

Comparative study of television and smartphone as distraction aid with conventional behaviour management technique in 4-8 year old anxious pediatric dental patients – A non randomized clinical trial

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Abstract

Introduction: Dental fear and anxiety among pediatric patients is a great challenge posed to dentist in their everyday dental practice. In this digital era, there is wider acceptance of smartphones irrespective of age barriers. So its positive aspects can be utilized in pediatric dentistry as a behavior management to tackle the child’s dental fear and anxiety.

Aim: The aim of this study to compare and evaluate the effectiveness of televisions and smartphones as distraction aids with conventional behaviour management in anxious pediatric dental patients. **Materials and methods:** A total of 120 children of the age group 4-8 years, who were in need of restorative treatment without using local anesthesia, were assigned in to three groups: group I: control group, group II:

cartoon films in television as distraction aid group and group III: games in smartphones as distraction aid group. Child anxiety level was assessed using a combination of anxiety rating parameters before and after the procedure. The physiological parameter (heart rate) and two behavioral parameters (Venham's anxiety rating scales and facial image scale) were recorded. Data were analyzed with independent sample t-test and ANOVA ($P < 0.05$).

Results: A significant difference in behavioural parameters was observed between the three groups. **Conclusions:** Games in smartphone offers a new concept of distraction aid in pediatric dentistry. This promising distraction method diminishes the unpleasantness often associated with dental procedures and offers a relaxed state in children.

Keywords: Anxiety, Distraction, Venham's Clinical Anxiety Rating Scale, Facial Image Scale, Pediatric Dental Patient

Introduction

McElroy (1895) quoted that 'Although operative dentistry may be perfect, the appointment is a failure if a child departs in tears' [1].

Dental fear and anxiety is a strong negative feelings associated with dental treatment or anticipation of dental treatment. The prevalence of dental fear among children has been reported to range between 5% and 20% with a mean prevalence of 11% [2]. Dental fear and anxiety often begins during childhood or adolescence. It leads to poor oral health manifesting as untreated caries, missing teeth or periodontal problems. Behaviour management is fundamental to the successful treatment of children. Disruptive behaviour can interfere significantly with providing quality dental care, resulting in increased delivery time and risk of injury to the child. In fact, surveys of clinicians have found that dentists consider the

uncooperative child to be among the most troublesome problems in clinical practice. Both pharmacological (e.g. sedation, general anesthesia) and non-pharmacological (e.g. distraction, communication, desensitization, tell show do, modeling, reinforcement) techniques have been developed for management of child's behaviour at dental operator. Currently aversive methods are becoming less popular among dentists and parents and non-aversive methods like distraction are gaining popularity. Distraction approach is used to modify child's discomfort by disrupting his/her attention away from the main task to accomplish successful treatment, but literature reports sparse data to assess the efficacy of distraction methods in pediatric dental patients. Different methods of distraction includes video games, watching videos and television, pictures, cartoons and audio taped stories. Nowadays children like to play with new gadgets and they are familiar with touch screen devices, smart phones, iPad, tablet computers and even virtual private theatre system like audio visual eye glasses.

Therefore, this study was undertaken to compare and evaluate the effectiveness of games in smart phones as a new method for distracting the child during stressful dental procedures compared to cartoon films in television which promotes distraction in its basic form.

Materials and Methods

The present study is a non-randomised clinical trial. The ethical approval for the study was obtained from our Institutional Review Board with ethical committee number IEC/M/15/2018/DCK. Physically and mentally healthy children with carious lesion which needs a cavity preparation using the airtor for restoration were included in the study. The children who have experienced the airtor hand piece earlier, those with previous unpleasant dental experiences, those with acute painful oral conditions, children with known systemic diseases, and

those with a history of recent prolonged hospitalization. Differently abled children and those who did not provide the required consent were also excluded from the study. Children in the age group of 4-8 years reported to the outpatient department who had satisfied the inclusion criteria were recruited into either Group I (control group) or Group II (cartoon films in television as distraction aid) or group III (games in smartphones as distraction aid) with 90 patients in each group (total 120 patients). In group I, conventional communication was used as behavior management technique [figure 1]. In the group II, among 4 cartoon film, Tom and Jerry, Sponge Bob Square, Dora the explorer and Shaun the Sheep, one is played as per the choice of child for 45 minutes in television mounted near to dental chair or in the dental operatory wall throughout treatment procedure which was used as a distraction aid [figure 2] and in the group III, among 4 videogames choices such as, Temple-Run, Car Race, Air Hockey Gold and Paper Toss in the smartphone provided by the investigator, were used as distraction aid [figure 3]. Child was also allowed to play the game in between the treatment procedure for total duration of 45 minutes including the treatment time.



Figure 1: Group I- Control group



Figure 2: Group II - Cartoon films in television as distraction method



Figure 3: Group III - Games in smartphones as distraction method

Each child in both groups had two dental visits. In the first visit, screening was done, procedure was explained and consent was obtained from the parent. In the second visit, cavity preparation was done using airtor with round bur followed by GIC restoration.[Figure 4] shows the armamentaria and gadgets used in the study.



