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Original Article

Dentistry Section

Effectiveness of Intellectual Memory Recall and Multifaceted Distraction Techniques in Reducing Anxiety among Children during Radiovisiography: A Randomised Clinical Trial

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ABSTRACT

Introduction: Dental anxiety is anticipatory in nature, and the manifestation of the anxiety is due to uncertainty about a future threat and the inability to mitigate or avoid it. Distraction with a multisensory approach aids in better managing the anxious child.

Aim: To compare the efficiency of two different play techniques, namely Intellectual Memory Recall (IMR) game and Multifaceted Distraction (MFD) game, in reducing procedural anxiety during Radiovisiography (RVG) among 4 to 10-year-old children.

Materials and Methods: It was a randomised clinical study conducted in the Department of Paedodontics and Preventive Dentistry, GITAM Dental College and Hospital, Visakhapatnam, Andhra Pradesh, India from July 2023 to September 2023 with a sample size of 90 children selected based on baseline anxiety using the Modified Faces version of the Modified Child Dental Anxiety Scale (MCDASf). The children were randomly allocated into three groups: Group IMR (n=30), Group MFD technique (n=30), and the control group-Tell Show Do (TSD) (n=30). The pre- and postprocedural anxiety of the children was measured using the RMS Pictorial Scale. The obtained readings were tabulated, and anxiety variation was statistically analysed using the student t-test (intragroup comparison) and one-way Analysis of Variance (ANOVA) (intergroup comparison). The frequency of anxiety reduction among children was analysed using the Chi-square test.

Results: Total 90 chidren {males-38(42.22%) and females-52(57.78%)} with a mean age of 7.09±1.68 years were found eligible and participated in the study. The Multifaceted Distraction (MFD) Technique was the most effective and significantly reduced anxiety in 96.67% of children (n=29), followed by IMR (n=27; 86.67%), and TSD (56.67%).

Conclusion: Both the MFD and IMR techniques have been found to be efficient in reducing procedural anxiety compared to the TSD technique. These techniques are cost-effective and easily understood by all children, making them potential alternatives to conventional behavioural guidance methods.

Keywords: Child behaviour, Distraction game, Fear reduction, Psychological intervention

INTRODUCTION

In Paediatric Dentistry, vicarious learning by the child and uncertainty about the upcoming procedure can trigger anxiety in young children. RVG, being no exception, can be one of the most stressful experiences for the child due to the challenging environment with unfamiliar machinery and rigid sensors. The use of a rigid sensor in the bisecting angle technique often induces an exaggerated gag reflex. Some patients cannot tolerate image receptors due to a constricted mouth opening, compromised anatomy with shallow or narrow arches, obliterated vestibule, large tori, etc [1,2]. The unavailability of direct sensors in different sizes exacerbates procedural anxiety, leading to nervousness, crying, and temper tantrums in children, creating chaos in the imaging room. Improper imaging may result in the need for repetitions, leading to multiple radiation exposures, behaviour management issues, and unpleasant experiences for both the dentist and the child.

Although informational control can be achieved through the "TSD" technique, explaining procedures in phrases appropriate to the child's cognitive level, demonstrating the procedure in a carefully defined, non threatening setting, and performing it without deviation from the demonstration [3,4]. According to Abbasi H et al., the use of this technique often heightens anxiety in an already anxious child, possibly due to the lack of a conceptual framework, making it difficult for children to understand the dentist's frame of reference [4].

Distraction is a non aversive, psycho-behavioural guidance technique that utilises visual, auditory, kinaesthetic modalities, or their combinations to achieve successful high-quality treatment by diverting the child's attention away from the main task [5]. Audiovisual distraction is gaining popularity for cognitive refocusing in paediatric dentistry. This may involve the child's active participation in the task directly (e.g., video games) or the child passively observing the activity or stimulus (e.g., television, mobile devices, etc.) [6,7]. However, using these devices can present procedural challenges during RVG, and excessive screen time can have negative effects on human cognition and socialisation [8].

