Research Article

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Comparison of effect of Interactive mobile game (IMG) with Tell-Show-Do technique (TSD) on behavior in six to twelve year-old children: A pilot trial

Abstract

Introduction: Fear and anxiety experienced by children during dental treatment may cause them to decline further treatment. Digital tools like interactive mobile games could be explored further for altering child behavior.

Aim: To compare effect of interactive mobile game with Tell-Show-Do technique on behavior in 6-12 year-old children.

Methodology: Thirty healthy children aged 6-12 years requiring restorative treatments were recruited in this parallel arm trial. Facial Image scale (FIS) score, Frankl Rating (FR) and Pulse Rate (PR) were analyzed at baseline and post-restorative treatment. FIS scores and FRs were compared using Mann Whitney U test and PRs using paired t test.

Results: Intergroup comparison revealed no significant differences between interactive mobile game and Tell-Show-Do on FIS scores (0.4+0.065, p=0.116), FRs (0+0.136, p=0.757) and PRs (0.1+0.509, p=0.978).

Conclusion: There was no difference between the effect of interactive mobile game and Tell-Show-Do on behavior in 6-12 year old children.

Keywords: patient, distraction, desensitization, modeling, contingency management, sedation, general anesthesia, exploration, pulse rate, aerator, cement carrier, restorative cement, behavior management

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Introduction

Pain and anxiety are the two main determinants for disruption of any dental treatment that may manifest as crying, jerky and sudden movements, kicking and throwing tantrums, pushing equipments,[3] thereby delaying treatment time.[4] This behavior exposes the patient to risk from injuries. These manifestations of behavior are age- specific.[6] Various pharmacologic and non-pharmacologic behavior management techniques have been put forth to combat this issue. Distraction,[7] desensitization, modeling,[8] contingency management, white noise/music,[9,10] aversive conditioning like HOME, and physical restraints like papoose boards and pediwraps,[11,12] are the non-pharmacologic means that have been described. Pharmacological management makes use of conscious sedation[1,2] or general anesthesia.[13]

In the era of digitization, dentists also have to adapt to the current technologies. Video games have been tried as a means of behavior management.[14] Peer-filmed videotaped presentation immediately preceding dental treatment has also been tried.[15]

With the advent of mobile phones, children have been exposed to a myriad of newer technologies since their infancy. The interactive mobile game consists of active participation of the child which simulates the dental procedure he is to undergo. The child actually treats the virtual patients thereby instilling in him a positive behavior. This may also serve to reduce anxiety and familiarize the child with the dental equipment to be used while performing treatment. There is a paucity of literature on the use of an interactive mobile game as

a behavior shaping tool, hence this warrants further exploration. The aim of this study was to compare the effect of an interactive mobile game with Tell-Show-Do technique on behavior in six to twelve year-old children.

Objectives:

Primary Objectives:

1. To assess the effect of Tell-Show-Do technique as a tool for behavior management.

2. To assess the effect of the Interactive mobile game as a tool for behavior management.

3. To compare the effect of these two techniques on the behavior of six to twelve year old children.

Secondary Objectives:

1. To assess the effect of age as a co-variable on the effectiveness of the two techniques.

2. To assess the effect of sex as a co- variable on the effectiveness of the two techniques.

Materials and methods

Settings:

Thirty healthy six to twelve year old children reporting to the Department of Pediatric and Preventive Dentistry at Dr. G. D. Pol

Comparison of effect of Interactive mobile game (IMG) with Tell-Show-Do technique (TSD) on behavior in six to twelve year-old children: A pilot trial

