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Effectiveness of combined effect of two Non - pharmacological techniques on the behaviour of children before and after dental treatment

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Abstract
Background: Dental anxiety is an abnormal feeling or a dreadful feeling that keeps the child away from visiting a dentist. Dental anxiety can lead to dental neglect in children compromising their oral health and impacting their quality of life.
Aim: The aim of the study was to assess the effectiveness of combination of a mobile dental app and tell-play-do in the management of children's behaviour before and after dental treatment
Materials and methods: Sixty children of the age group 5-8 years were divided into two groups of 30 each. Children in Group I was control group that received no intervention while Group 2 achieved intervention through the use of a mobile dental app "Little Lovely Dentist" and were also explained about the procedure through tell-play-do. For both the groups, heart rate was recorded with the use of pulse oximeter and the anxiety levels were estimated using facial image scale before and after the treatment.
Results: After observations Group 2 showed better results as the heart rate and FIS were reduced when compared to Group 1 THAT shows the effectiveness of mobile dental app and tell play do on the behaviour of children.
Conclusion: Combination of mobile dental app and tell- play- do was effective in reducing dental fear and anxiety amongst children. Mobile dental app can be used as an adjunct with tell- play- do to instill a positive attitude towards future dental appointments.

Keywords: Behaviour of children, effectiveness, Dental anxiety, FIS, dental app

Introduction

A child's initial appointment at a dental clinic stands as a pivotal moment that shapes the child's inclination towards accepting or rejecting dental procedures. Dental unease among children raises concerns, as it might result in dental negligence even during adulthood. However, tending to a child typically hinges on a one-to-two dynamic involving the dentist, the patient, and parents or guardians. [1]

As per the American Academy of Pediatric Dentistry, pediatric dentists have at their disposal both non-pharmacological and pharmacological methods to manage a child's behavior. Essential behavior guidance techniques encompass communication direction, positive mental imagery prior to the visit, modeling, demonstration, step-by-step explanation, interactive questioning, vocal direction, non-verbal cues, positive rewards, and descriptive praise, along with diversion and gradual acclimatization.[2] Among the most prevalent behavior management strategies employed by pediatric dentists are the tell-show-do (TSD) technique and modeling approach.[3,4] In the modeling approach, children are prepared for dental procedures by observing either a live demonstration involving a cooperative child or a filmed presentation. Children might replicate the conduct exhibited by the model. Nevertheless, relying solely on modelling and tell-show-do may not Impart a comprehensive understanding or adequately prepare them for dental procedures. Consequently, the tell-show-do approach has evolved into tell-play-do, wherein the child engages with custom-designed dental toys to simulate the experience, accompanied by verbal explanations.[5]

In the contemporary world driven by technology, mobile phones have become ubiquitous companions in human lives. It is evident that children of all age groups nowadays extensively utilize mobile phones to engage in a plethora of activities, ranging from playing games and communicating with friends to browsing the internet.

In the present day, a multitude of dental apps are available to educate children about dental procedures in an enjoyable gaming format, contributing to the reduction of dental apprehension and unease. These apps serve as a valuable platform for imparting knowledge about dental processes, the development of cavities, and various other aspects related to dentistry.

Among the diverse array of dental education apps, one noteworthy application is "Little Lovely Dentist," crafted by Leaf Cottage Software and Shanghai Edaysoft Co., Ltd. This application can be accessed on both the Google Play Store and App Store. It offers an interactive approach to educate children playfully about treatment procedures such

as prophylactic cleanings, application of pit and fissure sealants, dental restorations, and extractions. [6]

Numerous studies have been carried out to prove effectiveness of tell-show-do and video apps in the management of disruptive behaviour of children but none checked the combined effects of tell-play-do and video apps in the behaviour management of children.

Given the scarcity or absence of studies addressing the management of pediatric patients through the combined utilization of diverse dental apps and the tell-play-do technique, the objective of this research was to evaluate the efficacy of integrating the dental app "Little Lovely Dentist" and the tell-play-do approach in managing child behavior both before and after dental procedures.

Materials and methods

After obtaining ethical clearance from the institutional review board and acquiring written consent from parents, a total of 60 children, ranging in age from 5 to 8 years, were chosen as participants for this study.

Inclusion criteria

- Children within the age range of 5 to 8 years who were undergoing their initial dental visit were eligible for participation in the study.
- Children who were both mentally and physically healthy were considered for inclusion.

