Original Article

Evaluation of Effectiveness of Dental Apps in Management of Child Behaviour: A Pilot Study

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Abstract

Background: We see children from all age groups, be it a toddler to a teenager, stuck up to the mobile phone playing interactive games or even browsing internet entertainment holds a major share in the field of mobile applications, be it from listening to music or playing online games. However, very little has happened in favor of pediatric dentistry or even educating the patients about the procedures of their treatment which can help reduce their fear or apprehension. **Aim:** The aim of this study was to evaluate the effectiveness of dental apps in the management of child's anxiety and behavior. **Materials and Methods:** Sixty children (24 girls and 36 boys) were made to use mobile dental app called "My Little Dentist" developed by Tenlogix Games available on the Google Play Store on the android platform of the smartphones. Their anxiety levels were noted before and after playing the game using the face imaging scale. **Results:** The results were found to be highly significant; 86.67% patients turned from a negative to positive behavior, 11.67% from positive to definitely positive, and 1.67% from definitely negative to negative according to Frankl's behavior rating scale. **Conclusion:** The mobile dental app was found to be very useful in the dental setup to reduce the fear and anxiety of the pediatric patients.

Keywords: Children, dental anxiety, dental app

Introduction

The first dental visit is crucial in the formation of the child's attitude toward dentistry and future treatment success.[1] Dental appointment is a stressful situation, which raises children's anxiety level and avoidance behavior. Children's dental anxiety is an intense but situational and transient anxiety. If it is not managed, it will possibly continue to adulthood.[2]

Several communicative, advanced, and pharmacological interventions have been developed to manage children's anxious and cooperative behavior. The most commonly used techniques by dentists to manage child's anxiety/fear and even in some cases reluctant or resilient behaviors are tell-show-do method, modeling, and positive or negative reinforcements.

Tell-show-do technique, introduced by Addelston in 1959, remains the cornerstone of behavior management techniques (BMTs), which is commonly used by pediatric dentists in the management of children's anxiety at a pretreatment visit. It dictates that before anything is done, the child be told what will be done and then shown by some sort of simulation exactly what will happen before the procedure is started. Tell-show-do technique is based on the principle of learning theory and is performed by the dentists themselves in the operatory.[3,4]

Modeling refers to learning by observation and children may reproduce behavior exhibited by the model in the same situation.[3] Modeling can be performed in two forms: Live or filmed one. Studies on modeling have demonstrated its therapeutic effect in the management of anxiety[5,6] and educational effect in improving coping skills of children in stressful situations.[7] Filmed modeling does not take time by the dentist and dental team although it has not achieved its proper situation. Live models such as peers, siblings, or parents are used for preappointment teaching of the expected behavior to the child patient.[8-10] Several studies have evaluated the efficiency of the modeling through a film in the reduction of child's dental anxiety.[11-17]

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With the advancement in technology, a standard mobile device has gone from being no more than a simple two-way pager to being a mobile phone, GPS navigation device, an embedded web browser and instant messaging client, and a handheld game console. It is generally seen that children from all the age groups, be it a toddler to a teenager, stuck up to the mobile phone playing interactive games or even browsing internet. Today, we have an app for possibly everything. However, very little has happened in favor of pediatric dentistry or even educating the patients about the procedures of their treatment which can help reduce their fear or apprehension. On search of the literature, no studies could be found on the management of pediatric patients using dental apps. Thus, with these existing lacunae, this study is an attempt to evaluate the effectiveness of dental apps in the management of child's anxiety and behavior.

MATERIALS AND METHODS

After obtaining the ethical clearance from the Institutional Review Board and written informed consent and assent, sixty children (24 girls, 36 boys) in the age group of 8–12 years who attended the dental clinic for the first time and fulfilled the inclusion criteria were randomly selected from the Outpatient Department of Pedodontics and Preventive. Sixty children were enrolled into the study which was calculated according to the formula:[18] $n = \dfrac{\ln(1 - \gamma)}{\ln(1 - \gamma)}$, where the confidence was 0.95, the probability being 0.06. The sample size obtained was 49; however, considering the dropouts, a sample size was taken as 60 in the study. To rule out the bias, all the children enrolled into the study needed the same kind of treatments. The children who had reported with pain were not considered for the study. The parents/guardians were questioned on their child's anxiety using Corah's dental anxiety scale. In this study, we used a mobile dental app called "My Little Dentist" developed by Tenlogix Games available on the Google Play Store on the android and iOS platform of the smartphones [Figure 1]. The app gave the patients an idea as to what would be the nature of their treatment in an interactive manner. The patients were virtually made dentists and were made to do patients in the app that included extractions, scaling, filling and were taken into confidence and how atraumatically and painlessly a dental procedure could be performed was shown to the child [Figure 2]. The children were made to make use of the app and perform virtual dental treatments. The anxiety levels were noted before and after using the app using the face imaging scale; furthermore, Frankl behavior of the patients was also noted along with the other scales and was recorded into a standardized form.

