to test the alternative hypothesis that relaxation technique (Jacobson's progressive muscle relaxation technique) and audiovisual distraction technique are more effective in increasing cooperation in anxious children, than tell-show-do technique. According to the results

of Al-Khotani, Bello and Christidis where the probabilities in the control group were 0.75 and 0.52 and in test group were 0.14 and 0.36. Assuming an alpha level of 0.05 (5%) ie, power = (0.08) 80%, an effect size (W) of 1.364. 30 pediatric dental patients were recruited for the clinical trial. They were randomly and equally assigned into three groups. Group A: Tell-show-do technique, Group B: Audiovisual distraction technique and Group C: Jacobson's progressive muscle relaxation technique.

D. Ethical approval

The Ethical Committee of the Faculty of Dentistry at Cairo University reviewed and approved the protocol regarding its scientific content and adherence to applicable research and human subjects' regulations with an approval number of 8-9-20.

E. Subject selection

The principal investigator screened 30 children aged between 6 and 9 years, who were visiting the Outpatient Clinic of the Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University, to ensure compliance with the eligibility criteria.

Facial image scale was filled by children in the waiting room to assess their level of anxiety. Children were asked to point at which face they felt most like at the moment. The scale was scored by giving a value of (1) to the most positive affect face and (5) to the most negative affect face, considering anxious ratings 4 and 5 were recruited. Facial image scale was used to assess dental anxiety of children before and after dental treatment ⁷.

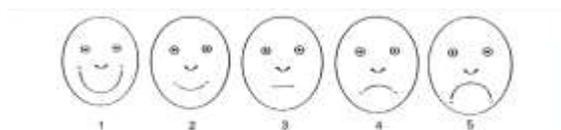


Figure 1: Facial image scale

F. Eligibility criteria:

Inclusion Criteria:

- Children: anxious children, 6 to 9 years old.
- Teeth: primary tooth requiring extraction.

Exclusion Criteria:

- Children having allergy to local anesthesia or systemic condition that contraindicates dental extraction.
- Parental refusal of participation.
- Mentally ill or mentally retarded children

G. Informed consent

An interview was held with parents of participating children to explain the steps of the used techniques and the benefits of performing them for children. Parents were asked to sign an informed consent agreeing to the clinical procedure and the use of the patients' data for scientific studies. Children were asked for a verbal assent.

H. Interventions

Children were randomly assigned into three groups according to the used behavior management technique into:

- Tell-Show-Do technique was performed as it is a basic principle in pediatric dentistry. In this technique the instruments were introduced to the children gradually as verbal explanation of the procedure (tell), demonstration for the patient of the visual, auditory, olfactory and tactile aspects of the procedure (show), completion of the procedure (do) ⁸.
- Tell-Show-Do technique in combination with Audiovisual distraction technique.

Audiovisual distraction was performed using VR BOX where the child chose from variable cartoon movies ⁹.

- Tell-Show-Do technique in combination with Jacobson's progressive muscle relaxation technique. Jacobson's progressive muscle relaxation involves tensing certain muscle parts, the muscle tension is held for a brief time and then released. It involves tensing toes, heels, knees, shoulders, elbows and facial muscles ⁶. Child was asked to perform different movements that represent the technique:
 - Lied down in a comfortable position.
 - Took a deep breath in through nose, held breath for a few second then, breathed out.
 - Gently pulled toes toward knees, held then let go.
 - Pressed heels toward floor, held briefly then let go.
 - Pulled knees together, held briefly then let go.
 - Gently pulled shoulders toward ears, held briefly then let go.
 - Pressed elbows and upper arms towards body, held briefly then let go.
 - Gently clenched hands, held briefly then let go.
 - Pushed head forward slightly, held briefly then released toward relaxed position.
 - Clenched teeth and lips, held briefly then let go.
 - Finally, child was asked to express how his/her muscles felt after the exercise.
- 2. Topical anesthesia was applied then after 2 minutes, administration of local anesthesia.
- 3. Dental extraction was performed by principle investigator.
- 4. Evaluation of patient behavior during local anesthesia was done by giving

him/her a score using Modified Venham rating scale.

5. Facial image scale was filled by the child after completion of the dental extraction.

Modified Venham rating scale was filled to assess child's cooperation level during local anesthesia administration and after performing the behavior management techniques. The scale ranges from total cooperation (0) to no cooperation (5) ¹⁰.

