

**Contingent Escape With or Without Audio Visual Distraction Aids – In Behaviour Management of Children Aged 4-8 Years.**

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**Abstract**

**Background:** Dental anxiety in children causes avoidance of treatment and increased stress among caregivers that affects the treatment quality. The aim of this study was to evaluate effectiveness of contingency escape with or without audio visual distraction in management of child patients.

**Materials and methods:** 45 children in age group 4-8 years with Frankel's behaviour rating scale 2 ; requiring simple dental restorations were included in study. They were randomly divided into 3 groups of 15 each. Group 1- contingency escape with video, Group 2- contingency escape without video and Group 3 -control group. Facial image scale, FLACC (Face, leg, activity, cry, consolability) score, pulse oximeter were used to assess child's behaviour 'before treatment' , 'after implementing behaviour modification technique- during the treatment'

and 'after finishing treatment'. A validated Dentist compliance questionnaire is used to assess ease of handling patient.

**Results:** Contingency escape with audio visual distraction found to be statistically significant in managing paediatric patients. (P value < 0.05)

**Conclusion:** Children who used oral health education video during treatment reported less anxiety and more positive response than control groups. Contingent escape with audio visual distraction effectively reduced fear and anxiety in children during dental treatment.

**Keywords:** Audiovisual distraction, Contingent escape, FLACC scale

**Introduction**

The primary goal for a dental professional is to treat their patients in an anxiety-free environment along with a high quality dental care. To achieve this, dentists have to

implement their learned skills and experience. Previous studies have shown that the level of fear that children perceive before or during dental treatment is associated with the degree of disruptive behaviour and an increase of pain perception, which consequently results in nervousness, anxiety and sensitization for future appointments.<sup>1</sup>

The use of contingent escape in the dental operator is one of the management strategy that may be implemented easily with minimal preparation. Contingency escape is the most common form of behaviour management (Iwata, 1987) which is an unavoidable feature of typical restorative dental visit. The common practice of stopping dental treatment in fact in response to disruptive behaviour could serve to maintain the same behaviour (Allen & Stokes, 1989).<sup>2</sup>

The use of reinforces and brief escape from dental treatment contingent upon cooperative behaviour was effective for managing disruptive behaviour in children during dental treatment.<sup>1,2</sup>

Based on the theory by McCaul and Mallot, a patient's perception of pain is decreased when distracted from an unpleasant stimulus. 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>1,3</sup> Distraction, one of the psycho-behavioural approaches used in medical and dental treatment situations, is defined as a non-aversive approach used to modify a child's discomfort by disrupting his/her attention away from the main task to accomplish successful treatment with high quality.<sup>3</sup> It has been stated, that the ideal distractor ought to possess various abilities such as visual, auditory and kinaesthetic modalities (i.e. physical movements) to

provide full capacity to harness the child's concentration and attention in turn minimizing the child's anxiety.<sup>3</sup>

Furthermore, it has also been shown that the use of audio visual (AV) distraction not only leads to full involvement of senses (visual and auditory), but it also induces a positive emotional reaction resulting in a relaxed experience.

With this in mind, the aim of the study was to implement (a) contingency escape and (b) contingency escape with distraction in the form of audio visual aid as behaviour modification technique in children with disruptive behaviour and evaluate the effectiveness of both these techniques on behaviour and anxiety in children receiving dental treatment.

### **Materials and methods**

This randomized, interventional clinical based study was conducted in the Department of Paediatric and Preventive Dentistry, M.R Ambedkar Dental College and Hospital, after obtaining approval from the Institutional Review Board and Ethics Committee and after obtaining written informed consent, from the parents of children involved in the study, with video recording of the same.

The study included 45 children, aged 4 to 8 years, belonging to both genders requiring a restorative dental treatment without local anaesthesia.

### **Inclusion criteria**

Children aged 4-8 years with Frankl's behaviour rating score 2

### **General good health**

### **First dental visit**

Children whose parents have given written consent to be a part of the study

### **Exclusion criteria**

Children with Frankl's behaviour rating score of 1 or 4, Physically or mentally handicapped children Children with compromised auditory and visual abilities Children

with extensively damaged teeth and carious lesions involving pulp, lesions extending below gingiva,

Children whose parents or guardians did not give consent.