Dental procedures were then clinically performed on the same day by a single operator after making sure that the patient is completely satisfied and confident about the dental procedures that were needed to be performed.

RESULTS

The data obtained were entered into a standardized form and were statistically analyzed using SPSS version 21.0 (IBM SPSS Statistics 21, SPSS South Asia, Bangalore, India). Paired *t*-test was applied for comparison of pre and post scores of face imaging scale where $P = 0.0000^*$, $t = 21.876$ which was statistically significant where P value was set at 0.05 [Figure 3]. The scale applied before playing the game showed that 10% of the children had mild symptoms, 85% showed moderate symptoms, and only 5% had severe symptoms of anxiety [Graph 1]. Postface imaging scales showed that the patients shifted mostly to mild symptoms (56.7%) or no symptoms of anxiety at all (38.3%) [Graph 2]; the results were found to be highly significant. Furthermore, behavior of the patients was examined and the data showed that 86.67% patients turned from a negative to positive Frankl behavior, 11.67% from positive to definitely positive, and 1.67% from definitely negative to negative. When the difference in gender was considered, it was seen that there was a significant reduction in the anxiety levels of males and females and both were statistically significant [Tables 1 and 2].
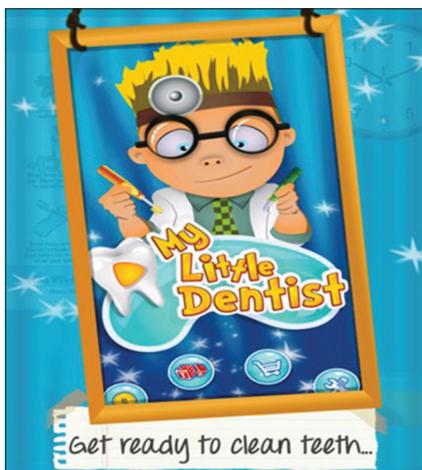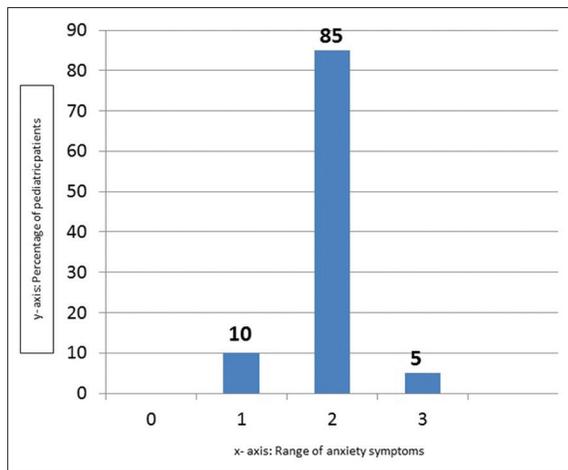

Figure 1: The dental app.

Figure 2: The patient being made to use the app.

Graph 1: Preface imaging scale or the symptoms of the patient before playing the game.

Graph 2: Postface imaging scale or the symptoms of the patient after playing the game.