Intellectual colour games and stress ball squeezing have shown a significant role in reducing dental anxiety in children by engaging the child mentally and promoting relaxation, respectively, but these techniques lack active participation [9]. It is imperative to provide a holistic approach that actively engages the child with enhanced sensory integration, potentially improving the child's ability to manage anxiety-inducing situations effectively. Therefore, the study aimed to assess the effectiveness of actively engaging children through the IMR game and MFD technique in reducing anxiety during RVG.

The null hypothesis posited that there would be no significant difference in the efficacy of the IMR technique and MFD technique in reducing anxiety during the RVG diagnostic procedure.

MATERIALS AND METHODS

The inception of this randomised clinical trial stemmed from a pilot study conducted in April 2023. Subsequently, the trial was executed within the Department of Paediatric and Preventive Dentistry, GITAM

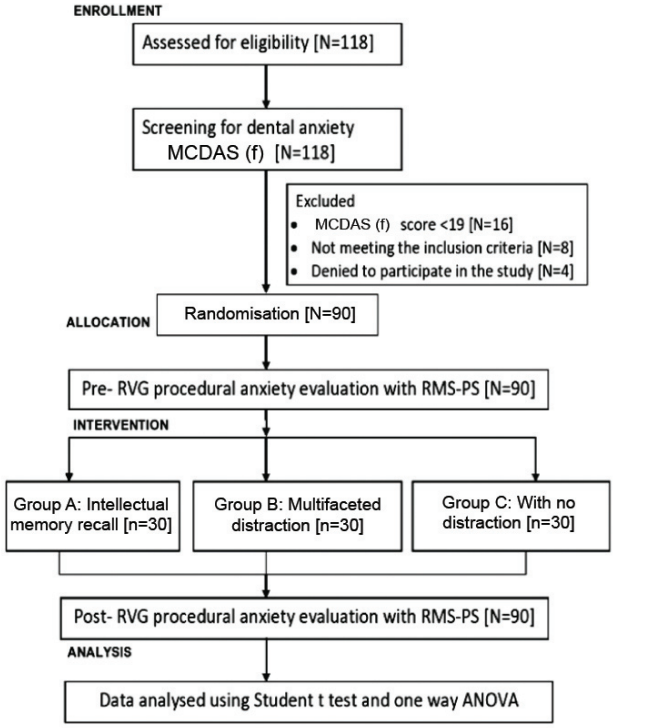
Dental College and Hospital, Visakhapatnam, Andhra Pradesh, India, having obtained approval from the Institutional Ethical Committee (protocol number: 23086031823) and conducted from July 2023 to September 2023. The study was performed in a controlled parallel arm pattern, and the study population was allocated in a ratio of 1:1:1. Blinding was not performed. Children aged 4-10 years visiting the Department were assessed for anxiety using a revised version of the Modified Child Dental Anxiety-Facial Version {MCDAS(f)}. The cumulative score from its six-question questionnaire may range between 5 (little or no anxiety) and 30 (extreme dental anxiety) [10].

Inclusion criteria: Healthy children with MCDAS(f) anxiety levels Above 19 score were included.

Exclusion criteria:

- Medically compromised individuals;
- Physically or intellectually disabled children;
- Children not requiring RVG as a preliminary investigation; and
- Children or parents unwilling to participate in the study.
- The procedure was explained clearly to parents and children, and informed consent was obtained.

Sample size calculation: Based on the results and recommendations of the pilot study (n=6/group), a sample size of 24 subjects per group was estimated with a power of 80% and a standard deviation of 1.01, with a significance level of 0.05 (G*power software version 3.1). The ultimate sample size was increased to 90, with 30 subjects in each group. After explaining the procedure to the parents and children and obtaining consent, the subjects were randomly allocated to each of the study groups using the lottery method. The Consolidated Standards of Reporting Trials (CONSORT) was reported in [Table/Fig-1].



[Table/Fig-1]: CONSORT flow diagram.

Study Procedue

The children were randomly allocated into three groups. The study groups include:

- Group A (n=30): RVG with IMR game (IMR)
- Group B (n=30): RVG procedure with MFD technique game (MFD)
- Group C (n=30): RVG with basic TSD (TSD-control).