Figure 4: Armamentaria and gadgets used in the study
Child anxiety level was assessed by the combination of anxiety rating parameters before and after the procedure.

Pulse rate/heart rate was measured using pulse oximeter. Each patient's behavioral response was assessed by a second person who was not involved in the treatment procedure or grouping of the patients using Facial Image Scale^[3] [Figure 5]. And Venham's Anxiety Rating Scale^[4] [Table 1]

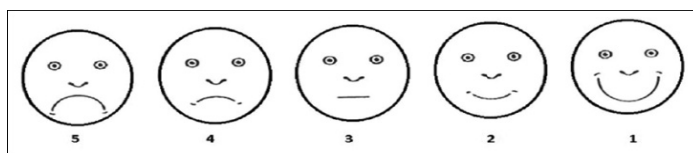


Figure 5: Facial Image Scale

| Score | Features |
|-------|---|
| 0 | Relaxed: smiling, willing and able to converse, displays behavior desired by the dentist. |
| 1 | Uneasy: concerned, may protest briefly to indicate discomfort. Hands may remain down or partially raised. Tense facial expression, may have tears in eyes. Capable of cooperating |
| 2 | Tense: tone of voice, questions and answers reflect anxiety. During stressful procedure, verbal protest, crying, hands tense and raised, but not interfering very much. Protest more distracting and troublesome. Child still complies with request to cooperate. |
| 3 | Reluctant: pronounced verbal protest, crying. Using hands to try to stop procedure. Treatment proceeds with difficulty. |
| 4 | Interference: general crying not related to treatment, prominent body movements sometimes needing physical restraint. Protest disrupts procedure. |
| 5 | Out of contact: hard loud crying, screaming unable to listen to verbal communication, trying to escape. Physical restraint required. |

Table 1: Venham's Anxiety Rating Scale

'Venham's Anxiety Rating Scale is a six point scale with scale points anchored in objective, specific and readily observable behaviour and Facial image scale comprises of a row of five faces ranging from very happy to very unhappy. The child was asked to point at which face/emotion they felt most like at that moment before the start of procedure and also after the completion of treatment. The scale is scored by giving a value of 1 to the most positive effect face and 5 to the most negative effect face. After completing data collection, data were fed in the computer for processing and analysis using the software package of statistical analysis (SPSS-16.02, SPSS Inc., Chicago, IL, USA). Quantitative variables were expressed in mean and standard deviation and qualitative variables were expressed in proportion and the results were

analyzed using independent sample t test and ANOVA test.

Results

Among 120 children studied, 56 were boys (46.7%) and 64 were girls (53.3%). The mean age of the participants in the group I was 6.15 ± 1.477 years, group II was 5.90 ± 1.317 and of group III was 6.00 ± 1.281 years. The F value obtained was 0.342 at $p = 0.711$ which means, there was no significant difference in the age between the three groups, so the patients selected were of same age groups, eliminating the selection bias. There was a statistically significant reduction in mean pulse rate/heart rate for distraction groups (both have $P < 0.05$) after treatment comparing with the control group indicating that a low anxiety level in the distraction group [Table 2].

| Heart rate | Group | Mean | N | Std. Deviation | t | P value |
|------------------|----------------------|---------|----|----------------|-------|---------|
| Before treatment | Control | 100.8 | 40 | 7.150 | 2.504 | .017 |
| | Cartoon Films in TV | 96.25 | 40 | 9.91179 | | |
| | Control | 100.83 | 40 | 7.150 | 1.866 | .070 |
| | Games In smartphones | 97.9000 | 40 | 7.05582 | | |
| After treatment | Control | 102.20 | 40 | 7.544 | 4.541 | .000 |
| | Cartoon Films in TV | 94.70 | 40 | 8.849 | | |
| | Control | 102.25 | 40 | 7.544 | 4.884 | .000 |
| | Games In smartphones | 94.7750 | 40 | 5.73557 | | |

Table 2: Comparison of physiological parameter between the groups

A statistically significant difference between mean FIS score and Venham’s Anxiety Rating Scales was obtained between three groups after the treatment (P = 0.000) which indicates a reduction of anxiety in distraction

groups compared to control group and among them, games in smartphones shows a greater reduction of anxiety after treatment . [Table : 3]

| Venham’s Anxiety Rating Scale | Group | N | Mean | Std. Deviation | t | p value |
|-------------------------------|----------------------|----|------|----------------|------|---------|
| Before treatment | Cartoon Films in TV | 40 | 3.00 | 1.109 | .519 | .605 |
| | Games in smartphones | 40 | 2.88 | 1.042 | | |
| After treatment | Cartoon films in tv | 40 | 2.53 | 1.109 | 3.21 | .002 |
| | Games in smartphones | 40 | 1.68 | 1.248 | | |
| Facial image Scale | Group | N | Mean | Std. Deviation | t | p value |
| Before treatment | Cartoon Films in TV | 40 | 3.40 | .871 | .228 | .820 |
| | Games in smartphones | 40 | 3.35 | 1.075 | | |
| After treatment | Cartoon Films in TV | 40 | 3.03 | .862 | 3.9 | .000 |
| | Games in smartphones | 40 | 2.18 | 1.035 | | |