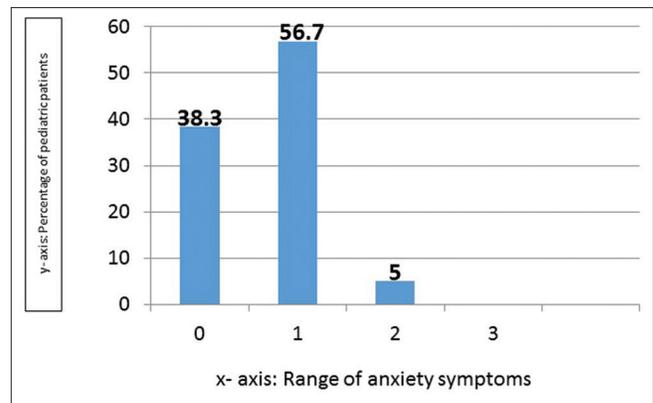**Table 1: Difference in anxiety levels based on females**

Anxiety Levels for females	
	postfacial - prefacial
z	-4.564[b]
Asymp. Sig. (2-tailed) (p-value)	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Table 2: Difference in anxiety levels based on males

Anxiety Levels for males	
	postfacial - prefacial
z	-5.535[b]
Asymp. Sig. (2-tailed)(p-value)	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

DISCUSSION

The management of children's behavior is an integral component of pediatric dental practice. It is as fundamental to the successful treatment of children as are handpiece skills and knowledge of dental materials in dental practice and it is achieved through the application of various BMTs.[19] BMTs are a set of procedures aimed at enhancing the child's useful coping skills, achieve complete willing and acceptance of dental care, and ultimately reduce the child's perception that the dental situation is overwhelming or dangerous.[18] In other words, the techniques are employed by dental practitioners in attending a child dental patient so as 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 and oral healthcare, thus coping with and willing to undertake dental treatment procedures.[20-22]

Preoperative anxiety (PA) is of utmost concern in pediatrics; 40%–60% of children undergoing surgical procedures experience high levels of PA.[23,24] PA may have negative effects on children, such as higher postoperative pain, emergence delirium, uncooperative behavior, and higher doses of sedation or preoperative analgesia. Typical PA signs include increased muscle tone, sleep disturbances, a cessation of playing, agitation, and escape behavior.[25]

In children younger than 6 years, PA is expressed through the fear of separation from the mother and the terror of the unknown, while the fear of death and mutilation is prevalent in older children. One category of interventions effective in reducing PA is to provide preprocedure information to children in a manner that is appropriate for their developmental stages.[26]

To date, a wide variety of BMTs are available to dental practitioners, namely, tell-show-do, desensitization, modeling, positive reinforcement, voice control, distraction, parental presence/absence, restrain/protective stabilization, nonverbal communication, hand-over-mouth, sedation, and general anesthesia. Besides the techniques mentioned above, mobile phone technology offers an unprecedented opportunity to unobtrusively track day-to-day behavior and changes in emotional state, all in real time.[27] Mobile phone health tools also offer the potential of immediate response to the outcome of this monitoring through delivery of mental health information contingent on changes in real-time emotional state. This technology has not yet been fully leveraged for these purposes despite mobile phones being one of the few pieces of technology that most people carry on their person every day. This pervasiveness means that mobile phones offer a highly natural and regular means, by which information on emotional state could be obtained. They are also a cost-effective means of seeking help for mental health issues that may overcome socioeconomic and geographic boundaries.[28]

Face imaging scale			p-value	t-value
	Mean	Std. Deviation		
pre	1.95	0.387		
post	0.67	0.572		
			p = 0.0000*	t = 21.876

Figure 3: Paired *t*-test comparing pre- and post-usage of the dental app.

The natural evolution of computer-based applications is toward mobile apps that can be used on a smartphone. Smartphone-based mental health apps may include many of the benefits such as cost-effectiveness plus they are always online, almost always with the individual, and can collect location and other data through their integrated sensors. Many populations outside the West that would not otherwise own a computer are beginning to own smartphones. In China, for example, the proportion of users accessing the Internet with a mobile device by the end of 2013 surpassed those doing so with a PC. Text-based bibliotherapy can be readily translated to other languages,[29] providing the ability to introduce new populations to mental health services. However, according to a latest survey, the internet users in India 2016 was approximately 34.8%,[30] which is still pretty far from other developed or even developing countries. So the challenge remains to spread the technology equally and efficiently. Another short coming of the mobile applications are that they are available mostly available in English and hence a big chunk of population is not able to use these applications because of the language barrier.[31] There is a need to promote small scale developers and entrepreneurs so more and more applications can be developed in regional languages as a result of which a larger spectrum of population can be benefitted.

Conclusion

The mobile dental app was found to be very useful in the dental setup to reduce the fear and anxiety of the pediatric patients. Therefore, we can conclude that within the limitations, mobile dental apps can be used as an adjunct with the conventional BMTs.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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