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Original Research

'Scream's to Stream's': Role of AI in Paediatric dentistry

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ABSTRACT:

Aim: To compare and evaluate the anxiety levels and pulse rate of children with and without using mobile Applications. **Methodology:** A total of 60 children in the age group of 4 to 8 years were included and randomised into two groups. Group A—BehaviourModification using Mobile application for 7daysand Group B—Control group. The study was done in two appointments. Pulse rate, Facial image scale (FIS), and Venham picture test (VPT) scores were recorded, before and after the intervention. Version 23 of SPSS software was used to conduct the statistical analysis after the data were entered into a spreadsheet. **Result:** At the second visit, the intervention group (Group A) showed significantly lower pulse rate, FIS, and VPT scores compared to the control group ($p = 0.001$), indicating reduced anxiety. No significant differences were observed at baseline ($p > 0.05$). Independent t-tests were used for intergroup comparisons, while repeated measures ANOVA and paired t-tests evaluated intragroup changes. Data normality and homogeneity were confirmed using the Shapiro–Wilk and Levene's tests. Structured usage of the mobile application proved effective in alleviating dental anxiety and enhancing cooperative behaviour in children. **Conclusion:** Behaviour Modifications using Mobile application is more efficient and promising in 4–8-year-old children to reduce anxiety and attain co-operative behavior during the dental treatment as compared to children not using similar mobile applications.

Keywords: Behaviour modification, AI (Artificial intelligence),Mobile application, "MASHA AND THE BEAR: DENTIST"), Pulse Rate, Facial Image Scale (FIS),Venham picture test (VPT).

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INTRODUCTION

"The goal of paediatric dentistry is not just to fix teeth but to fix the fear; to create a positive dental experience that lasts a lifetime.**"**

"An unpleasant state accompanied by a fear of danger from within or a learnt process of one's own environment" is one definition of anxiety.[1] Dental anxiety is defined as a condition of anxiety that arises during dental procedures and is associated with unfavorable presumptions that are usually connected to unpleasant past experiences and negative attitudes from family members.[2] The children, parents, and dental team all experiences difficulties as a result of anxiety.[3]

According to Corah et al., dental anxiety is a patient's reaction to anxiety that is strongly tied to their dental appointments.[4] To address these issues,dental anxiety screening is necessary to facilitate diagnosis and treatment and ensure an enjoyable dental visit.[5]

Numerous advanced, verbal, and pharmacological interventions have been employed to address the cooperative and anxious behaviours of children.[6] Future research should focus more on non-pharmacologic behaviour control strategies, according to the American Academy of Paediatric Dentistry[7]. Tell-Show-Do (TSD), Improving control, Voice control, Modeling positive reinforcement, Desensitization, Sedation, and General Anesthesia are some of the behaviour management strategies used to treat dental anxiety.[8]

"According to the principles of Modern Learning theory, Behavior Modification is an attempt to alter people's emotions and behaviours for the better", Eysenck said, emphasizing this idea.[9]First dental experiences have a big impact on a child's attitude toward dentistry and the outcome of their dental care.[10]A youngster between the ages of 4 and 6 may not have a mental framework for the treatments

performed by the dentist, making it difficult for them to comprehend dental care and the numerous dental equipment used for treatment.[11]

In the evolving landscape of paediatric dentistry, the integration of Artificial Intelligence (AI) offers an exciting shift—from traditional fear-based responses ("screams") to calm, interactive digital engagement ("streams"). With AI-enabled applications like "MASHA AND THE BEAR: DENTIST," children are no longer passive patients but active digital explorers of the dental world.

This study investigates how AI tools can transform anxiety into understanding, fear into familiarity, and ultimately, screams into streams.

In today's digital era, children spend considerable time on mobile devices, engaging with games and applications. While excessive or unstructured screen time can have adverse effects, structured and intentional use of digital media can serve educational and therapeutic purposes. By leveraging screen time in a precise and targeted way—such as through mobile apps designed to familiarize children with dental procedures—it becomes possible to transform a typically passive activity into an engaging tool that reduces fear and builds comfort with the dental environment.