The children were distributed into three groups using simple random sampling method .They are group1: contingency escape with video , group 2: contingency escape without video , group 3: control group. Samples in each group were treated in a single appointment after using either of the behaviour modification techniques.

The treatment of all children was performed by a single operator in order to avoid any degree of sample bias.

Behaviour of child before and after the procedure was assessed using Frankel's behaviour rating scale. Level of dental anxiety was assessed using a portable pulse oximeter and Facial Image Scale at different intervals of the procedure, which were:

- a) Before the treatment procedure (entry into clinic)
- b) During treatment (while using aerotor, after using behaviour modification technique)
- c) After treatment (after using aerotor)

The patient was asked to select the image from FIS(Facial image scale) which can be closely associated with that moment of treatment. Also patient's pulse rate was noted down using pulse oximeter. Using FLACC (Face, Leg, Activity, Cry, Consolability) behaviour scale child's behaviour was rated. The ease of handling the patient (pre – operatively and during the procedure) and the ease of carrying out the procedure after using these behaviour modification techniques were assessed through a validated questionnaire.

### Statistical Analysis

One-way ANOVA Test followed by Tukey's HSD post hoc Analysis was used to compare the Mean Facial Image Scale scores and Pulse Oximeter readings between 03 study groups at different time intervals.

Chi square Test was used to compare the distributions of FLACC scale scores between 03 study groups and the distributions of responses for Paediatric dentist questionnaire at different time intervals between 03 study groups.

Repeated measures of ANOVA Test followed by Bonferroni's Post hoc Analysis was used to compare the Mean Facial Image Scale and Pulse Oximeter readings between different time intervals in each study group.

Z Test for Proportions was used to compare Frankel scale Scores, between before and after Rx in each study group.

The level of significance [P-Value] was set at  $P < 0.05$

### Results

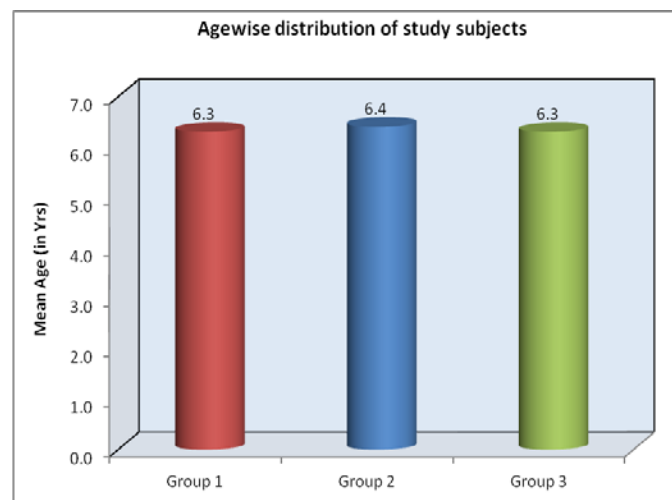
The study sample consisted of 45 children between 4-8 years divided into three groups of 15 each.

Group 1 : Contingent escape with audio-visual distraction aid as behaviour modification technique

Group 2 : Contingent escape without audio-visual distraction as behaviour modification technique

Group 3 : Control group ( without contingent escape or audio-visual distraction aids)

Graph : 1



Kruskal Wallis test and Chi Square test was used to assess the difference between the three groups regarding background data such as age and sex. But the comparison

has not given any significant results. (GRAPH :1 and GRAPH : 2)