Exclusion criteria

- Children above or below the reference age
- Children with previous dental experience
- Children with any underlying physical or learning disability
- Children undergoing any medical treatment that might affect heart rate

The total number of participants, 60 children, were randomly divided into two groups, each consisting of 30 children. Group 1 was control group that did not receive any intervention. Group 2 was experimental group that underwent an intervention involving the utilization of the mobile dental app "Little Lovely Dentist" in conjunction with the tell-play-do technique using specially designed dental objects (Fig 1). Initially, the children were allowed to observe the dental procedure within the mobile app for a duration of 5 minutes (Fig 2) followed by the tell-play-do method, in which the initial 'tell' stage encompassed providing a verbal explanation of the procedure tailored to the child's developmental stage. During the subsequent 'play' phase, the children familiarized themselves with and interacted with the customized dental objects (Fig 3,4). Lastly, the 'do' phase involved commencing the actual treatment while adhering to the earlier provided explanation. For both the groups anxiety levels were measured using facial image scale (Fig 5) subjectively while heart rate was recorded as a physiological marker of anxiety. Heart rate was measured using a microtek pulse oximeter (Fig 6). Both the facial image scale ratings and heart rate measurements were collected before and after the dental treatment session. The specific dental procedure chosen for this study was oral prophylaxis. (Fig 7).

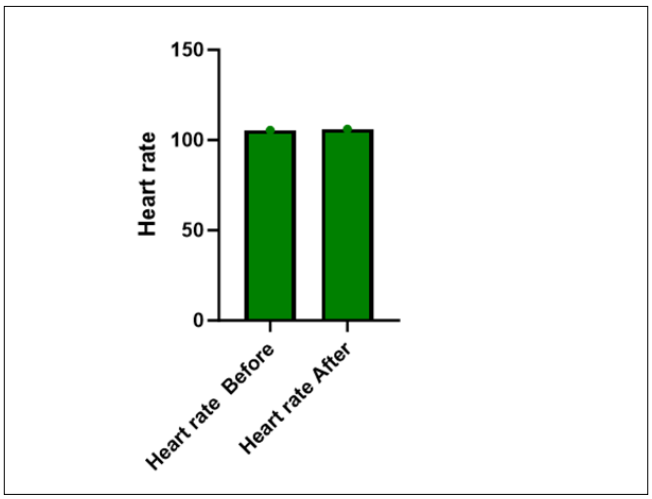
Behavior management strategies are designed to improve a child's willingness to cooperate, establish effective communication, reduce fear and unease, provide successful and high-quality dental treatment, foster a trusting bond among the dentist, child, and parent, and encourage a positive attitude towards dental experiences.

Table 1: Heart Rate and FIS before and after the treatment in Group 1

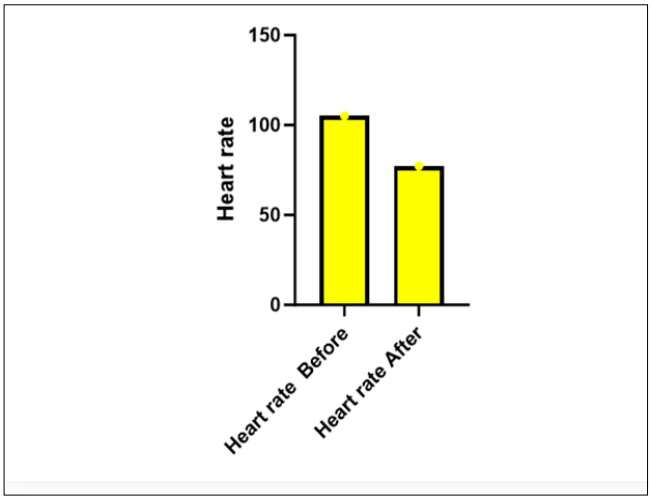
Group 1	Before Treatment	After Treatment	T	P - Value
Heart Rate	105.47 ± 8.82	106.07 ± 8.42	0.6989	0.49**
FIS	3.48 ± 1.12	3.93 ± 1.16	1.7518	0.09**

Table 2: Heart Rate and FIS before and after the treatment in Group 2

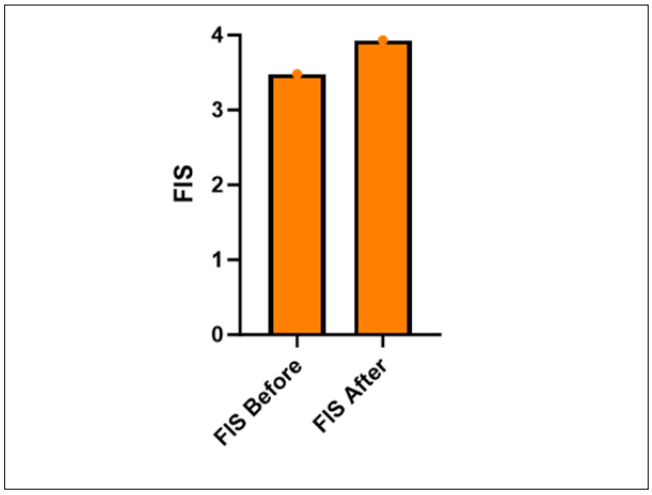
Group 2	Before Treatment	After Treatment	T	P - Value
Heart Rate	105.07 ± 8.80	77.23 ± 7.97	11.9317	<0.0001*
FIS	3.57 ± 1.01	1.30 ± 0.47	11.635	<0.0001*



