

Comparison of Digital Games as a Behaviour Modification Among Anxious Children Aged 4-8 Years

Yash Bafna^{1*} Matangi Joshi² Shoba Fernandes³ Krupal Chokshi⁴ Dharti Patel⁵

¹Reader, Department of Pediatric and Preventive Dentistry, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.

²PG Student, Department of Pediatric and Preventive Dentistry, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.

³Professor and Head, Department of Pediatric and Preventive Dentistry, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.

⁴Reader, Department of Pediatric and Preventive Dentistry, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.

⁵Senior Lecturer, Department of Pediatric and Preventive Dentistry, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.

ABSTRACT

Aim: The aim of this study was to compare the techniques of digital dentist game, and a conventional video game of children's choice method in the behavior modification of anxious children in the dental operatory.

Materials and Methods: 40 children in the age group of 4-8 years, with Frankl's behavior rating score of 2 or 3, requiring, Class - II cavity restorations were divided into two groups. The groups were Group 1: children's choice game (CCG). Group 2: Digital dental game (DDG); and each group comprised of 20 children. Pulse rate and blood pressure, Facial Image Scale (FIS) and Frankle's behavior scales were used to quantify anxious behavior. patients of both the groups preoperatively and post operatively after modelling them with smartphone app.

Results: Both smartphone applications showed reduction in all anxiety parameters, however, the reduction in anxiety parameters was almost 50% in both the games for behavior modification of anxious children.

Conclusion: DDG and CCG both are effective distraction techniques in management of anxious children in the dental operatory.

Keywords: Behavior modification, digital games, children.

INTRODUCTION

Dental anxiety being attributed by many as a major cause to avoid seeking dental care by children as well as young adults, proper communication is important, and is a big challenge in the dental office.¹ McElory (1895) has beautifully stated that 'Although operative dentistry may be perfect, the appointment is a failure if a child departs in tears', it stresses the importance of behavior management over technical excellence in pediatric dentistry. Fear

and anxiety are often associated with child's first dental visit and have a negative impact on child's psychology making the dental appointment an unpleasant one.¹

Management strategies are categorized under behavioral and pharmacological, among them distraction technique is shown to be a valuable tool.^{2,3} Distraction is broadly classified into active and passive distraction techniques. Active forms

Received: Feb. 13, 2021; Accepted: Mar. 9, 2021

*Correspondence Dr. Yash Bafna.

Department of Pediatric and Preventive Dentistry, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat, India.

Email: dr.yashbafna@gmail.com

promote the child's involvement into an activity during a dental procedure. These techniques involve several sensory components of the child. Some of the employed forms are interactive toys, singing songs, squeeze balls, controlled breathing, guided imaginary, and relaxation. Passive forms on other hand require the child to remain calm and quiet during a procedure.

In this case, distraction is achieved by observation of the activity or stimulus rather than their overt participation. It includes auditory and audiovisual techniques. Several technological options are available for both visual and auditory distraction, such as background music, television sets, Digital games, and virtual reality (VR) glasses.^{4,5}

Since smart phones have become very common and technologically very advanced, they can be equipped with proper simulation games to act as a new, convenient, and economical way to reduce dental anxiety and desensitize children who require dental treatments⁶

Hence, this study conducted with an aim to evaluate the effectiveness of Smartphone applications in reducing dental anxiety among pediatric patients.

MATERIALS AND METHODS

In this Randomized Control Trial, 40 children were equally divided into two groups. Group 1: Digital Dental Game (DDG) n=20, Group 2: Children's Choice Game (CCG); n= 20.



Fig 1a: Digital dental game.



Fig 1b: Children's Choice Game.



Fig 2: Biofeedback.



Fig 3: Facial Anxiety Scale.