There has also been an increase in the number of mobile applications related to the healthcare sector. Based on various surveys, it was found that there are approximately 168 pediatric dental applications accessible for iOS devices and 151 for Android phones.These advancements also have an impact on pediatric dentistry, and the number of applications in this specialty continues to rise everyday.In their assessment of patients' attitudes toward dental apps, Bohn et al. discovered that patients approved of the apps, that they were beneficial and informative, andthey enhanced their interactions with the dentist.[12]

Various games are also available on app store for children to become acquainted with the dentist. "MASHA AND THE BEAR: DENTIST" is accessible on the Google Play Store for smartphones running iOS and Android. In a fascinating manner, the app helps the children understand the kind of treatment they might receive. The software allows users to be virtual dentists and perform dental procedures such as extractions, restorations, and oral prophylaxis. Patients can be taken into confidence and shown how painless a dental visit can be.

Therefore, the purpose of this study was to compare and evaluate the anxiety levels and pulse rate of children with and without using mobile applications.

MATERIALS AND METHODS

A total of 60 children, aged 4-8 years, who visited for their first dental appointment, were included as study participants. Informed consent was obtained from the children's guardian/parents prior to their participation. The study was conducted in the Department of Paediatric and Preventive Dentistry, RUHS College of Dental Sciences, Jaipur **(from September 2023 to November 2023),** after the acquisition of ethical clearance from the institutional ethics committee **RUHS-CDS/EC/PG-SS-02/2023) to** conduct the clinical trial.

Inclusion criteria

1. Children in age group of 4-8 years.
2. Children with early carious lesion (not involving pulp)
3. Children with Frankl's Behaviour rating scale 2 and 3.

Exclusion criteria

1. Children with systemic diseases, developmental disorders & impaired cognitive functions.
2. Patients/Guardians who refused to participate in study.

The recruited children were randomized using block randomization and assigned to one of the following two groups:

- **Group A - Behaviour modification using mobile application for 7 days**
- **Group B – Control group.**

FIRST DENTAL VISIT

For the children who visited the OPD of Department of Paediatric and Preventive Dentistry in the hospital, Dental counselling for the child was done, followed by their routine oral examination. The parents/patient were then introduced to mobile application (android/iOS) "MASHA AND THE BEAR: DENTIST") (Figure 1).Then baseline data was recorded: Pulse rate [using Pulse oximeter], FIS (Facial image scale) (Figure 2) and VPT (Venham picture Test) (Figure 3) score.Parents/patient is then instructed regarding duration & method of mobile application usage (2-3 min daily under the parents' supervision) & recalled after seven days(Figure 4).

SECOND DENTAL VISIT

On the second visit, participants in both groups received the same treatment. They entered the clinical area, where occlusal cavity was prepared for tooth restoration.

The responses of the participants were recorded in two stages:

- Baseline data was recorded (Before starting the dental treatment) and following the dental treatment: pulse rate (using Pulse oximeter), FIS and VPT.
- Anxiety reaction and pulse rate were assessed independently for each participant.
- Blinding: The principal investigator was unaware about which participants belonged to which group. (Figure 5).

The data wasthen entered in a spreadsheet, and Statistical analysis was performed using SPSS software version 23 (IBM, Chicago, United States).

Statistical Analysis

The data for the present study was entered in the Microsoft Excel 2007 and analysed using the SPSS Statistical Software Version 23.0. The descriptive statistics included mean, standard deviation frequency and percentage. The level of the significance for the present study was fixed at 5%. The intergroup comparison will be done using the independent t tests and intragroup comparison will be done using the Repeated Measures ANOVA and Paired t-test The Shapiro–Wilk test was used to investigate the distribution of the data and Levene's test to explore the homogeneity of the variables.

