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Original Research Article

Storytelling using self-designed image-based storybook as tools for reducing dental anxiety in 5 to12-years-old children: a narrative therapy

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ABSTRACT

Background: Children commonly experience dental anxiety, marked by a general feeling of fear when they have not encountered the situation before. By incorporating positive dental information through storytelling or engaging dental activity books, children can be effectively reassured and mentally prepared for their initial dental appointments. Storytelling and storybooks in healthcare serves multiple functions such as educating patients and their families, promoting specific qualities, and enhancing behaviors.
Methods: A randomized clinical study involving 240 children aged 5 to 12 years was conducted. The children were randomly assigned to three groups of 80 each: group 1 (received storytelling with image-based storybook), group 2 (received only storytelling), and the control group (received neither). Pulse rate and anxiety assessment using animated emoji scale measurements were taken at the start of the appointment, after the intervention before treatment, and after dental treatment.
Results: The interventional groups 1 and 2 showed a significant difference compared to the control group for pulse rate and animated emoji scale. Group 1 exhibited the highest reduction in anxiety as measured using the animated emoji scale and pulse rate.
Conclusions: In conclusion, providing children with a dental storybook before dental treatment can decrease dental anxiety and improve their behavior during the dental treatment.

Keywords: Dental anxiety, Child behavior, Story book, Story telling

INTRODUCTION

Dental anxiety is a prevalent issue that influences people across diverse age brackets. It is marked by an intense fear or anxiety related to dental visits and procedures that goes beyond typical nervousness.[1] This heightened level of distress can result in increased stress or avoidance of dental care. The fear of unfamiliar aspects of dental procedures, combined with the sensory elements of the dental environment, contributes to heightened anxiety for many individuals. Impact of dental anxiety' extends beyond emotional stress, potentially resulting in postponed or overlooked dental care, ultimately jeopardizing oral health.[2] Delaying routine dental check-

ups and essential treatments may worsen dental issues, establishing a pattern of avoidance, and further compromising oral health. Furthermore, an individual's dental anxiety is significantly influenced by cultural attitudes toward dentistry and personal experiences. It is crucial to address dental anxiety to support overall well-being and prevent complications associated with oral health. Comprehending the source of this anxiety, employing empathetic communication among dental professionals, and incorporating relaxation techniques can contribute to establishing a dental environment that is more comfortable and supportive.[1] Through acknowledgment and proactive management of dental anxiety, individuals can actively break the cycle of fear, advocate for enhanced oral health, and cultivate a more positive dental experience. The initial dental encounter plays a crucial role in shaping a child's perception of dentistry and influencing the outcome of their dental treatment.

The first dental visit experience is pivotal in shaping a child's perspective on dentistry and impacting the outcome of their dental treatment.[3] Altering an individual's pre-existing notions about dental care or specific treatment procedures is essential to achieve a more favourable outcome. Patients across different age groups display differing degrees of cognitive and/or perceptual functioning, along with varying skills in verbal and nonverbal communication, as well as social interaction. Therefore, various non-pharmacological techniques are employed based on individual needs. These may include methods like "tell-show-do," relaxation, distraction, systemic desensitization, modelling, and more. Patients possessing extensive knowledge about their oral condition or treatment procedures tend to experience superior outcomes compared to those lacking such understanding. Consequently, the provision of comprehensive information to patients typically enhances compliance. In the field of health education, various media are at our disposal, including demonstration models, leaflets, video films, and computers. Patients from rural areas in developing countries may lack awareness of dental procedures. Therefore, it is recommended to offer them a book that explains dental procedures, facilitating better understanding on their part. Various communication-assisted approaches, including applied behavioural analyses, visual pedagogies, pictorial or iconic images, and audio-visual aids, have been suggested to facilitate behavioural changes among individuals. Recent studies have explored various behavioural interventions, including social stories, visual pedagogy, and comic strips.[2] These tools are frequently employed to encourage a desired behaviour or prepare a child for a new experience. Like other behaviour management techniques, they prove effective, cost-efficient, and easy to implement. It is of utmost importance to craft stories from the child's perspective and present them in a print size tailored to the child. This approach aims to enhance the child's understanding of the dentist's frame of reference, fostering a more straightforward correlation between them. The American academy of pediatric dentistry recommends placing greater emphasis on nonpharmacological interventions and behaviour modification techniques. Limited research exists on preoperative behaviour modification utilizing storytelling and storybooks in the available literature. There is a scarcity of studies that have evaluated the effectiveness of a dental storybook in reducing dental anxiety. Hence this study aims to compare verbal storytelling and a self-designed image-based storybook as tools for reducing dental anxiety in 5-12-years-old children.