Graph : 2

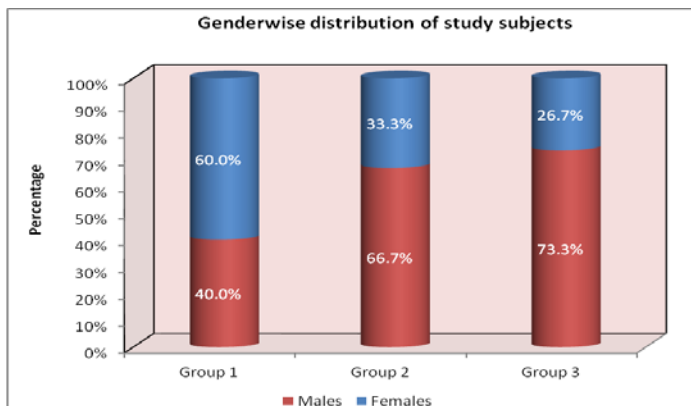
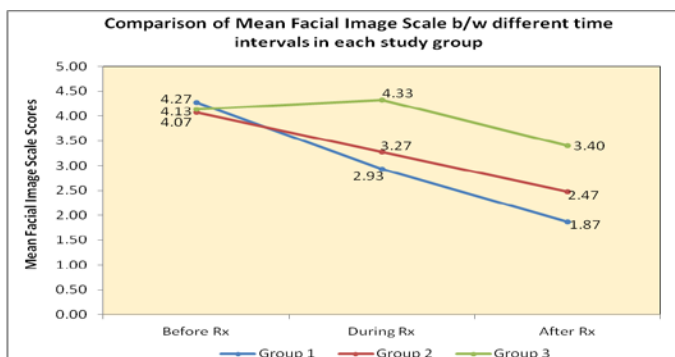


Table: 1

Comparison of Mean Facial Image Scale scores b/w 03 study groups at different time intervals using One-way ANOVA Test followed by Bonferroni's Post hoc Analysis										
Time	Group 1		Group 2		Group 3		P-Value	Tukey's HSD Post hoc Test		
	Mean	SD	Mean	SD	Mean	SD		G1 Vs G2	G1 Vs G3	G2 Vs G3
Before Rx	4.27	0.59	4.07	0.70	4.13	0.64	0.69	..	..	..
During Rx	2.93	0.59	3.27	0.46	4.33	0.72	<0.001*	0.29	<0.001*	<0.001*
After Rx	1.87	0.74	2.47	0.52	3.40	0.74	<0.001*	0.04*	<0.001*	0.001*

Comparison of mean facial image scale using one-way ANOVA before attempting behaviour modification technique shows no significant differences between the three groups. But has given statistically significant difference of <0.001 between three groups during and after treatment(after implementing behaviour modification technique).Further Post Hoc analysis gives statistically significant difference of <0.001 between Group 1 and Group 3 ; and Group 2 and Group 3 during and after treatment. (TABLE : 1 and GRAPH : 3)

Graph: 3

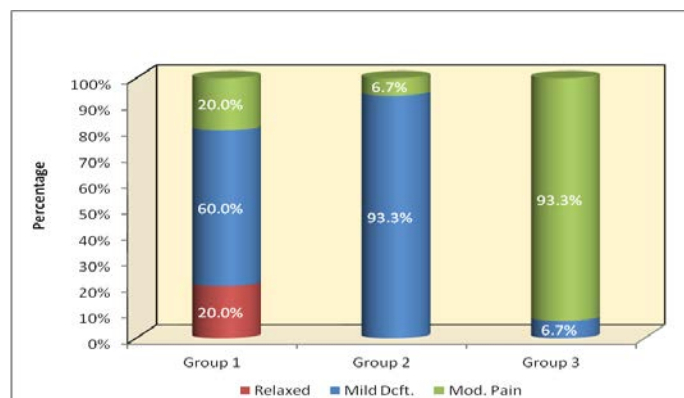


Group 1 : contingent escape with video, Group 2: Contingent escape without video , Group 3 : Control group.

Table: 2

Comparison of distributions of FLACC scale scores between 03 study groups using Chi square Test									
Variables	Scores	Group 1		Group 2		Group 3		χ <sup>2</sup> Value	P-Value
		n	%	n	%	n	%		
FLACC	Relaxed	3	20.0%	0	0.0%	0	0.0%	33.083	<0.001*
	Mild Dcft.	9	60.0%	14	93.3%	1	6.7%		
	Mod. Pain	3	20.0%	1	6.7%	14	93.3%		