TABLE 1: INTERGROUP COMPARISON OF PULSE RATE BETWEEN THE GROUPS

Time Intervals	Groups	N	Mean	SD	Std Error	P value
1st Visit	Control Group	30	90.93	16.74	3.05	0.413
	Intervention Group	30	95.26	9.78	1.78	
2nd Visit - Before intervention	Control Group	30	97.23	14.29	2.60	0.001
	Intervention Group	30	84.86	8.52	1.55	
2nd Visit – After intervention	Control Group	30	104.23	16.14	2.94	0.001
	Intervention Group	30	80.40	6.65	1.39	

Independent t test with p value less than 0.05 is significant

TABLE 2: INTERGROUP COMPARISON OF FAS BETWEEN THE GROUPS

			Mean	SD	Std Error	
1st Visit	Control Group	30	2.65	1.184	0.216	0.861**(NS)**
	Intervention Group	30	2.60	1.037	0.189	
2nd Visit - Before intervention	Control Group	30	2.80	0.909	0.166	0.001 **(S)**
	Intervention Group	30	1.83	0.746	0.136	
2nd Visit – After intervention	Control Group	30	3.16	1.188	0.217	0.001 **(S)**
	Intervention Group	30	1.30	1.087	0.198	

TABLE 3: INTERGROUP COMPARISON OF VPT SCORE BETWEEN THE GROUPS

			Mean	SD	Std Error	P value
1st Visit	Control Group	30	3.20	1.51	0.277	0.473**(NS)**
	Intervention Group	30	2.93	1.33	0.244	
2nd Visit - Before intervention	Control Group	30	3.23	1.15	0.211	0.001 **(S)**
	Intervention Group	30	1.83	1.01	0.186	
2nd Visit – After Intervention	Control Group	30	3.90	1.49	0.273	0.001 **(S)**
	Intervention Group	30	1.16	1.26	0.230	

