



Effectiveness Of A Distraction Technique Using Play Dough To Manage Gagging In Children: A Randomised, Controlled Trial

Indu M Varkey, Akshaya S Mudaliar*, Mansi A Baviskar, Kiran D Ghule

²BDS, ^{1,3,4}MDS (Pediatric And Preventive Dentistry),

Department of Pediatric and Preventive Dentistry,

D Y Patil Deemed to be University School of Dentistry,

Sector 7, Nerul, Navi Mumbai- 400706, India

***Corresponding Author:**

Dr. Akshaya S Mudaliar

BDS, D Y Patil Deemed to be University School of Dentistry, Sector 7, Nerul, Navi Mumbai- 400706, India

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Abstract

Background: An exaggerated gag reflex during maxillary impression recording in children can increase anxiety and hinder patient cooperation. Distraction techniques can be used to control gagging.

Aim: To evaluate the effect of play dough as a distraction technique on the severity of gag and impression success in children with gag reflex aged 5-9 years.

Design: Single blinded, randomized controlled trial consisting of 58 children requiring maxillary impressions were divided randomly into 2 groups-Test group (using play dough as a distraction) & control group(no distraction). Dental anxiety was recorded using Facial image scale (FIS) before and after the procedure. Gag Severity Index (GSI) and Gagging related impression success scale (GISS) were assessed after the impression was recorded. Non - Parametric tests were used to compare data between the groups.

Results: FIS scores increased in both groups, with a statistically significant increase in the control group ($p=0.00$). The mean Gag severity index score was significantly higher in the control group ($p=0.001$). In the test group, 96.6% impression success rate in spite of gagging (65.5%) or no gag (31%).

Conclusion: The use of play dough as a distraction technique is a safe and potentially effective method to manage gagging during impression recording in children.

Keywords: Anxiety, Distraction, Gag reflex, Impression, Play dough

Introduction

Gag reflex is an inborn natural defense that prevents foreign bodies from penetrating the respiratory tract.¹ During the first four years of life, the gag reflex gradually regresses as the oral functions begin to mature. Gag reflex becomes more posterior once the dentition appears as the child stimulates receptors by introducing various objects into the mouth.²

Gagging is a reflex to tactile stimulation of certain "trigger zones" in the oral region namely- base of the tongue, uvula, palate, post pharyngeal wall, palatopharyngeal and palatoglossal folds.³ Triggering

of these zones sends afferent impulses through the cranial nerves (V, IX & X) to the medulla oblongata, which sends efferent impulses to cause disorganized and spasmodic muscle movement characteristic of gagging.⁴

Gagging often has a multifactorial etiology,⁴ presenting clinically as simple contractions of circumoral musculature or even spasm of pharyngeal structures. Literature states two main categories of gagging: somatogenic and psychogenic. The somatogenic group requires sensory stimuli while the

psychogenic group only requires a psychological thought to initiate gagging.⁵ A common trigger for gagging is dental procedures, e.g., recording a maxillary impression in children and adults. According to Kastouda et al, the prevalence of gagging in children is nearly 30% in a dental set up.⁶ Gagging can originate due to the dental procedure itself or from the anxiety associated with a dental visit and can interfere with the dental treatment and hinder patient cooperation.

Miscellaneous management strategies highlighted in literature include behavioural modification techniques such as relaxation, distraction, systemic desensitization; pharmacological techniques namely-conscious sedation and general anesthesia. Additional techniques like acupressure and acupuncture at P6 point cite little evidence as management techniques to control gagging during dental treatment.⁷

Distraction techniques may be used to control gagging to some extent.⁴ Kovats⁸ and Krol⁹ have described distraction techniques to obtain impressions successfully in gagging adult patients. In children, to the best of our knowledge, only two studies are available in literature till date which utilizes interactive distraction technique which could reduce the gagging severity and dental anxiety during impression taking. Debs and Aboujaoude¹⁰ engaged children in an intellectual coloured game (ICG) and Dixit and Moorthy¹¹ used a colourful matching puzzle block.

Since there is scarcity of information but immense potential to use this technique, we formulated a study to assess the effect of a distraction technique using play dough to control gagging in children aged 5-9 years with gag reflex during impression recording.