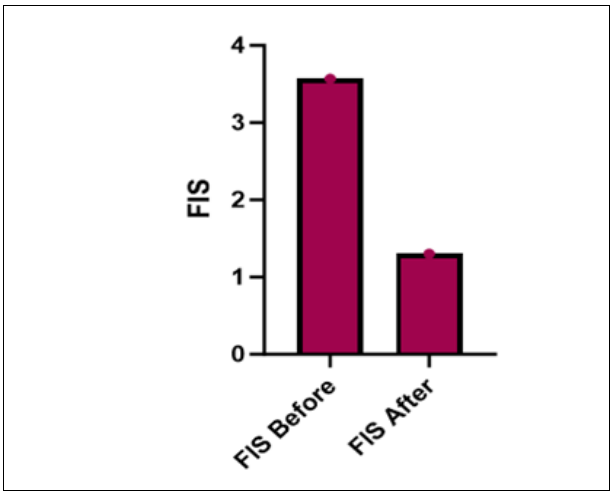
Graph 1: Heart Rate before and after the treatment in Group 1



Graph 2: Heart Rate before and after the treatment in Group 2



Graph 3: FIS before and after the treatment in Group 1



Graph 4: FIS before and after the treatment in Group 2

Fig 1: Little Lovely Dentist App

Fig 2: Child watching the app

Fig 3: Toys used for tell-play-do

Fig 4: Child learn through tell-play-do

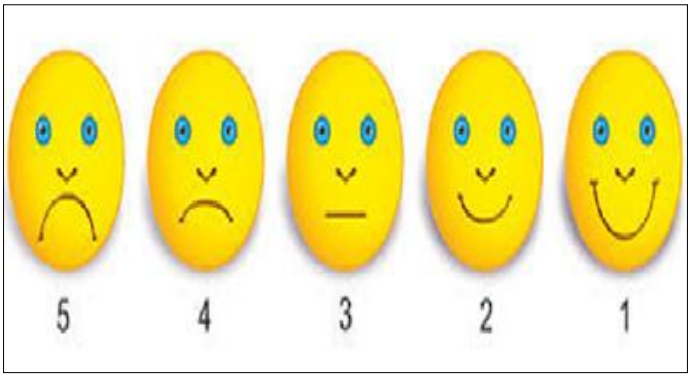


Fig 5: Facial Image Scale

Fig 6: Microtek pulse oximeter

Fig 7: During treatment; Oral Prophylaxis

Results

Data obtained was compiled on an MS Office Excel Sheet and was subjected to statistical analysis using graph pad prisms software. Paired t test was applied to compare the heart rate and facial image scores before and after treatment in both the groups.

Calculation of Heart Rate

Group 1 was control group and group 2 was intervention group. Our analyses aimed to uncover any significant changes in these variables before and after the treatment.

In Group 1 the mean values of heart rate before and after treatment were 105.47 beats per minute (bpm) and 106.07 bpm respectively. On applying t test and calculating p value the difference was not statistically significant (p=0.49) (Table 1, Graph 1).

Whereas in Group 2, the mean heart rate before and after treatment was 105.07 and 77.23 respectively. On applying t test and calculating p value a highly significant difference was found. (p=<0.0001). (Table 2, Graph 2).

Calculation of Facial Image Score

In Group 1 the mean values of FIS before and after treatment were 3.48 and 3.93 respectively. On applying t test and calculating p value the difference was not statistically significant (p = 0.09) (Table 1, Graph 3).

In Group 2 the mean values of FIS before and after treatment were 3.57 and 1.3 respectively. On applying t test and calculating p value the difference was highly statistically significant (p< 0.0001) (Table 2, Graph 4).

The results provide an insight that the intervention through combination of mobile dental app and tell- play- do has shown significant changes in heart rate and facial image scores of children which proves its effectiveness in the change of children's behaviour.

Discussion

Behavior management strategies are designed to improve a child's willingness to cooperate, establish effective communication, reduce fear and unease, provide successful and high-quality dental treatment, foster a trusting bond among the dentist, child, and parent, and encourage a positive attitude towards dental experiences.