FIGURE 1: FIRST VISIT

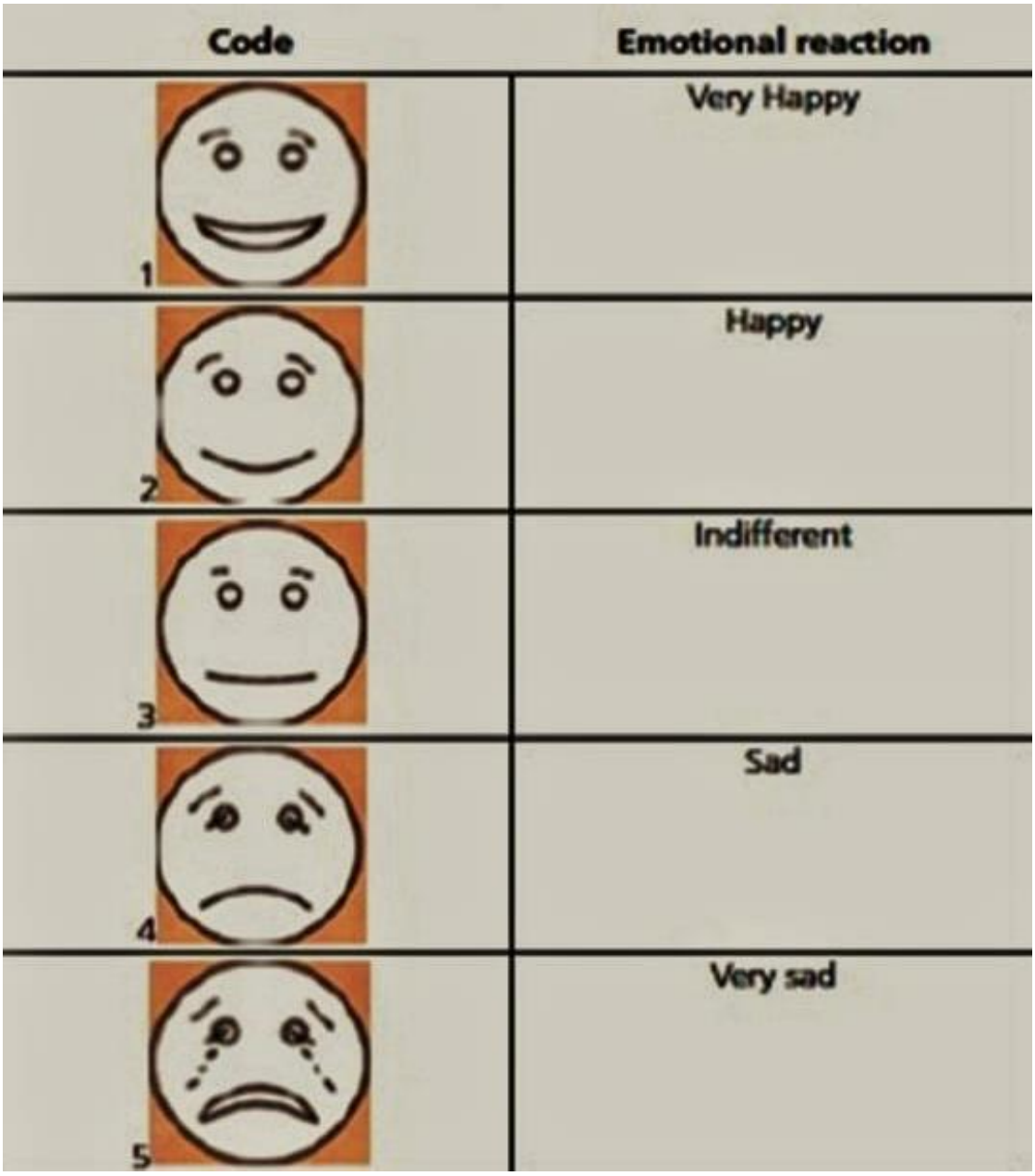

FIGURE 2: FACIAL IMAGE SCALE

FIGURE 3: VENHAM PICTURE TEST

FIGURE 4: SENT BY PARENT

FIGURE 5: SECOND VISIT

RESULTS

60 participants weredivided into two groups using a lottery method. Group A: Behaviour modification using mobile application for 7 days (n = 30) and Group B:Control group (n = 30). At the second visit,Mean Pulse Rate, Mean FIS Score, Mean VPT Score was lower in both groups as compared to first visit. (Table 1-3)

For the FIS Score, the mean FIS score was significantly lower in the Group A as compared to the Group B in second visit. At the first visit, there was no difference in the FIS Score between the groups (Table 2).

For the VPT Scores, mean VPT score was significantly lower in the Group A as compared to the Group B in second visit. At the first visit there was no difference in the VPT Score between the groups (Table 3).

DISCUSSION

The goal of this study was to compare and evaluate the anxiety levels and pulse rate of children with and without the use of mobile applications. Piaget's theory of cognitive development states that children in the preoperational stage, which lasts from 4 to 7 years of age, are characterized by developing their reading, attention, and concentration skills. This stage reflects the child's readiness to interact, communicate, and learn through sensory and experiential methods. Constructivist learning theory supports the idea that children understand reality by touching, experiencing, and observing—they construct their knowledge through active engagement with the world.

The results strongly indicate that structured use of AI-enhanced mobile applications contributes significantly to lowering dental anxiety. This transformation—"from screams to streams"—is emblematic of how artificial intelligence is reshaping paediatric dentistry. By converting potentially traumatic experiences into engaging, educational encounters, AI becomes more than a technological tool; it becomes a behaviour guide and anxiety buffer.