Rating	Definition
0	Total cooperation, best possible working conditions, no crying or physical protest.
1	Mild, self-verbal protest or (quiet) crying as a signal of discomfort, but does not obstruct progress. Appropriate behaviour for procedure, i.e. slight start at injection, "ow" during drilling if hurting, etc.
2	Protest more prominent. Both crying and hand signals. May move head around making it hard to administer treatment. Protest more distracting and troublesome, however, child still complies with request to cooperate.
3	Protest prevents real progress to dentist. Complies with dentist's reluctantly, requiring extra effort by dentist. Body movement.
4	Protest disrupts procedure, requires that all of the dentist's attention be directed toward the child's behaviour. Compliance eventually achieved after considerable effort by dentist, but without much actual physical restraint. (May require holding child's hands or the like to start). More prominent body movement.
5	General protest, no compliance or cooperation. Physical restraint is required.

Figure 2: Modified Venham rating scale

All dental treatments were done under topical anesthesia followed by local anesthesia. Tell-show-do technique was used accompanying audiovisual distraction technique and Jacobson's progressive muscle relaxation technique. Facial image scale was used to assess dental anxiety of children before and after dental treatment⁷.

I. Statistical analysis

Ordinal data were presented as mean and standard deviation (SD) and median and interquartile range values. Inter and intragroup comparisons were analyzed using Mann Whitney U-test and Wilxon signed rank test respectively. The significance level was set at $p \leq 0.05$ for all tests. Statistical analysis was performed with IBM® SPSS® (SPSS Inc., IBM Corporation, NY, USA) Statistics Version 26 for Windows.

III. Results

In this study the intergroup comparison before dental treatment showed no significant difference in facial image scale values between tested groups ($p>0.05$) and after dental treatment showed no significant difference in facial image scale values between tested groups ($p>0.05$). All the performed behavior management techniques showed effectiveness in reducing dental anxiety (figure 3).

The intragroup comparison for tell-show-do group showed a significant reduction of facial image scale median values ($p=0.014$), for audiovisual distraction group showed a significant reduction of facial image scale median values ($p=0.005$) and for Jacobson's progressive muscle relaxation group showed a significant reduction of facial image scale median values ($p=0.003$) (table 1).

Additionally, the intergroup comparison after performing the behavior management techniques showed no significant difference in modified Venham rating scale values between tested groups ($p=0.972$). All the performed behavior management techniques enhanced children's cooperation during dental treatment (figure 4).

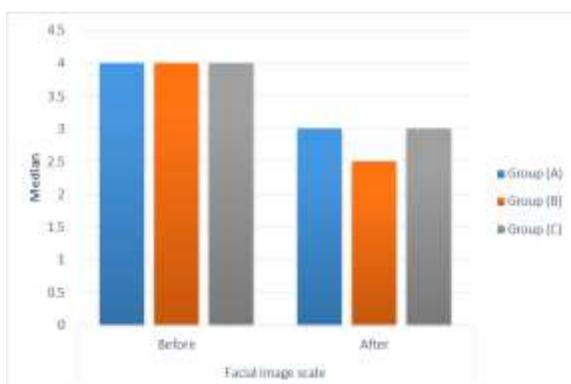


Figure 3: Bar chart showing median Facial image scale for the tested groups before and after performing behavior management techniques.

Table 1: Summary statistics and results of intragroup comparisons for Facial image scale

Facial image scale	Parameter	Before	After	p-value
Group A	Mean±SD	3.90±0.57	3.20±0.63	0.014*
	Median (IQR)	4.00(0.00)	3.00(0.75)	
Group B	Mean±SD	4.10±0.57	2.70±0.82	0.005*
	Median (IQR)	4.00(0.00)	2.50(1.00)	
Group C	Mean±SD	4.40±0.52	2.70±0.67	0.003*
	Median (IQR)	4.00(1.00)	3.00(1.00)	

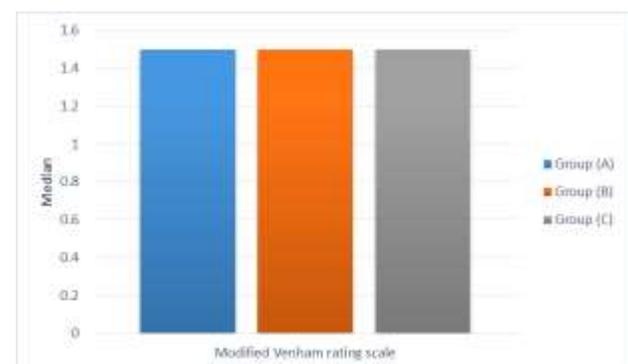


Figure 4: Bar chart showing median Modified Venham rating scale for the tested groups after performing behavior management techniques.