METHODS

Study design

This is a randomised control trial conducted in the department of paediatric and preventive dentistry Mathrusri Ramabai Ambedkar dental college and hospital, by a single operator. Written informed consent was obtained from patient's parents, with assent from patient. Study was under for a period of 6 months i.e., June 2023 to November 2023. Total sample of 240 children aged between 5-12 years, visiting the department for first dental visit requiring oral prophylaxis or restorations were randomly selected.

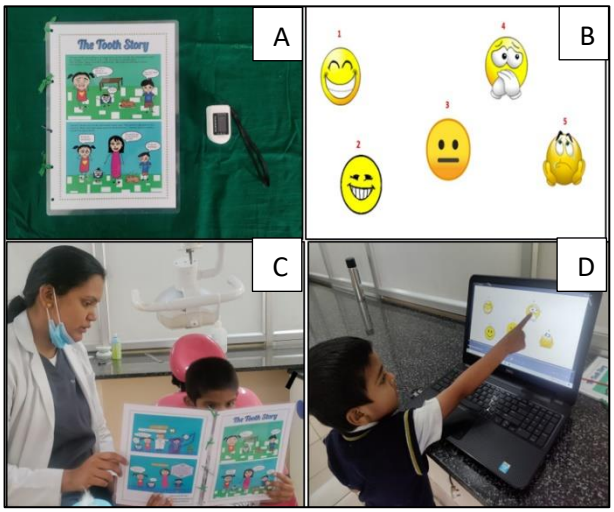

Figure 1: A) Story book and pulse oximeter, B) animated emoji scale, C) group A-story book and D) measurement of animated emoji scale.

Inclusion criteria

Patients who fulfil below criteria were included in study. Children between the ages of 5 and 12, who are in good general health, possess the ability to understand and communicate effectively, and have parental or guardian consent, are sought for participation in this study. Candidates must not be currently involved in similar research on dental anxiety, and they should not have severe mental health disorders that could significantly

affect study outcomes. Additionally, they should reside in stable living environments, free from recent traumatic experiences likely to impact anxiety levels.

Exclusion criteria

Patients were excluded from the study if they had significant medical conditions posing risks to safe participation, severe anxiety or mental health disorders unrelated to needle anxiety, cognitive impairments affecting comprehension and communication, did not fall within the specified age range, lacked parental consent, experienced recent trauma, or failed to adhere to study protocols.

In this study where anxiety was assessed using heart rate and anxiety scores using animated emoji scale in children aged 5-12 years for first dental visit requiring oral prophylaxis or restorations. Patients were divided into 3 groups of 80 each: group 1 (received story telling using image-based storybook), group 2 (received storytelling) and the control group (did not receive either). Evaluation of all parameters was carried out at three levels, i.e., pre-operative, post-intervention (In control group after they were seated comfortably for 10 minutes) and after treatment completion. The animated emoji scale (AES) utilizes five animated emoji faces representing various emotions, spanning from extreme happiness and laughter to deep sadness and crying, illustrating a spectrum from the most positive to the most negative feelings. The child was requested to select the animated emoji displayed on the electronic screen that most accurately reflected their current emotions. The scale ranged from a score of 1, corresponding to the happiest emoji, to a score of 5, indicating the saddest emoji, as depicted in (Figure 1).[4-6]