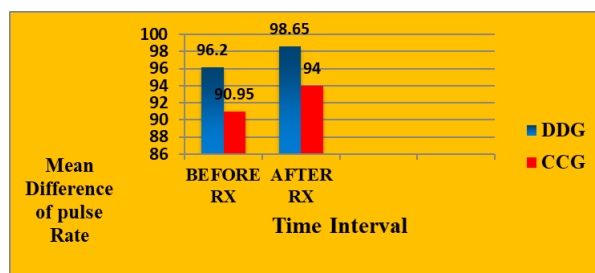
Inclusion criteria:	Exclusion criteria:
- Children with Frankl's behavior rating score of 2 or 3 and no prior dental experience - Class I carious lesion on the primary molars, limited to enamel and 2/3rd of dentin and requiring a restoration without local anesthesia	- Children with Frankl's behavior rating score of 1 or 4 - Extensively damaged teeth - Teeth with lesions involving pulp or extending below gingiva - Carious teeth with pre-shedding mobility - Medically and developmentally compromising conditions - Patients with mental / cognitive problems

Biofeedback, Facial Image Scale (FIS) and Frankl's behavior scales (FBRS) were used to quantify anxious behavior. All children were treated by a single operator in order to avoid bias. The behavior of the child patient before and after the procedure was assessed using (FBRS). The patient was asked to select the image from the FIS that he/she can closely associate with at that moment and the patient's pulse rate and blood pressure were noted.

The data collected was tabulated and subjected to the following statistical analyses performed using SPSS statistical software package Version 20.0. A one-way ANOVA followed by Tukey's HSD post-hoc analysis was used

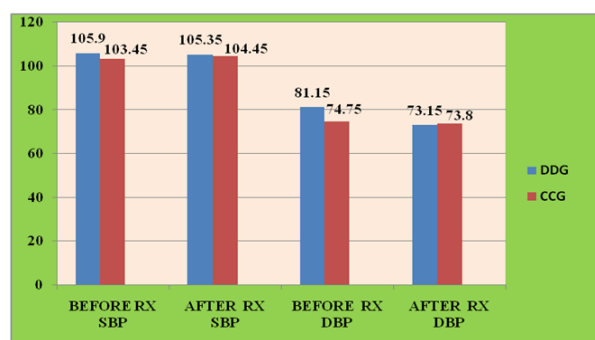
RESULT

Graph 1: Biofeedback Mean Difference of Pulse Rate.

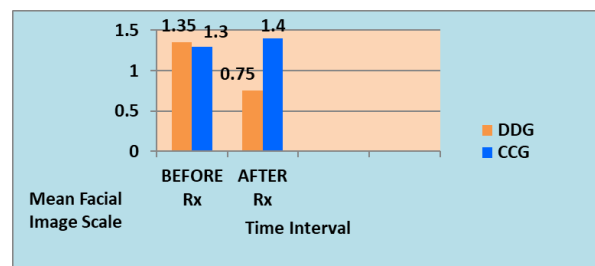


There was a significant reduction in mean pulse rate, after treatment in Group 1 was 2 and Group-2 was 3 indicating a greater anxiety significant change in Group 1 compared to Group 2.

Graph 2: Mean Difference of blood pressure (mmHg).



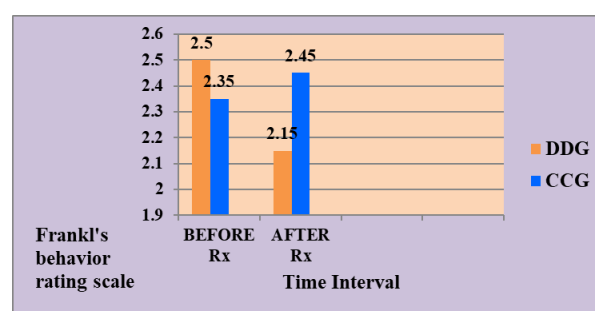
There was a decrease in post-intervention blood pressure, both systolic and diastolic, in both the groups compared to pre-intervention values, where statically significant difference was observed in diastolic blood pressure. Which indicates reduced in dental anxiety in both the groups.



Graph 3: Mean Facial Image Scale (FIS).