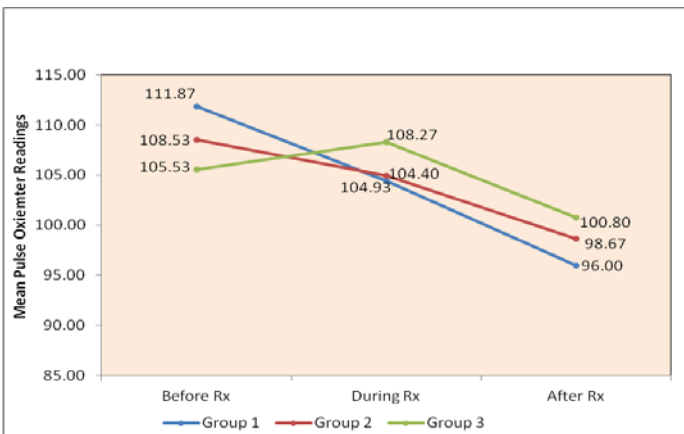
Mild Dcft : mild discomfort , Mod pain : moderate pain  
The FLACC scores during the procedure was analysed using Chi square Test. FLACC scores showed that more percentage of patients were relaxed in contingency escape with video group indicating a better behaviour. The P value after comparison of the FLACC scores in the three groups was <0.001. In group one 20% (n=3) of the sample were relaxed and 60%(n=9) reported mild discomfort. In group 2 (n=14) 93.3 % had reported mild discomfort . In group 3 majority reported moderate pain (n=14) 93.3%. (TABLE : 2 and GRAPH : 4)



Graph 4 :Comparison of distributions of FLACC scale scores between 03 study groups

Table 3: Comparison of Mean Pulse Oximeter readings between 03 study groups at different time intervals using One-way ANOVA Test							
Time	Group 1		Group 2		Group 3		P-Value
	Mean	SD	Mean	SD	Mean	SD	
Before Rx	111.87	11.34	108.53	9.57	105.53	9.99	0.26
During Rx	104.40	9.52	104.93	8.69	108.27	9.97	0.48
After Rx	96.00	9.89	98.67	6.62	100.80	7.92	0.29

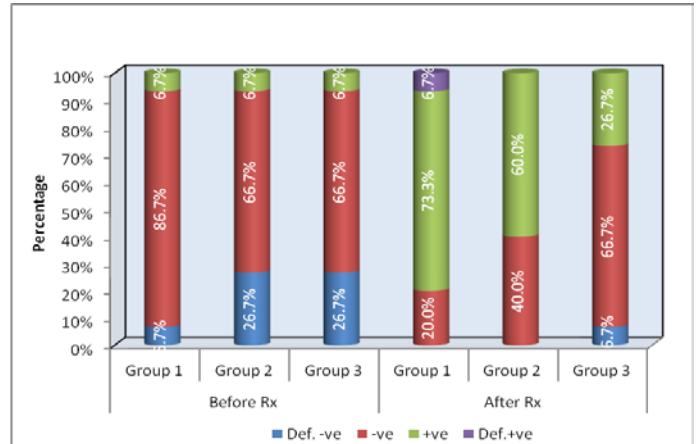
The levels of dental anxiety, assessed using portable pulse oximeter, among the three groups were compared at four intervals of the procedure using One-way ANOVA test followed by Tukey's HSD post hoc analysis . There is a reduction in mean pulse rate for both contingency escape with video and contingency escape groups indicating low anxiety level in the experimental groups when compared to the control group. But the differences between the groups were not statistically significant. (TABLE : 3 and GRAPH : 5)



Graph 5 : Comparison of Mean Pulse Oximeter readings between different time intervals in each study group

Table 4 :Comparison of distribution of Frankel scale Scores between Before and After Rx in each study group using Z Test for Proportions						
Groups	Scores	Before Rx		After Rx		P-value
		n	%	n	%	
Group 1	Def. -ve	1	6.7%	0	0.0%	<0.001*
	-ve	13	86.7%	3	20.0%	
	+ve	1	6.7%	11	73.3%	
	Def.+ve	0	0.0%	1	6.7%	
Group 2	Def. -ve	4	26.7%	0	0.0%	0.006*
	-ve	10	66.7%	6	40.0%	
	+ve	1	6.7%	9	60.0%	
	Def.+ve	0	0.0%	0	0.0%	
Group 3	Def. -ve	4	26.7%	1	6.7%	0.03*
	-ve	10	66.7%	10	66.7%	
	+ve	1	6.7%	4	26.7%	
	Def.+ve	0	0.0%	0	0.0%	

Frankl's scale scores among the three groups, before and after treatment, was analysed using z test for proportions. It showed that the contingency escape with video group had statistically significant difference(<0.001) when compared to both contingency escape and control groups.