New technologies and interactive applications provide innovative environments to deliver healthcare services, especially to children and adolescents. Smartphones and internet access enable quick, direct communication between patients and healthcare providers, enhancing overall health management. In this context, mobile applications have emerged as valuable tools for promoting oral hygiene, educating patients, and reducing dental anxiety. They offer features such as visual demonstrations, reminders, educational games, and even tele-health services. As technology continues to evolve, its integration into dental care has the potential to significantly improve outcomes and reduce treatment-related fear. [13]

In this study, the mobile application "MASHA AND THE BEAR: DENTIST," freely available on smartphones, was introduced to 60 paediatric participants, aged 4–8 years who visited the Paediatric dental department for routine oral examination. At the second visit, Statistically Significant improvements were observed in the Mean Pulse Rate, Mean Facial Image Scale (FIS) scores, and Mean Venham Picture Test (VPT) scores both before and after treatment in the test group. This suggests that mobile apps may effectively reduce anxiety by familiarizing children with dental tools and procedures in a playful, engaging manner. The data was encouraging and supports the productive use of digital media in paediatric dental care.

In this study, screen time was not used randomly or passively, but in a precise, structured, and clinically guided way to familiarize children with dental settings. By turning digital exposure into a targeted learning and desensitization tool, this approach demonstrates how screen time—when purposefully implemented—can become a powerful aid in reducing dental anxiety.

Serap Sinan Özvarış et al. also supported the use of mobile applications such as the "Brush DJ" app, which promotes better brushing habits in children by turning oral hygiene into a daily, fun activity. Campos et al. (2014) developed and evaluated a mobile educational app for preschoolers on oral health, emphasizing the importance of early digital education. However, very few studies have focused on the use of

mobile technology to manage dental anxiety in children. [14]

In a study by Meshki et al.[15], children were instructed to play a dental simulation game ("Crazy Dentist – Fun Games 1.0") twice a day for two weeks before their dental visit. The results showed a significant reduction in heart rate, indicating decreased anxiety, especially during local anesthesia and drilling. The researchers emphasized the importance of delivering age-appropriate pre-treatment information, and suggested that this content could be integrated into future mobile app features.

Another related study by Deshpande et al. (2023) showed that using flashcards (Dental Pictionary) with euphemisms were more effective than euphemisms alone in alleviating the anxiety and improving cooperation among children aged 4–6 during dental procedures. [17]

Similarly, Lior Zaidman et al. (2022) demonstrated that Virtual Reality goggles helped decrease pain and anxiety during rubber dam placement, although their benefits were limited during local anesthesia. [18]

Kevadia et al. (2020) compared Tell-Play-Do, mobile dental apps, and traditional Tell-Show-Do (TSD) techniques, concluding that Tell-Play-Do could serve as a strong alternative to TSD. [19]

Aitkin et al.[20] explored children's natural curiosity about dental procedures and found that despite having interactive aids, they still preferred to observe the procedures directly. They suggested that frequent exposure to technology might reduce the novelty and effectiveness of digital distractions, making traditional distraction methods more effective in some cases. Moreover, their findings questioned the effectiveness of music alone as a distraction during treatment, calling for more robust studies and analyses.

According to the results of this study, children who used the mobile application far more frequently demonstrated enhanced cooperation and a positive response at the second visit. This indicates a promising role for digital engagement in managing paediatric dental anxiety. However, despite these encouraging findings, the approach currently has limited scientific validation and requires further randomized controlled clinical trials to establish its efficacy more conclusively.

CONCLUSION

The use of AI-powered mobile applications, when strategically implemented, is a futuristic yet practical solution that helps convert children's dental "screams" into calm "streams", improving compliance, reducing anxiety, and setting the tone for lifelong positive dental experiences. These enable families to cope with dental emergencies, and assist dentists in integrating technology with clinical practice.

The effect of screen time on our eyes proves that when everything is balanced, things go well.Behaviour Modification using mobile applications is more efficient in 4–8-year old children to reduce anxiety and attain co-operative behaviour during the dental treatment as compared to children not using similar mobile applications.

Limitations

- Given the limited sample size used in the study, larger sample sizes are advised for future research.
- Too much screen time can harm the eyes, proving that keeping things in balance is key.

Ethical Issues

Ethical approval was obtained from the Institutional Ethical Committee (Reference No. RUHS-CDS/EC/PG-SS-02/2023)

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