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Foundation YMT Dental College and Hospital, Navi Mumbai were selected for this parallel arm trial. The study was conducted from 10th July 2018 to 9th August, 2018. Healthy (ASA 1) children who required restorative dental treatment in primary teeth, exhibiting Frankl Rating of 2 and 3 or 4 and with no H/o prior dental treatments were selected. Children, who exhibited Frankl Rating 1, required emergency dental treatment and who were physically and medically compromised were excluded from the study. The two interventions used in the study were the conventional Tell-Show-Do (TSD) and the Interactive Mobile Game (IMG). The subjects were randomly divided allotted to the two groups using the lottery method maintaining an allocation ratio of 1:1. The interactive mobile game used for this study was downloaded from Android play store (Dentist Game; Version 5.6. released on 28th December 2015, updated on 18th June 2018). The 'Dentist' game simulates the real time restorative treatment along with audio stimulus. The children treated the virtual patient using the restorative instruments and equipment like aerator, plastic instrument, cement carrier and suction tip. The sequence in the game was the usage of aerator, restorative procedure using cement, teeth cleaning with a brush and paste followed by suction, all in a real time experience. TSD was employed for aerator, cement carrier, restorative cement and suction using appropriate euphemisms. The TSD session lasted for a period of 2 minutes. The procedure of TSD was standardized and the operator was trained and calibrated.

Variables:

The effect of the two interventions on the behavior of the children was assessed as

a. Facial Image Scale rating

b. Frankl rating

c. Pulse rate

The confounding variables assessed were

a. Age

b. Sex

a) Facial Image Scale

A self-reported Facial Image scale was used for assessment of behavior. FIS is a 5-point Likert scale starting from 1 to 5, 1 indicative of 'dislike very much' and 5 indicative of 'like very much'.

b) Frankl Rating (FR):

700`an operator rated Frankl rating scale was used to assess the behavior. The FR is a 4-point scale ranging from definitely negative to definitely positive.

c) Pulse Rate (PR):

Pulse rate was measured as beats/min as a physiological indicator of behavior by the operator. The Pulse Rate was measured using a pre-calibrated fingertip pulse oximeter (Easy CareTM) attached to the right index finger of the child.

All variables were assessed at the following intervals:

1. Baseline

2. Mid-treatment (MT)

Statistical analysis

Data obtained was compiled on a MS Office Excel Sheet (v 2010). Data was subject to statistical analysis using SPSS (version 21.0). The FIS Score and FR rating were depicted as frequencies and percentages, while PR as mean with SD. Inter-group comparison of numerical variables was done using t test; Mann Whitney U test was used for ordinal variables. Intra-group comparison was done using paired t test for numerical variables and Wilcoxon Signed Ranks Test for ordinal variables. For all the statistical tests, $p<0.05$ was considered to be statistically significant, keeping α at 5% and β<20%.

Results

The distribution of the study participants is outlined in CONSORT Flow Diagram (Figure 1). Thirty, six to twelve year old children were selected and were divided into two groups. There was no significant difference in age (p=0.601) and gender distribution between the two groups (p=0.713) (Table 1). An intergroup comparison showed no significant difference between FIS (p=0.116), FR (p=0.757) and PR (p=0.978) (Table 2) between the two groups. The intra-group comparison of TSD and IMG (Table 3 & Table 4) also showed no significant differences.

Table 1 Demographic distribution of the study participants – age and gender-wise

	INTERVENTION	N	Mean	Std. Deviation	t value	p value
AGE	1	15	7.933	1.2799	0.529	0.601
	2	15	7.7	1.1307		
	SEX				**x2 value**	**p value**
		M	**F**	**Total**		
INTERVENTION	1	7	8	15	0.136	0.713
	2	6	9	15		
	Total	13	17	30		

Comparison of effect of Interactive mobile game (IMG) with Tell-Show-Do technique (TSD) on behavior in six to twelve year-old children: A pilot trial

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Table 2 Inter-group comparison of IMG and TSD on behavior