Graph 6 : comparison of distributions of responses frankl's scale at different time intervals between 03 study groups

### Discussion

The present study showed that audio visual distraction using only oral health education video during contingent escape periods seems to be effective in reducing dental anxiety and maintaining cooperative behaviour in children during restorative dental treatment. There was a difference in the overall disruptive behaviour between the control group and the contingent escape with AV distraction-group where children in the latter showed improved behaviour with a positive response.

There was a notable difference in the observed mean cooperative behaviour and anxiety between those who used AV distraction and those who did not during contingent escape intervals, where AV distraction aided group showed improved anxiety reduction during and after treatment and more cooperative behaviour.

As observed in this present study, Filcheck et al. (2004) reported that the display of attention-grabbing videotaped material had an effect in distracting the children from the feared stimuli and that it was considered as one of the



most easy method for modifying children's behaviour during dental treatment.

According to a study by Amal Al Khotani et al(2016), audio visual (AV) distraction leads to full involvement of senses(visual and auditory), and induces a positive emotional reaction resulting in a relaxed experience during dental treatment.

Another study done by Keith D Allen et al(2004), by exposing children to temporary escape during dental treatment ,contingent upon cooperative behaviour, found out that short escape periods can be an effective way for dentist to manage disruptive child behaviour in dental operatory

Patel et al.(2006) has showed that children who enjoyed playing hand-held video games had less anxiety during anaesthesia induction compared with the children who had only their parental presence.

Dental anxiety is a multi-dimensional concept that consists of behavioural, cognitive and physiological components. Strength of this study can be the use of AV distraction in the form of oral health education video only during contingent escape intervals rather than providing an unlimited access to the same which could be detrimental in long term use. According to one commentary by Hardell L, based on an evaluation on brain tumour risk done by International Agency for Research on Cancer at WHO ; Radiofrequency radiation from devices that emit nonionizing RF radiations could be a possible human carcinogen. Given the very fast uptake of this technology by children of all ages around the world and the emerging health risks posed by chronic exposure to wireless devices, it is imperative that precautionary warnings be widely circulated now to parents and schools by health professionals with expertise in this subject (Reykjavik Appeal on Wireless Technology in Schools, 2017, see Appendix S1)

With respect to health implications of digital (wireless) technologies, it is of importance that neurological diseases, physiological addiction, cognition, sleep, and behavioural problems are considered in addition to cancer. Well-being needs to be carefully evaluated as an effect of changed behaviour in children and adolescents through their interactions with modern digital technologies.

Here a combination of more than one measurement technique for anxiety and behaviour, which is crucial to successfully assess children who have limited cognitive/linguistic skills and little ability to remember. For instance, FIS was used as a self-report measure that, appropriately used with children, provides an immediate state of emotional feeling towards dental treatment. It has been reported as a valid indicator of a child's pain experience.[12]

The PR within the CTR-group in this study was significantly elevated during the treatment and after the treatment when compared to the preoperative baseline value during the restorative treatment procedure. However, in contingent escape with distraction group there is a gradual reduction in pulse rate during the treatment and after the treatment. In contingent escape group also there is reduction in pulse rate during and after the treatment but less than that of AV distraction aided group. This result complements other studies that reported less increase in PR in a group of children undergoing dental treatment using AV distraction aids.

Upper primary school age group children has better cognitive abilities and linguistic skills when compared to lower primary school age group. For this reason children between 4-8 years were chosen for the current study,

One limitation of the current study is the sample size. A larger sample size and a general clinical setting might have elucidated the differences in the use of AV distraction as indicated by anxiety and behaviour

measures. This study excluded children with previous bad experience which might have affected the results and could hence be considered a limitation. However, this was chosen in order to achieve as a homogeneous group as possible to be able to draw any conclusions.

### Acknowledgement

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