For each group, preoperative anxiety in the RVG room was evaluated using the Raghavendra, Madhuri, Sujata Pictorial Scale (RMS-PS) [11,12]. The scale consists of five different facial expressions gradually varying from very happy to very unhappy. RMS designed two separate sets of photographs for boys and girls respectively [Table/Fig-2] [11]. The children were asked to choose the facial expression that closely matches their own feelings.

[Table/Fig-2]: Self-reported anxiety using RMS-PS scale.

Group A- Intellectual Memory Recall (IMR) game: In this group, a mini slide projector torch with multiple switch-operated patterns was used to engage the child in an activity. The slide rail with definitive images related to the child's cognitive levels was selected and inserted into the mini slide projector. The child was seated, relaxed, and asked to project the image at a distance of 100-150 cm, and advised to switch the images slowly [Table/Fig-3]. During this process, the child was asked to memorise the sequence of images simultaneously during the RVG procedure, similar to the study by Debs NN and Aboujaoude S. (2017) [13].

[Table/Fig-3]: RVG with Intellectual Memory Recall (IMR) distraction.

Group B -Multifaceted Distraction Technique (MDT) game: This gaming concept utilises a dental chair-mounted MFD device that actively engages the child in an activity, facilitating both stress relaxation and visual distraction. The device consists of an inflation bulb attached to the dental chair near the handle and is made easily accessible for the child. The inflation bulb is connected through a hollow tube, diverting the air to blow up the balloon at the child's eye level. The children were introduced to the inflation bulb and instructed to press the inflation bulb at a slow pace as per convenience, and focus on the balloon inflation as a part of play therapy, thus engaging the child while performing the RVG procedure. This process simulates squeesing a stress ball for relaxation [14,15] and causing visual distraction during the RVG procedure [Table/Fig-4] [14,16].

[Table/Fig-4]: RVG using Multifaceted Distraction (MFD) technique.

Group C- Tell Show Do (TSD) control group: In this group, the conventional RVG procedure was performed with basic behavioural guidance technique (TSD). The child was made seated comfortably, and a standard set of verbal instructions with age-appropriate euphemisms were applied to explain, show, and perform the RVG procedure for children [3,4].

Postprocedural anxieties in all the groups were recorded using RMS-PS [Table/Fig-2] [11,12].

STATISTICAL ANALYSIS

The readings obtained were tabulated and statistically analysed using Statistical Packages for Social Sciences (SPSS) version 23.0. The variable (anxiety score) was expressed in mean and standard deviation. One-way ANOVA was used to compare among the three groups, and Tukey's Post-hoc test was performed for pair-wise comparison. Paired t-tests were applied within each group to find significant differences between the pre and post-anxiety scores.

RESULTS

A total of 118 children were considered for inclusion in the study, but 16 of them scored MCDAS(f) less than 19, eight children did not fulfill the inclusion criteria, and the parents of four denied to participate. Total 90 chidren {males-38(42.22%) and females-52(57.78%)} with a mean age of 7.09±1.68 years were found eligible and participated in the study. The patients in the three study groups were similar between age groups (p=0.107), genders (p=0.421), and comparable with no significant difference (p<0.05). MCDAS (f) scores of all study populations fall greater than 19, representing the state of anxiety [Table/Fig-5]. Significant variation in anxiety was observed between the pre and postprocedural phases in the entire test groups (p<0.05), and the mean difference was highly significant in the experimental groups (p=0.001) has been depicted in [Table/Fig-6].

Category	Sub category	IMR (n=30) n (%)	MFD (n=30) n (%)	Control (n=30) n (%)	Total N (%)	p-value
Age	4-7 years	15 (50)	22 (73.33)	15 (50)	52 (57.78)	0.107 (NS)
	8-10 years	15 (50)	8 (26.67)	15 (50)	38 (42.22)	
Gender	Male	15 (50)	10 (33.33)	13 (43.33)	38 (42.22)	0.421 (NS)
	Female	15 (50)	20 (66.67)	17 (56.67)	52 (57.78)	
MCDAS(f) score	19-30	30 (100)	30 (100)	30 (100)	90 (100)	1.000 (NS)

[Table/Fig-5]: Baseline details of participating children (N=90).
IMR: Intellectual memory Recall; MFD: Multifaceted distraction technique; NS: Not significant (p>0.05)