Materials And Methods.

Aim. To evaluate the effect of play dough as a distraction technique on the severity of gag and

impression success in children with gag reflex aged 5-9 years.

Study Design. This study was designed as a randomized, controlled trial with two groups- Test

group and Control group. The study was approved by the Institutional Ethical Committee (IREB/2022/PEDO/03).The lottery technique was used to randomly allocate the selected children to

either the test or control group. Children in both groups had to undergo maxillary impression recording; the test group children had “play dough” as an interactive distraction technique and the control group had none.

Sample Size.

To determine the sample size, a pilot study was initially conducted on 10 children (5 in each group). Based on data obtained and comparing to previous studies, with $\alpha = 0.05$ and power of 80%, the sample size was estimated to be 29 for each group.

Study Participants. Children aged 5- 9 years requiring maxillary impressions as a part of routine investigations were selected from the OPD of the Department of Pediatric and Preventive Dentistry. Children with an exaggerated Gag reflex determined by the Classification of Gagging problem index (CGP) of G1(Normal) /G2(Mild) /G3(Moderate) (described by Saita)¹² were recruited for the study. Children with no previous history of impression recording and those falling under Frankl positive or definitely positive were included in the study. Exclusion criteria was children with a nasal obstruction, upper respiratory tract infection or medically compromising conditions Informed consent was obtained from parents who agreed for their child’s participation. No dropouts were reported in our study.

Procedure. On the day of scheduled appointment for impression recording, a simple random

technique (lottery method) was used for allocation of included children to one of the groups by the chief investigator. An assistant dentist would then guide the child to rate his/her anxiety using the Buchanan Facial Image Scale (FIS) (Figure 1).

Children in the test group were shown pictures of animals, vegetables, etc. on a chart (Figure 2) and were asked to choose one to replicate using “play dough” (*Kores Play Dough*) while the impression was being recorded. The children were encouraged to choose a shape and assisted based on their needs to form the shapes, once, before the procedure. During this time, the assistant dentist would constantly communicate with the child to gain the cooperation and trust of the child.

The children in both groups were then guided into the dental operatory and comfortably seated upright in the chair. An appropriately sized metal tray was selected and a trial was done in the child's mouth. The procedure was explained to the child using euphemisms. An unflavoured fast setting alginate (*Tropicalgin Zhermack, Italy*) was used for recording impressions. The children in the test group were asked to replicate the shape (priorly chosen) using play dough during impression recording. For children included in the control group, maxillary impressions were made without any distraction technique.

The assistant dentist would once again help the children from both groups record his/her anxiety using the FIS, post impression recording. In the test and control group, recordings of the mouth region was done for a blinded expert to score the severity of gag reflex during impression taking using the Gagging Severity index (GSI, Dickinson 2000) and the success of impression obtained using the Gagging related impression success scale (GISS, Dixit and Murthy 2020) (Table 1).

Statistical Analysis.

All data was entered into a Microsoft Office Excel (Office version 365) in a spreadsheet and checked for errors and discrepancies. Data analysis was done using SPSS version 21.0 (SPSS Inc. Chicago, IL, USA). Data normality was tested using the Kolmogorov-Smirnov test and Shapiro-Wilk test. Categorical variables were compared using the Chi square test and Fisher's exact test and the continuous variables were analyzed using the Mann-Whitney U test. Correlation between variables was assessed using the Spearman's correlation test. The significance level was set at 0.05.

Results.

This is a single blinded, randomised controlled trial consisting of 58 children, aged 5-9 years, randomly allocated to two groups. There were no dropouts in our study.

Demographic Distribution.

Based on age and sex, no statistical differences was observed between the two groups. The Gag reflex scores (Saita et al)¹² of all children is as described in Table 2.

Fis

Pre-impression mean FIS scores did not statistically vary between the test and control groups ($p=0.68$). However, post impression FIS scores rated by the children without the distraction.

technique was higher and a highly statistically significant difference was observed in the mean FIS scores between both the groups after the impression recording ($p=0.00$).

On comparing the pre and post impression mean FIS scores, children in both the groups showed statistically significant increase in scores (Test: $p=0.017$, Control: $p=0.00$).