A statistically significant difference between the mean FIS scores was obtained after dental procedure in Group 1 and Group 2 which indicates a greater reduction of dental anxiety in Group 1 compared to Group 2.

Graph 4: Mean Frankl's behavior rating scale.



Frankl's scale scores after the dental procedure showed that patients exhibited definitely positive behavior in Groups 1 compared to Group 2 which was statistically significant.

DISCUSSION

The management of children's behavior is an integral component of pediatric dental practice. the techniques are employed to establish communication, alleviate fear and anxiety, facilitate delivery of quality dental care, build a trusting relationship between dentist, child, and parent, and promote the child's positive attitude toward oral/dental health.⁷ study is divided into three parameters: 1) Pulse oximeter 2) FIS 3) FBRS

Other significant means to assess dental fear and anxiety are physiological parameters which include blood pressure and pulse rate. It is well-established that fear or anxiety-provoking situations result in sympathetic stimulation, which causes an increase in pulse rate and blood pressure.^{8,9,10} that was used as a first scale to record the anxiety in this study. Second parameter which was used in this study is

FIS. It comprises a row of five faces ranging from very happy to very unhappy.¹⁰Third parameter, FBRs is one of the most widely used behavior evaluation scales in pediatric dental research and in daily clinical practice.^{11,12}

In the present study, there was a significant reduction in mean pulse rate, after treatment in Group-1 (DDG) was 2 and Group-2 (CCG) was 3. Earlier studies done by Radhakrishna et al.¹³ concluded that DDG group indicating low anxiety levels compared to others. Pulse rate is a direct measure of physiological arousal and its increase is attributed to stress during dental procedures. Some other studies done by Shah HA¹⁴, Patil VH¹⁵, Mershi R¹⁶, Lee JH¹⁷ concluded that DDG significantly reduced the pulse rate in anxious children.

In the present study when the blood pressure was compared in both the groups there was a decrease in blood pressure values after the treatment. Which was statistically significant and suggested greater reduction of dental anxiety, Shah HA¹⁴ observed significant reduction in systolic and diastolic BP which is in accordance with the current study.

The FIS is repeatable, easy to use, quick, reliable and valid. It has been used to quantify anxiety in children in various studies.^{18,19}Current study shows a statistically significant difference between the mean FIS scores indicating a greater reduction of dental anxiety in Group-1 compared to Group-2. Earlier studies done by Radhakrishna et al.¹³ evaluated with FIS and concluded that DDG group shows lower anxiety levels compared to others.

The Frankl's scale scores after the dental procedure showed that patients exhibited definitely positive behavior in Groups 1 compared to Group -2. similar outcomes were observed by other reserchers.²⁰⁻²¹

A study conducted by Allani S et al ²¹ suggested that active distraction that enhances visual, mental, and motor participation of the child patient would provide anxiolysis and analgesia that surpasses the effect of passive distraction.

CONCLUSION

It is the responsibility of pedodontists to make dentistry as child-friendly and pain-free as possible to bring about positive changes in the behavior of children during dental treatment. DDG and CCG

both are effective distraction techniques in management of anxious children in the dental operatory.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

REFERENCES

1. Kaur R, Jindal R, Dua R, Mahajan S, Sethi K, Garg S. Comparative evaluation of the effectiveness of audio and audiovisual distraction aids in the management of anxious pediatric dental patients. *J Indian Soc PedodPrev Dent.* 2015; 33:192-203.
2. Asl Aminabadi N, Erfanparast L, et al. The impact of virtual reality distraction on pain and anxiety during dental treatment in 4–6 year-old children: a randomized controlled clinical trial. *J Dent Res Dent Clin Dent Prospects.* 2012;6:117–124.
3. Richmond BJ, Sato T. Enhancement of inferior temporal neurons during visual discrimination. *J Neurophysiol.* 1987;58:1292–1306. doi: 10.1152/jn.1987.58.6.1292.
4. Armfield JM, Spencer AJ, et al. Dental fear in Australia: who's afraid of the dentist? *Aust Dent J.* 2006;51:78–85.
5. Abdelmoniem SA, Mahmoud SA. Comparative evaluation of passive, active, and passive-active distraction techniques on pain perception during local anesthesia administration in children. *J Adv Res.* 2016;7(3):551–556.
6. Anthonappa RP, Ashley PF, Bonetti DL, Lombardo G, Riley P. Non-pharmacological interventions for managing dental anxiety in children. *Cochrane Database Syst Rev.* 2017 Jun;6: Laila Bailey. Strategies for Decreasing Patient Anxiety in the Perioperative Setting. *AORN Journal.* 2010; 92(4):445-458.
7. Yelderman M, William N. Evaluation of pulse oximetry. *J Anesth*1983;59:349-52
8. Aka W, Jedrychowski JR. Intra operative and post operative physiologic monitoring practices