Group	Preprocedural Mean±SD	Postprocedural Mean±SD	Mean difference	Paired t-test	p-value
Intellectual	3.57±1.19	1.80±0.85	1.77±1.25	t=7.737	0.001*
Multifaceted	3.77±1.01	1.40±0.56	2.37±1.03	t=12.544	0.001*
Control	2.83±1.29	2.13±1.25	0.70±1.26	t=3.034	0.005*

[Table/Fig-6]: Intragroup comparison using paired t-test.
Pre-Pre-anxiety scores taken prior to intervention Post-anxiety scores taken after intervention; NS: Not significant (p>0.05); *Significant (p<0.05); **Highly significant (p<0.005)

In the IMR group, the mean anxiety score measured by RMS-PS decreased from 3.57±1.19 to 1.80±0.85, and in the MFD group, the mean anxiety score decreased from 3.77±1.01 to 1.40±0.56 [Table/ Fig-7]. A significant difference between the groups in both the pre-anxiety score (p=0.007) and post-anxiety phase (p=0.012) is shown [Table/ Fig-8]. Children in the IMR group and MFD technique group were more anxious before RVG compared to the control group TSD (p<0.05). In contrast, the TSD group showed more anxiousness than the experimental groups after RVG, and MFD showed a significant difference in anxiety score compared to TSD [Table/Fig-7,8].

Parameters	Intellectual Memory Recall (IMR)	Multifaceted Distraction (MFD)	Control with no distraction	F statistics	p-value
Pre-anxiety score value	3.57±1.19	3.77±1.01	2.83±1.29	5.301	0.007*
Post-anxiety score value	1.80±0.85	1.40±0.56	2.13±1.25	4.663	0.012*
Change in anxiety score value (reduction in percentage)	1.77±1.25 (49.58%)	2.37±1.03 (62.86%)	0.70±1.27 (24.73%)	15.166	0.001*

[Table/Fig-7]: Intergroup comparison of pre and post-anxiety scores using one-way ANOVA.
NS: Not significant (p>0.05); * Significant (p<0.05); **Highly significant (p<0.005)

Both experimental procedures MFD and IMR were effective in reducing anxiety with a success rate of 96.67% and 86.67%, respectively (p=0.0026) has been depicted in [Table/Fig-9].

DISCUSSION

The first dental visit of a child plays a critical role in shaping their perception of dental care and can significantly impact the quality of treatment they receive in the future. It is imperative for Paediatric Dentists to ensure that this initial encounter is positive and successful, as it sets the tone for subsequent visits. The TSD technique has long been a staple in behavioural guidance for paediatric dentistry, fostering rapport between dentists, parents, and children. Rooted in behavioural psychology principles, TSD aims to familiarise children with dental procedures through verbal explanation, demonstration, and gradual exposure [3,17]. The advent of advanced technologies and procedures, such as RVG, has introduced new challenges in anxiety management, necessitating innovative solutions. However, recent studies have shown that TSD alone may not effectively mitigate anxiety during RVG procedures, particularly if children are exposed to the bulky sensor.

This limitation was evidenced in present study, where TSD was found to reduce procedural anxiety in only 17 (56.67%) of children in the control group. This result further emphasises the importance of utilising economical distraction aids for stressful RVG procedures in paediatric dentistry.

Distraction theory provides a conceptual framework for understanding anxiety management in paediatric dentistry. According to this theory, redirecting a child's attention away from the dental stimuli can effectively reduce anxiety levels (McCaul and Mallet 1984) [18]. Building upon this principle, recent research has explored a range of distraction techniques, including taste distraction (Lollipops)

Pre-anxiety score Mean difference (i-j) p-value			Post-anxiety score Mean difference (i-j) p-value			Change in anxiety score Mean difference (i-j) p-value		
Groups (Mean±SD)	MFD (j) (3.77±1.01)	Control (j) (2.83±1.29)	Groups (Mean±S.D)	MFD (j) (1.40±0.56)	Control (j) (2.13±1.25)	Groups (Mean±S.D)	MFD (j) (2.37±1.03)	Control (j) (0.70±1.27)
IMR (i) (3.57±1.19)	-0.20 p=0.786	0.73 p=0.045**	IMR (i) (1.80±0.85)	0.40 p=0.225*	-0.33 p=0.353*	IMR (i) (1.77±1.25)	-0.60 p=0.129*	1.067 p=0.002**
MFD (i) (3.77±1.01)	-	0.93 p=0.007**	MFD (j) (1.40±0.56)	-	-0.733 p=008**	MFD (j) (2.37±1.03)	-	1.67 p=0.001***