When the change in dental anxiety was assessed between groups, the level increased considerably in 25 (86.2%) children of the control group but remained constant in 17 (58.6%) children belonging to the test group. This difference in the dental anxiety level was statistically significant between the two groups in our study ($p=0.001$) (Table 3).

Gsi

In the test group, 17 (58.6%) children had mild gagging followed by 11(37.9%) with very mild gagging during the impression recording procedure. Only one child in the test group had moderate gagging despite of the interactive distraction technique. However, in the control group 24 (82.8%) children had mild gagging during the impression recording. This difference in GSI between the test and control group was statistically significant ($p=0.003$) (Table 4).

Giss

In the Test group, maxillary alginate impressions were successfully obtained in all the children except 1 (3.4%); majority inspite of gag (65.5%) or no gag (31%). Impressions could not be recorded successfully in 13.8% of children belonging to the control group due to severe gagging. Statistically significant difference was found between the two groups in relation to GISS. ($p=0.003$) (Table- 5).

Correlation Between Variables.

The gag reflex scores recorded prior to the procedure showed significant correlation to GSI (Spearman's correlation; Test: $r = 0.402$, $P= 0.031$; Control: $r= 0.430$, $P= 0.020$) and GISS Spearman's correlation; Test: $r = -0.374$, $P= 0.046$; Control: $r= -0.472$, $P= 0.010$) in both the groups. In the control group, there

was a significant correlation between pre-impression FIS.

and GSI (Spearman's correlation; $r= 0.404$, $p= 0.030$) as well as post-impression FIS and GISS (Spearman's correlation; $r= -0.372$, $p= 0.047$).

Discussion.

Gagging has been linked to psychological problems like fear and anxiety, which cause around 20% patients to forgo dental treatments.¹⁰ Anxiety induced by gagging sensation can also act as a negative feedback system- i.e. due to gagging, patients avoid a dental visit, which further deteriorates the oral conditions and potentially leading to more gagging episodes when a dental visit becomes essential.⁶ Exaggerated reflexes during maxillary alginate impressions could make the procedure more difficult and, in some situations, almost impossible. Because the sensation or act of gagging can be humiliating for children, understanding how to control it can be helpful in addressing the child's psychosocial concerns.⁷ This study aimed to investigate the effect of a distraction technique using play dough on the gagging severity during impression recording in children.

One of the most frequent phobias in children is dental fear. Fear and anxiety levels in preschoolers have been found to be greater than in school-aged children. Since distraction techniques require lower levels of dental fear and anxiety, school-aged children were chosen for the current study. Furthermore, various age groups have distinct distraction-related cognitive and behavioral responses. As a result, it's been hypothesized that distraction works better in older age group.¹³ Another reason to choose school-aged children was that younger children can be more uncooperative and disruptive, making it difficult to control them.¹⁴

Play dough is an appealing, easy to use yet intellectually challenging and cognitively demanding interaction that engages multiple senses, especially sense of touch in children. This tactile stimulation distributes and transmits energy from caregivers to child and helps to calm and soothe the child. All these characteristics may have contributed towards the effectiveness of play dough as a good distraction technique during impression recording in our study.

In our study, children in the test group had only mild levels of gagging during the procedure as compared to the control group. This is in agreement with studies by Dixit and Moorthy¹¹ and Debs and Aboujaoude¹⁰. Although Dixit and Moorthy¹¹ in their study reported 100% success using their interactive distraction technique, their inclusion criteria did not involve children with an excessive gag reflex. Debs¹⁰ reported a success rate of 88.1% using counting of different geometric shapes and colours. Our success rate using play dough was 96.6 %, which is commendable as a new distraction technique. One patient in the test group completed the procedure but the impression could not be retrieved completely due to uncooperative behaviour.

The gag reflex scores recorded before the procedure in this study was significantly correlated to the Gag severity score as well as impression success rates. Dental gagging is sometimes not an indication of anxiety in a child, but rather the fear of choking.⁵ This is seen as a deliberate act of self-defense against an invasion of the oral cavity.^{15,16} According to Armfield et al.¹⁷, gag reflex can also be triggered by emotional variables, which might be connected to the child's previous dental experiences.