IV. Discussion

Dental fear and anxiety toward the dentist and dental treatment mainly lead to avoidance of dental care. Dental care in children requires multiple visits for adequate preventive and restorative treatment. However, the beneficial effects of the preventive dental care are limited in uncooperative children suffering dental anxiety¹¹. In most studies, the most commonly performed technique to obtain the child's cooperation is Tell-show-do technique^{12,13} followed by distraction techniques (73%) as the second most used technique¹⁵.

This study is a randomized controlled trial aimed to compare between cooperation of anxious child after performing different behavior management techniques: Jacobson's progressive muscle relaxation technique, audio-visual distraction technique and tell-show-do technique.

Patients were recruited from outpatient clinic in Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University, having dental problem. Treatment was done in postgraduate clinics in Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University, Egypt. Patients were between 6 and 9 years old with no physical or mental disability that might interfere with the targeted behavior management techniques. Children of this age have similar cognitive and intellectual development which helps achieving more accurate outcomes. Anxious children require integration of behavior management techniques to show cooperation and compliance during dental treatment. This justifies the choice of anxious children in the study to achieve the desired outcomes.

Facial image scale was filled by children in the waiting room to assess anxious children before allocation. Facial image scale comprises a row of five faces ranging from (1) happy to (5) sad. Children were asked to point at which face they

felt most like at the moment. Facial image scale was filled before performing the behavior management technique and again after completion of dental treatment to compare between anxiety level before and after the performed behavior management techniques.

Tell-show-do technique is the most commonly used behavior management technique in pediatric dentistry. It is convenient for both the dentist and the patient. Hence, this justifies being the method of choice for patient education and behavior guidance during the dental visit. It is based on the principle of learning theory. It dictates that before any procedure is done, the child is to be well informed and a demonstration should be given to explain exactly what will happen before the dental treatment is started¹⁵. Tell show do was used solely in a group and was used also in addition to the other behavior management techniques. This came in accordance with (Khandelwal et al., 2018 & Kharouba et al.,2020)^{16,17} who compared tell-show-do in a group in comparison audiovisual distraction.

Children were offered different cartoon movies to choose from. VR Box was used to present the audiovisual distraction targeted for children. Child seeing the audiovisual presentation has multisensory distraction effect as he/she tends to concentrate on the screen, thereby screening out the sight of dental treatment and the sound of the program helps the child to eliminate the unpleasant dental sounds, such as the sound of handpiece. Tell-show-do was performed again before audiovisual distraction. This came in accordance with (Khandelwal et al., 2018)¹⁶ who found significant anxiety reduction after combining tell-show do technique and audiovisual distraction technique and (Liu et al., 2019)¹⁸ that stated effectiveness of audiovisual distraction using wall mounted device in reducing pain sensation and dental anxiety.

After Jacobson's progressive muscle relaxation there was a significant reduction of Facial image

scale median values referring to reduction in dental anxiety. The technique showed significant reduction Facial image scale suggesting reduction of anxiety, this came in accordance with (Park Eun et al., 2018)¹⁹.

V. Conclusions

- Jacobson's progressive muscle relaxation and audiovisual distraction techniques have been found to be useful in reducing dental anxiety.
- Tell-show-do is considered the main non-pharmacological behavior management technique.
- Children's cooperation during dental visit was enhanced after performing Jacobson's progressive muscle relaxation technique and audiovisual distraction technique.
- Anxious children require integration between different behavior management techniques to reduce dental anxiety and enhance children's cooperative behavior.

VI. Conflict of interest

The authors don't have any stated conflicts of interest.

VII. Funding

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VIII. Ethics

This study protocol was approved by the ethical committee of the faculty of dentistry- Cairo university on 30/9/2020 approval number : 8-9-20

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