[Table/Fig-8]: Pair-wise comparison of pre, post and change in anxiety scores using Tukey's Post-hoc analysis.
I: groups present in the column; j: groups present in the row for pair-wise comparison; i-j: Mean differences; IMR: Intellectual memory recall; MFD: Multifaceted distraction technique; NS: Not significant (p>0.05); *Significant (p<0.05); **Highly significant (p<0.005)

Frequency of children n (%)				
Param-eters	Reduced anxiety score	No change in anxiety score	Increased anxiety score	Total
IMR	n=26 (86.67%)	n=3 (10%)	n=1 (3.33%)	n=30 (33.33%)
MFD	n=29 (96.67%)	n=1 (3.33%)	n=0 (0%)	n=30 (33.33%)
Control	n=17 (56.67%)	n=10 (33.33%)	n=3 (10%)	n=30 (33.33%)
Total	n=72 (80%)	n=14 (15.56%)	n=4 (4.44%)	N=90 (100%)

[Table/Fig-9]: Association of distraction technique with anxiety reduction.
Chi-square value: 16.321 degree of freedom:4; p-value=0.00261**; **Highly significant (p<0.005)

[19], audiovisual distraction aids [6,20], aromatherapy [20], playing with fidget spinners [6], kaleidoscope visual distraction [6], tactile stimuli with stress balls [14], etc., to enhance the dental experience for children. When using distraction cards and kaleidoscopes, operators should talk to children face-to-face when they are calm. It is not appropriate to use these tools to distract a crying child in a noisy, understaffed ward [21].

Incorporating lollipops as a taste distraction during the positioning of the sensor in RVG procedures could inadvertently enhance the fear of vomiting or choking. Technological aids like headphones and mobile devices, although reported to be successful, may cause digital eye strain and communication challenges during RVG procedures [22]. Virtual reality, although evolving, is costly and impractical in RVG procedures due to its reliance on physical movements [22,23]. Moreover, Bernaerts et al., (2022) highlighted the lack of validated measures for assessing the safety of virtual reality, particularly regarding virtual reality sickness in children [24]. However, the efficacy and practicality of different techniques vary in various treatments with their own set of limitations, highlighting the need for tailored approaches to anxiety management [Table/Fig-10] [9,15,19,25-29].

In response to the challenges of traditional procedures, the current study introduces two novel distraction techniques: IMR and MFD. IMR engages children in cognitive tasks to divert their attention, combining visual and tactile sensations to create a multisensory experience in children. Implementing brainstorming techniques to alleviate dental anxiety involves engaging patients in creative activities aimed at diverting their attention from discomfort. When children face anxiety-inducing situations, their amygdala, responsible for processing fear, activates stress pathways, triggering rapid fight or flight responses. Simultaneously, the insular cortex, involved in processing tactile sensations, works to modulate the amygdala,