In certain circumstances, children's anxiety manifests itself in a greater tendency to gag. In our study, dental anxiety was recorded using the Buchanan Facial Image scale (FIS) (Buchanan and Niven 2002) before and after the procedure of impression recording. It is a simple and reliable method of assessing paediatric participants' anxiety levels in a dental setting.^{18,19} In our study, the pre-impression FIS scores were not related to either gagging severity or to the impression success in the test group, but related to the gag severity score in the control group. The post impression score was also negatively correlated to the GISS in the control group. These are in agreement with studies by Katsouda et al.⁶ & Debs and Aboujaoude¹⁰ but contradictory to observations by Dixit¹¹. This can be explained partially by the increased anxiety scores post impression in children who had no distraction during the procedure, causing more gagging and thus reducing their chances of obtaining success during impression recording.

FIS scores before the impression were comparable between the two groups, but children in the control group showed statistically significant increase in

anxiety scores after the procedure. This can be attributed to absence of the distraction technique in diverting the child's attention till completion of procedure. The play dough could have enhanced the self-confidence of the child, possibly by release of endorphins, which play a role in modulating mood and behaviour.¹⁰ Both groups individually also had a significant increase in dental anxiety scores after impression recording, in agreement with previous studies.¹⁰⁻¹¹ However literature extensively quotes effectiveness of distraction technique in reducing anxiety which was not observed in our study.¹⁹⁻²⁰ According to Singh et al., behavioural strategies are the most effective methods for control of gagging. This lowers anxiety and aids in the "unlearning" of the action that causes gagging.²¹ The play dough distraction technique in this study increased the child's cooperation and concentration, allowing for a good alginate impression by lowering the anxiety and subsequently gag reflex.

Our study recorded baseline gag score before the impression recording and this score was positively correlated to GSI and negatively correlated to GISS in both groups. This existing gag reflex raises the anxiety levels in children and hinders dental procedures. In spite of increased anxiety levels in both groups of our study, the GSI was lesser and the GISS score was better in our test group and thus we are able to validate this interactive distraction technique using play dough as a possible approach to reduce gagging during dental procedures. Various passive distraction techniques have also been reported in literature²², but active techniques like the play dough engage numerous senses and enhance further communication with the child. The video recording made during the procedure ensured no bias from the chief investigator/assistant dentist to document the GIS/GISS score.

There are a few limitations to our research that should be noted. This study excluded children with previous bad experiences and children demonstrating negative & definitely negative behaviour on the Frankl behaviour rating scale, which might have affected the results. However, this was chosen in order to achieve a uniform group to be able to define the effectiveness of this novel technique. The child's anxiety was assessed using a self-reported scale, which may be subjective.

Conclusion.

The use of an interactive distraction technique such as play dough in children aged 5-9 years substantiated it to be an efficacious and cost effective method for management of gag reflex. Children who used play dough had lesser levels of gag severity, increased impression success rates and lower levels of anxiety. The effectiveness of this distraction technique is of interest since parents often prefer non-pharmacological interventions.

Why this paper is important to pediatric dentists?

1. This study introduces a cost effective and engaging method to manage gagging during impression recording in children.
2. This method of distraction manages the issue of gagging in a fun and interactive way reducing anxiety in patients leading to better bonding with the operator.
3. The parents are at ease as it is a non - invasive and non - pharmacological technique to manage gagging.

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Table 1- Classification of Gagging Problem (CGP) index, Gagging severity Index (GSI), and Gagging related impression success scale (GISS)

Classification of Gagging Problem (CGP) index (<i>Saita et al. 2013</i>)		Gagging Severity Index (GSI) (<i>Dickinson 2000</i>)		Gagging related impression success scale (GISS) (<i>Dixit 2020</i>)	
G1	Normal gagging but not desensitised	I	Very mild, occasional and controlled by the patient.	Score 1	Impression could not be obtained due to severe gagging
G2	Mild gagging	II	Mild, and control is required by the patient with reassurance from the dental team.	Score 2	Impression was obtained in spite of gagging
G3	Moderate gagging	III	Moderate, consistent and limits treatment options	Score 3	Impression was obtained successfully without gagging
G4	Severe gagging	IV	Severe and treatment is impossible		
G5	Very Severe gagging	V	Very severe; affecting patient behavior and dental attendance and making treatment impossible		