Table 3: Comparison of behavioral parameters between the distraction groups

Discussion

Owing to the limitless burden of expectations from parent, society and child, there has been a constant evolution in application of behaviour management techniques in dental clinics.^[5] Various innovations have been developed in an effort to help dentists manage the disruptive behaviour of children during dental treatment. Mobile phones are used all over the world in most of the fields because of its extreme versatility and function as personal computers, so its having an important role in day to day life. Owing to

the increasing spread of mobile technologies throughout the world, the World Health Organization (WHO) has coined a new term: mobile Health (mHealth), a component of e Health, and is defined as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices”.^[6] Fiordelli et al. concluded that “the potential of smartphones does not seem to have been fully exploited yet” and shows the potential and scope of evolution of

smart phones and its use in treatment aspects in medical and dental fields.^[7]The age group of the patients selected for the study was 4-8 years. Similar study was conducted by Harsh A Shah et al.^[8] where they evaluated the influence of using smartphone applications to reduce dental anxiety and hemodynamic changes produced in pediatric patients aged 5–10 years. Out of the 120 children studied, 56 were boys and 64 were girls i.e., study population consisted of 46.7% males and 53.3%, females. In the present study, Chi-square value for gender distribution was 1.57, which is not statistically significant ($P = 0.455$). That means there is no significant dependency of gender between the three groups. This result was in accordance to the study conducted by BS Suprabha et al.^[9] in 2011 where they found there is no statistically significant difference in the mean scores of boys and girls. Regarding the physiological parameter measured in the present study, heart rate, which was used in the study according to McCarthy, 1957^[10] acted as a definitive indicator of stress and anxiety. In this study, heart rate showed a significant difference between the control group and distraction groups. This was in accordance with the study conducted by Sreeraksha Radhakrishna et al.^[11] who observed a similar significant decrease in heart rate after the procedure when mobile application was used as the intervening method. In the present study Considering various behavioural parameters such as facial image scale, after the procedure, the F value obtained was 20.445 with a $P = 0.000$ among the three groups and a significant difference in facial image score was found between the distraction group with t value 3.9 at $p = 0.000$. this according to the study by Cumino DO et al.^[12] in a randomised controlled trial also cited that Smartphone-based behavioural intervention alleviates children's anxiety during anaesthesia induction. In the case of Venham's anxiety rating scale, post treatment F value

was 20.447 with a $P = 0.000$ among the three groups and a significant difference in venham's anxiety rating scale was found between the distraction groups at t value 3.21 at $p = 0.002$. This was similar to a study conducted by Sindura Allani et al.^[13] which cited that games in mobile phone is a better way to reduce anxiety in dental office. The operator bias was also not a consideration in the present study as the same operator performed the restorative procedure in both groups. The readings of both behaviour rating scale and the physiologic parameters were recorded by an independent observer who was unaware of the grouping. There are several studies like Lee HJ et al.^[14] which showed distraction with smart phone applications significantly reduce preoperative dental anxiety in children. A double blind randomized clinical trial by Meshki et al.^[15] also reported that games in smart phone effectively reduced dental anxiety in children during anesthetic injection and cavity preparation using high speed hand piece. Patel et al.^[16] in 2006 showed that children who enjoyed playing hand-held video games had less anxiety during anaesthesia induction when compared to the children who had only their parental presence, this highlights the use of active distraction like smart phone games. In the present study Children had an overwhelming response towards games in smartphones and wanted to play the game in subsequent visit. Limitations of the study: Many recent studies are showing that increased screen time neglects the circuits in the brain that control more traditional methods for learning and these are typically used for reading, writing, and concentration. Hence, the WHO recommends to limit the screen time. A larger sample size and in a general clinical setting might have elucidated the difference in anxiety levels with various distraction aids. 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 a study group as homogeneous as possible to be able to draw any conclusions. In the present study, patients were not allowed to choose the video or games they watch or play usually. Some children may be interested only in some particular cartoons or games. Therefore, the result would have been better, if the patient had chosen their favourite cartoon video or games.

Conclusion

Games in smartphones as distraction method offers a new concept as a distraction aid in pediatric dentistry. This promising distraction method diminishes the unpleasantness often associated with dental procedures and offers a relaxed state in children. Taken together with prior research, results suggest that the use of games in smartphone as distraction method may be a beneficial option for patients with mild to moderate fear and anxiety associated with dental treatment in children. However, still much research needs to be done to obtain a clearer picture of its full potential strength and limitations.

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