	Mean	N	Std. Deviation	t value	p value
FIS BASELINE	3.6	15	1.454	-1.115	0.265
FIS MT	4	15	0.845		
FR BASELINE	3.13	15	0.516	-1.414	0.157
FR MT	3.27	15	0.458		
PULSE BASELINE	101.6	15	12.229	1.123	0.28
PULSE MT	96.53	15	12.176		
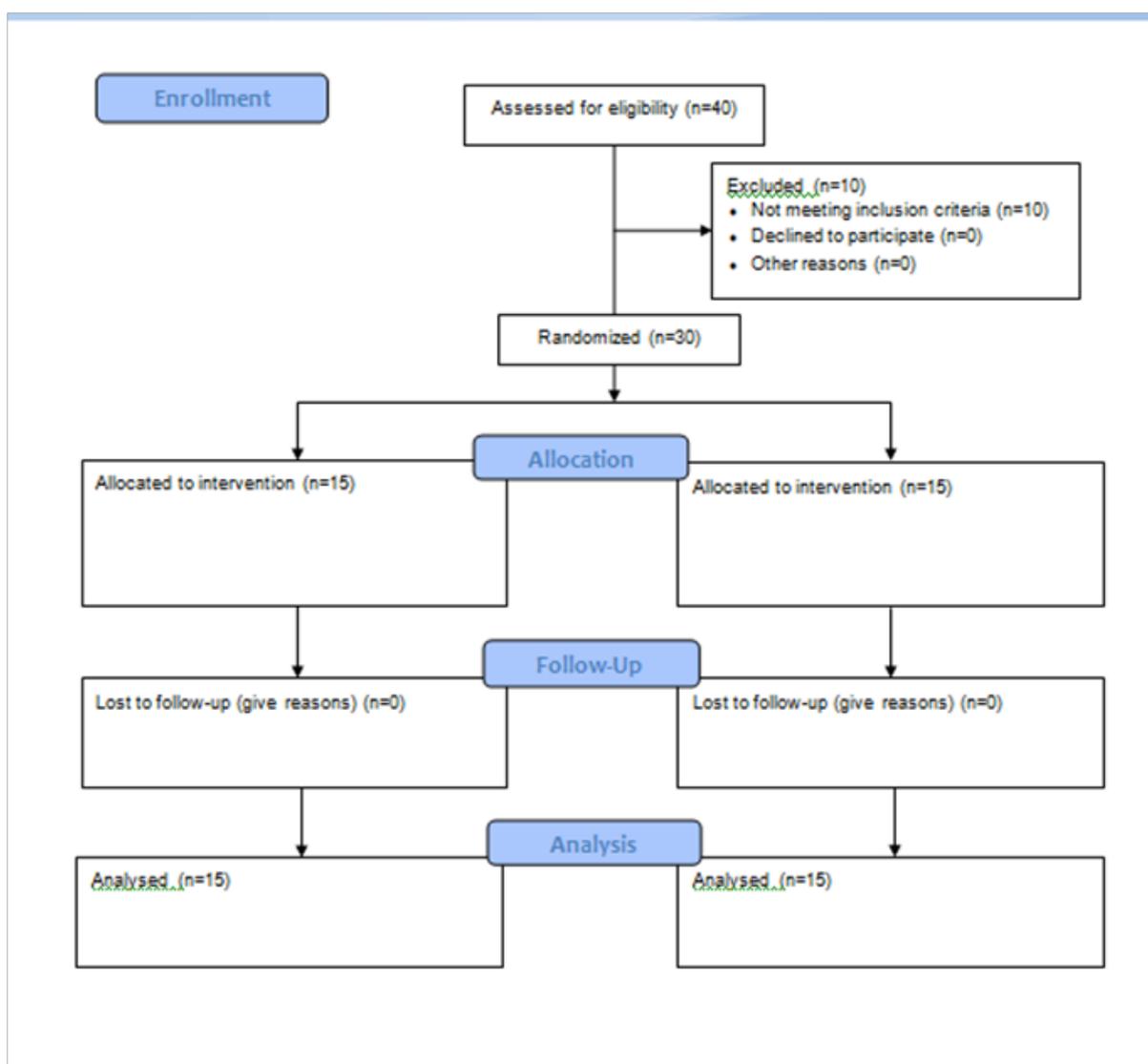
Figure 1 Consort flow diagram for distribution of participants.