Randomised clinical Trials	Country	Sample size	Age (yrs)	Procedure	Intervention	Type (active/passive)	Effect on anxiety
Dixit UB, Moorthy L (2021) [25]	India	24	5-10 years	Gagging-related impressions	Interactive distraction	Passive interactive	Facial image scale scores significantly less post operatively (p=0.048)
Torres-Gomez J (2021) [26]	USA	20	24-85 years	Scaling and root planning	Stress ball	Active	No significant effect state trait anxiety inventory scale Pre-anxiety score- 30.0, Post score- 25.0, p=0.67, Change in anxiety Median-0
Linthoingambi A et al., (2022) [9]	India	36	5-12 years	Alginate impressions	Intellectual colour game	Passive	Chota Bheem Chutki scale, Mean Pre-score 2.666±0.92and post score-2.111±1.21 (p=0.023)
	India	36	5-12 years	Alginate impressions	Stress ball	Active	Chota bheem chutki scale, Mean Pre-score 2.611±1.47and post score - 1.666±0.92 (p=0.001)
Shekhar S et al., (2022) [15]	India	41	8-12 years	Inferior alveolar nerve block	Stress ball	Active	Significant difference in the pre and post mean MCDAS (f) scores (t= 22.26; p <0.001)
	India	41	8-12 years	Inferior alveolar nerve block	Audiovisual distraction	Passive	Significant difference in the pre and post mean MCDAS (f) scores (t=14.33; p<0.001)
Tyagi P et al., (2022) [19]	India	20	5-10 years	Intraoral periapical radiography	Lollipop taste distraction	Passive	RMS pictorial Scale, Mean Pre-score 3.500±0.759 and post score - 1.700± 0.571 [p=0.000]
	India	20	5-10 years	Intraoral periapical radiography	Visual distraction by projector method	Passive	RMS pictorial Scale, Mean Pre-score 3.800±0.833 and post score- 1.350±0.489 [p=0.000]
Kakkar T et al., (2023) [27]	India	30	4-7 years	Restorative procedure	Intellectual colour game	Passive interactive	Venham's anxiety rating scale-Mean Pre-score-1.7±0.9154; Post score - 1.233±1.7022
	India	30	4-7 years	Restorative procedure	Virtual reality	Passive	Venham's anxiety rating scale-Mean Pre-score-1.433±0.8584; Post score - 0.7±1.0726
Khan AK et al., (2023) [28]	India	15	4-7 years	Radiovisuography	Taste distraction	Passive	Venhams Picture scale, Mean Pre-score- 2.533±1.06; Post score- 1.40±0.7368 (p=0.002)
	India	15	4-7 years	Radiovisuography	Aroma therapy	Passive	Venhams Picture scale, Mean Pre-score- 2.467±1.06; Post score- 0.800±0.7746 (p=0.001)
Soltani P et al., (2023) [29]	Iran	16	20-40 years	Inferior alveolar nerve block	Stress ball	Active	The mean pain score in the anti-stress ball group was significantly lower (p<0.001)
Present study	India	30	4-10 years	Radiovisuography	IMR game using mini-projector	Active	RMS-Pictorial scale, Mean Pre-score- 3.57±1.19 Post score- 1.80±0.85 (p=0.001)
	India	30	4-10 years	Radiovisuography	MFD technique	Active	RMS-Pictorial scale, Mean Pre-score- 3.77±1.01; Post-score- 1.40±0.56 (p=0.001)

[Table/Fig-10]: Randomised clinical trials with different distraction techniques [9, 15,19,25-29].

dampening the stress response [30]. The present study delves into the effectiveness of two techniques, IMR and MFD, in improving inter-sensory integration, a crucial aspect of functional ability.

The investigation examines how the proprioceptive system, crucial for interpreting sensory input from joints and muscles, intricately interacts with somatosensation and integrates with visual and motor signals within the posterior parietal cortex. This integration enhances the nervous system's processing, organisation, integration, and motor planning capabilities, as cited by Guardado KE and Sergent SR, 2023 [30]. In the IMR technique, children are tasked with using proprioception to manipulate images with one hand while memorising patterns projected by a mini slide projector, engaging visual processing. On the other hand, MFD involves proprioception through inflating a balloon with an inflation bulb, providing visual distraction. By combining visual and tactile processing, researchers aim to provide a holistic approach to enhance sensory integration, potentially improving the child's ability to manage anxiety-inducing situations effectively. Additionally, dysregulation of 5-HT1A receptors occurs in children suffering from depression and related mood disorders. The active participation of a child by playing the IMR game or by squeezing the inflation bulb and inflating the balloon in the MFD technique distracts the child's attention, which might enhance endorphin production and boost their self-confidence [12].

Kakkar T et al., emphasised the challenge of managing disruptive behaviour in children aged 4-10 years during their initial dental visits [27]. As such, this study included this age group. The Modified Child Dental Anxiety Scale {MCDAS(f)}, a validated self-reporting tool, was employed to identify children with higher levels of state anxiety before entering the dental operatory (Howard KE and Freeman R, 2007) [10]. The study utilised the RMS-PS to assess pre- and postprocedural anxiety during RVG. This scale, featuring original photographs of various facial expressions, enhances its ease of use and acceptance among children of different ages [11].