The technique of tell-show-do (TSD) is the most commonly employed method to effectively manage children's anxiety during their preliminary treatment visits. This approach acquaints them with unfamiliar procedures, thus alleviating their anticipatory unease. In 2017, Vishwakarma *et al*. [7] conducted a comparison between two distinct behavioral modification techniques, namely tell-play-do and live modeling, among children aged 5 to 7 years. The findings indicated that the tell-play-do technique proved to be more effective than the live modeling technique in diminishing children's apprehension and eliciting a more cooperative demeanor during treatment sessions. The study observed that the mean heart rate at various intervals was notably lower in the tell-play-do group in comparison to the live modeling group. This difference was observed during both the initial visit (post-intervention and treatment procedure) and the subsequent visit (during the procedure). Consequently, the tell-play-do technique could serve as an alternative to the conventional tell-show-do and live modeling techniques. The tell-play-do approach exhibited greater success in reducing children's anxiety compared to the "Tell-Show-Do" technique.

As reported by Ibrahim *et al*. [8] in 2023, a significant number of children within the tell-play-do group exhibited a state of relaxation and comfort in contrast to those in the tell-show-do group.

Safar M *et al*. [9] further corroborated this notion by asserting that the tell-play-do technique is notably more effective in addressing the anxiety of a child characterized by a negative behavioral pattern as per the Frankl Scale, when compared to both the direct observation technique and the tell-show-do approach.

Patil VH *et al*., in 2017, [10] undertook a study involving 60 children who engaged with a mobile dental application named “My Little Dentist." This application, developed by Tenlogix Games and accessible on the Google Play Store for smartphones, was utilized to assess its impact. The study evaluated the children's anxiety levels before and after playing the game, utilizing the facial imaging scale as a measure. The outcomes were found to be remarkably significant: 86.67% of participants transitioned from exhibiting negative behavior to a positive one, 11.67% progressed from positive behavior to a definitively positive stance, and 1.67% transformed from definitely negative behavior to a negative one, as evaluated through Frankl's behavior rating scale. The researchers concluded that the mobile dental app holds the potential to effectively mitigate children's apprehension and unease surrounding dental treatment. They suggested that it could serve as a supplementary tool alongside conventional behavior management techniques.

In 2003, Buchanan H *et al*. [11] introduced the Facial Image Scale (FIS) as a viable tool for evaluating the level of dental anxiety among children. In the current research, both heart rate and the facial image scale were employed to gauge anxiety levels. Heart rate served as a physiological indicator, while the facial image scale operated as a subjective measure.

In 2019, Elicheria *et al*. [12] arrived at the conclusion that mobile dental applications were more effective in alleviating the anxiety of children aged 6 to 12 years old.

On the contrary, Pandey N *et al*. [13] in 2019, found no notable distinction in the impact between interactive mobile games and the Tell-Show-Do technique on the behavior of children aged 6 to 12 years old. The possible reason could be wide difference in age group amongst the children.

In 2020, Kevadia MV *et al*. [14] determined that the Tell-Play-Do technique proved to be more successful in diminishing children's fear and anxiety concerning dental treatment when compared to film modeling and mobile dental app. The Tell-Play-Do technique was identified as a viable alternative to both the Tell-Show-Do (TSD) and modeling techniques during dental treatment in the age group of 6-9 years of age.

Emmanuel BJ *et al*. 2021[15] evaluated the efficacy of My Little Dentist app. Anxiety levels were checked using Chhota Bheem- Chutki scale and found out that the mobile app was very useful in reducing the fear and anxiety of children in dental clinic.

Abbasi H *et al* 2021*et al*.[16] concluded that tell-show-do although most commonly used didn’t prove to be beneficial in reducing the anxiety level. Behavior modification techniques like smartphone applications, “little lovely dentist,” and “dental songs” can alleviate dental anxiety experienced by pediatric patient.

In our study we found a lot of significance difference between the heart rate and FIS before and after dental treatment in 5-8 year old children on using mobile dental app and tell-play-do which proves the effectiveness of these techniques in reducing dental fear and anxiety during dental visit in children.

Conclusion

In our study, both mobile dental apps and the Tell-Play-Do technique have demonstrated their effectiveness in reducing anxiety levels among children ranging from 5 to 8 years old. The Tell-Play-Do approach fosters the development of a positive rapport between the dentist and the child, while the mobile app, even under supervision, effectively engages the child in a virtual learning experience regarding dental procedures. By integrating technology into traditional methods and making necessary adaptations, successful outcomes can be achieved in managing child behavior within the realm of pediatric dentistry. Consequently, the incorporation of mobile dental apps can complement interventions like the Tell-Play-Do technique, thereby enhancing cooperative behavior among children in a dental setting.

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