Comparison of effect of Interactive mobile game (IMG) with Tell-Show-Do technique (TSD) on behavior in six to twelve year-old children: A pilot trial

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Table 3 Intra-group comparison of IMG on behavior

	Mean	N	Std. Deviation	t value	p value
FIS BASELINE	4	15	1.134	-1.2	0.23
FIS MT	4.4	15	0.91		
FR BASELINE	3.07	15	0.458	-1.342	0.18
FR MT	3.27	15	0.594		
PULSE BASELINE	100.27	15	17.136	1.545	0.145
PULSE MT	96.4	15	11.667		

Table 4 Intra-group comparison TSD on behavior

	Mean	N	Std. Deviation	t value	p value
FIS BASELINE	3.6	15	1.454	-1.115	0.265
FIS MT	4	15	0.845		
FR BASELINE	3.13	15	0.516	-1.414	0.157
FR MT	3.27	15	0.458		
PULSE BASELINE	101.6	15	12.229	1.123	0.28
PULSE MT	96.53	15	12.176		

Discussion

This study was aimed at comparing the effectiveness of Interactive mobile game and Tell-Show-Do on child behavior. This study was designed as a parallel arm trial. Six to twelve year old children were selected as the children in this age group are amenable to audiovisual aids for behavior management[16] and show a better capacity to play the mobile games.[17] Children with special needs would not be able to play the mobile game owing to the difficulties in cognition.[18] Children belonging to FR 1 were excluded since only distraction techniques may not be effective in this type of behavior.[19] Children in whom no prior dental treatment was done were included to avoid effect of past dental experience on treatment. The interactive mobile game was downloaded from Android play store (Dentist Game; Version 5.6. released on 28th December 2015, updated on 18th June 2018). This game was selected since it simulated the same procedures of restorative dentistry that were to be carried out in the child.

There are many scales to report patient's anxiety. The three scales used in the study were FIS, FR and PR. Facial image scale (FIS) and Frankl behavior rating scale were used in this study because of ease in usage and comparison.[20–22] Pulse rate was measured since it may be regarded as a physiological indicator of anxiety.[23,19,21] Two readings were noted for both the interventions during the complete procedure, one at baseline (prior to caries excavation) and the second at mid-treatment. The FR and FIS were recorded as subjective parameters and PR as objective. In the inter-group comparison no significant difference was found between the two techniques on the parameter of FR rating. FR scale is a subjective assessment of child behaviour

that does not indicate the degree of the behaviour. In addition, a change in the behavior may not be discernible on a subjective scale like FR. Similarly, no significant differences were found in the FIS scores. This could be attributed to FIS being a scale of subjective expression, however, the exact and full range of expressions may not be represented on the scale. Though we found a reduction in PR in both the techniques, there was no significant difference between the two.

Limitations

This being a pilot study, a small sample size was employed. Both FR and FIS are subjective assessments and though universally accepted, may not convey the full range of child behavior and anxiety. The findings were assessed only at baseline and mid intervention and they do not provide the fluctuations in the anxiety. The behavior of other children in the surrounding area could have affected the behavior of the children since they were not treated in isolation.

Generalizability

This study was conducted in the Department of Pediatric Dentistry in patients seeking dental care; the findings could therefore be generalized to children with similar age groups in similar study settings.

Conclusion

There is no difference between IMG and TSD on the behavior of six to twelve year old children with respect to parameters like FR,

Comparison of effect of Interactive mobile game (IMG) with Tell-Show-Do technique (TSD) on behavior in six to twelve year-old children: A pilot trial

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FIS, PR. IMG could be used an adjunct to the conventional TSD technique. Different types of dental games could be compared with other distraction techniques in various age groups and assessed for its effectiveness on behavior. A multi-centric study across ages and varied study settings could be done.

Conflict of interest

The authors declare no conflict of interest. No funding was received for the study.

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Conflict of interest

The authors declare that there is no conflict of interest.

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