Debs NN and Aboujaoude S utilised counting of various geometrical shapes and colours as a distraction during impression making [13]. However, this method relies on passive observation and fails to actively engage the child, potentially leading to attention reversal towards the procedure. Drawing from a similar principle, this study employed a mini projector where children actively interacted by changing slides and memorising displayed images. The findings of present study align with those of Linthoingambi A et al., (2022) and Debs NN and Aboujaoude S who evaluated children's gag reflex and anxiety during dental impressions using an intellectually stimulating game, yielding positive results [9,13].

In the present study, the IMR technique demonstrated success in 26 (86.67%) of children. The initial mean anxiety score significantly decreased from 3.57±1.19 to 1.80±0.85 post-IMR intervention, indicating a noteworthy 49.58% reduction in anxiety.

This reduction surpassed that achieved by the TSD technique, which only saw a 24.73% reduction in anxiety. These outcomes are consistent with studies conducted by Linthoingambi A et al., and Kakkar T et al., where authors compared passive visual distraction using IMR [9,27]. The significant anxiety reduction observed in the study could be attributed to the intricate interaction between somatosensation, visual processing, and memorisation. Blowing up a balloon and coughing engage pressure receptors in the chest, while ball squeezing activates mechanoreceptors, and all these techniques were found to be successful in alleviating pain during procedures, as observed by Aykanat Girgin B and Gol I [14]. However, a drawback arises from the lack of evidence supporting an optimal blowing force, and the effectiveness of blowing varies significantly among children with differing levels of control, posing challenges in standardising its application, as stated by Yin FF et al., [21]. Moreover, studies by Shekhar S et al., and Torres-Gomez J et al., have observed that using active stress ball distraction alone has limited effectiveness in reducing dental anxiety [15,26], but this is contradicted by Linthoingambi A et al.'s study results [9]. The current MFD technique activates mechanoreceptors through the compression of the inflation bulb. Unlike blowing up a balloon, this method doesn't require exerting pressure on the chest, thus eliminating the need to determine an optimal blowing force. Moreover, the balloon inflation process adds a visual component, without any chest pressure, that contributes to a significant reduction in anxiety levels (96.67%, n=29) in present study, outperforming traditional methods like TSD ($p<0.05$). The present study highlights the significant effectiveness of MFD and IMR in reducing children's anxiety, outperforming traditional methods. Statistical analysis supports these findings, dismissing the null hypothesis and emphasising the importance of actively engaging children during procedures for optimal anxiety mitigation. Both techniques were relatively practical methods to implement, a potential alternative to reduce distress or dental anxiety in children. Most of the children were satisfied operating the two new techniques. Both techniques were safe, child-friendly, and clinically feasible. They do not interfere with the RVG procedure and are capable of distracting children at ease with no technical difficulties.

Limitation(s)

The present study has a few limitations. Neither the investigator nor the participants were blinded due to the nature of the intervention. Inter-participant variability between the groups might result due to the parallel study design. The study involves a smaller sample size, and anxiety reduction was assessed based on a single parameter (RMS-PS). Vital parameters like blood pressure, oxygen saturation, etc., were not taken into consideration.

CONCLUSION(S)

The MFD approach demonstrated exceptional efficacy, leading to a remarkable reduction in anxiety among 29 (96.67%) of the children. Following closely behind was the IMR technique, which effectively alleviated anxiety in 27 (86.67%) of cases. Conversely, the TSD technique exhibited the least anxiety reduction, with only 56.67% effectiveness. These findings underscore the potency of MFD in mitigating anxiety among children, highlighting its superiority over traditional methods such as TSD. In conclusion, while fundamental behaviour guidance techniques such as TSD can mitigate procedural anxiety to a certain degree, employing distraction methods to divert the patient's attention from the treatment area proves highly beneficial. MFD and IMR, besides being cost-effective, readily accessible, and user-friendly, emerge as promising alternative approaches for effectively managing procedural anxiety in children during RVG procedures.

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