- by pediatric dentists. J Clin Pediatr Dent 1995;19:91-8.
9. Shinohara S, Nomura Y, Shingyouchi K, Takase A, Ide M, Moriyasu K et al. Structural relationship of child behavior and its evaluation during dental treatment. J. Oral Sci. 2005;47(2):91-96.
10. Frankl SN, Shiere FR, Fogels HR. *Should the parent remain with the child in the dental operatory?* J Dent Child. 1962;29:150-63
11. Sharma A, Tyagi R. *Behavior assessment of children in dental settings: A retrospective study.* Int J Clin Pediatr Dent. 2011;4:35-9.
12. Radhakrishna S, Srinivasan I, Setty JV, DR MK, Melwani A, Hegde KM. Comparison of three behavior modification techniques for management of anxious children aged 4–8 years. Journal of Dental Anesthesia and Pain Medicine. 2019 Feb 1;19(1):29-36.
13. Shah HA, Swamy KN, Kulkarni S, Choubey S. Evaluation of dental anxiety and hemodynamic changes (Sympatho-Adrenal Response) during various dental procedures using smartphone applications v/s traditional behaviour management techniques in pediatric patients. Int J Appl Res. 2017;3:429-33.
14. Patil VH, Vaid K, Gokhale NS, Shah P, Mundada M, Hugar SM. Evaluation of effectiveness of dental apps in management of child behaviour: A pilot study. International Journal of Pedodontic Rehabilitation. 2017 Jan 1;2(1):14.
15. Meshki R, Basir L, Alidadi F, Behbudi A, Rakhshan V. Effects of pretreatment exposure to dental practice using a smartphone dental simulation game on children's pain and anxiety: A preliminary double-blind randomized clinical trial. Journal of Dentistry (Tehran, Iran). 2018 Jul; 15(4):250.
16. Lee JH, Jung HK, Lee GG, Kim HY, Park SG, Woo SC. Effect of behavioral intervention using smartphone application for preoperative anxiety in pediatric patients. Korean journal of anesthesiology. 2013 Dec;65(6):508.
17. Rank RC, Rank MS, Vilela JE, Ogawa WN, Correa MS. Dental anxiety and behavior in young children undergoing different distraction techniques. Pesq Bras Odontoped Clin Integr 2017; 17: 1-11
18. Abanto J, Vidigal EA, Carvalho TS, Bönecker M. Factors for determining dental anxiety in preschool children with severe dental caries. Braz Oral Res 2017; 31: e13.
19. Shah U, Bhatia R. Effectiveness of Audiovisual Distraction Eyeglass Method Compared to Tell-Play-do Technique Among 4–7-year-old Children: A Randomized Controlled Trial. Int J Oral Care Res. 2018;6:1-7.
20. Krishnappa S, Srinath S, Vishwanath SK, Bhardwaj P, Singh R. Evaluation of facial image scale and Venham picture test used to assess dental anxiety in children. Journal of Indian Association of Public Health Dentistry. 2013 Jul 1;11(3):31.
21. Allani S, Setty JV. Effectiveness of distraction techniques in the management of anxious children in the dental operatory. IOSR J Dent Med Sci. 2016;15:69-73.