Table 2: Demographic characteristics of the test and control group

	Test Group n=29	Control Group n=29		
Age (Mean ± SD)	7.414±1.0183	7.655±1.1425	t= -0.849 [†]	p= 0.399
Gender [n (%)]				
Male	15 (51.7)	14 (48.3)	$\chi^2 = 0.69^{\ddagger}$	p= 0.793
Female	14 (48.3)	15 (51.7)		

Gag Reflex Score [n(%)]				
G1 (normal gagging)	0 (0)	0 (0)		
G2 (mild gagging)	25 (86.2)	28 (96.6)	$\chi^2 = 0.352^{\S}$	p= 0.16
G3 (moderate gagging)	4 (13.8)	1 (3.4)		

†t test, ‡Chi square test, §Fisher's Exact Test

Table 3: Pre and post-impresion mean FIS scores and change in dental anxiety between the test and control groups

FIS score (Mean ± SD)	Test Group n=29	Control Group n=29		
Pre-impresion FIS	1.6±0.56	1.55±0.5	Z= -0.403 [†]	P=0.68
Post-impresion FIS	2.03±0.73	2.6±0.6	Z= -3.573 [†]	p=0.00***
Comparison between pre- and post-impresion FIS scores**	Z= -2.389 [‡]	Z= -4.562 [‡]		
	p=0.017**	p=0.00***		
Change in the dental anxiety.	Test Group n(%)	Control Group n(%)		
No change in anxiety	17 (58.6)	4 (13.5)	$\chi^2 = 14.49^{\S}$	p=0.001***
Increase in anxiety	11 (38)	25 (86.2)		
Decrease in anxiety	1 (3.4)	0 (0)		

†Mann–Whitney U test, ‡Wicoxon signed-rank test, §Chi squared test

Table 4: Gagging Severity index (GSI) comparison between the two groups

GSI score	Test Group Number of children (%)	Control Group Number of children (%)		

I (Very Mild)	11 (37.9)	1 (3.4)	$\chi^2 = 11.328^\dagger$	p= 0.003***
II (Mild)	17 (58.6)	24 (82.8)		
III (Moderate)	1 (3.4)	4 (13.8)		
Mean ± SD	1.655±0.55	2.10±0.40	Z=-3.24‡	p= 0.001***

†Chi squared test, ‡Mann–Whitney U test

Table 5: Gagging -related Impression Success scale (GISS) comparison between the two groups

GISS Score	Test Group Number of children (%)	Control Group Number of children (%)		
I (Not obtained)	1(3.4)	4(13.8)	$\chi^2 = 11.618^\dagger$	p=0.003***
II (Obtained in spite of gagging)	19(65.5)	25(86.2)		
III (Obtained without gagging)	9(31)	0(0)		

†Chi squared test

Figure 1- Buchanan Facial Image scale (FIS)

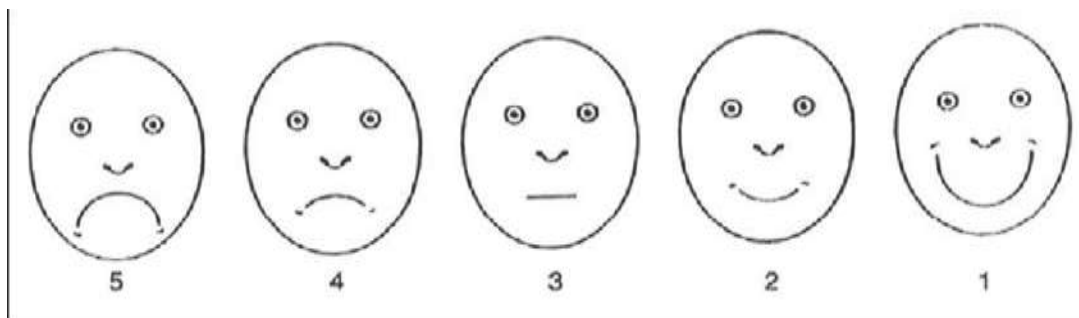


Figure 2- Pictures of animals and vegetables on a chart