Statistical analysis

Statistical Package for Social Sciences (SPSS) for Windows Version 22.0 Released 2013. Armonk, NY: IBM Corp., will be used to perform statistical analyses. Chi Square Test was used to compare the gender distribution between 4 groups. One-way ANOVA Test followed by Tukey's post hoc Test was used to compare the mean heart rate between 3 groups at different time intervals. Repeated measures of ANOVA Test followed by Bonferroni's post hoc Test was used to compare the mean heart rate between different time intervals in each group. Kruskal Wallis Test followed by Dunn's post hoc test was used to compare the mean Animated Emoji Scale scores between 3 groups at different time intervals. Friedman's Test was used to compare the mean Animated Emoji Scale scores between different time intervals in each group. The level of significance was set at $p<0.05$.

RESULTS

No significant difference existed in mean heart rate among the three groups pre-operatively. Post-intervention, significant differences emerged (p=0.009), with the control group displaying higher mean heart rate compared to the storybook and storytelling groups (p=0.02 and p=0.03 respectively). Post-operatively, similar findings were observed (p=0.005), with the control group having significantly higher mean heart rate than the storybook and storytelling groups (p=0.006 and p=0.03 respectively). However, there was no significant difference between the storybook and storytelling groups post-operatively (Table 1).

Table 1: Comparison of mean heart rate (BPM) between 3 groups at different time intervals using one-way ANOVA test followed by Tukey's post hoc test.

Time	Groups	N	Mean	SD	P value[a]	P value[b]
Pre-operative	Group 1-storybook	80	96.05	9.19	0.94	-
	Group 2-storytelling	80	96.55	10.09		-
	Group 3-control	80	95.35	12.31		-
Post intervention	Group 1-storybook	80	90.40	7.65	0.009*	0.94
	Group 2-storytelling	80	91.00	8.22		0.02*
	Group 3-control	80	98.05	9.21		0.03*
Post-operative	Group 1-storybook	80	88.85	8.31	0.005*	0.82
	Group 2-storytelling	80	90.55	8.05		0.006*
	Group 3-control	80	97.80	10.11		0.03*

*Statistically significant, [a]One-way ANOVA test and [b]Tukey's post hoc test

No significant differences were noted in mean animated emoji scale (AES) scores among the three groups pre-operatively.

Post-intervention, a significant difference emerged (p=0.009), with the control group scoring higher than the storybook and storytelling groups ($p<0.001$ and p=0.002 respectively). However, there was no disparity between storybook and storytelling groups pre-operatively. Similarly, post-operatively, significant differences were observed (p=0.005), with the control group scoring higher than the storybook and storytelling groups ($p<0.001$). Yet again, there was no difference between the storybook and storytelling groups (Table 2).

Table 2: Comparison of mean animated emoji scale between 3 groups at different time intervals using Kruskal Wallis test followed by Dunn's post hoc test.

Time	Groups	N	Mean	SD	P value[a]	P value[b]
Pre-operative	Group 1-storybook	80	2.45	1.00	0.47	-
	Group 2-storytelling	80	2.75	0.79		-
	Group 3-control	80	2.85	0.99		-
Post intervention	Group 1-storybook	80	1.45	0.76	<0.001*	0.22
	Group 2-storytelling	80	1.85	0.59		<0.001*
	Group 3-control	80	2.70	0.87		0.002*
Post-operative	Group 1-storybook	80	1.35	0.59	<0.001*	0.48
	Group 2-storytelling	80	1.60	0.68		<0.001*
	Group 3-control	80	2.80	0.77		<0.001*

*Statistically significant, [a]Kruskal Wallis test and [b]Dunn's post hoc test

Table 3: Comparison of mean heart rate (BPM) between different time intervals in each group using repeated measures of ANOVA test followed by Bonferroni's post hoc test.

Groups	Time	N	Mean	SD	P value[a]	P value[b]
Group 1-storybook	T0	80	96.05	9.19	0.01*	0.07
	T1	80	90.40	7.65		0.03*
	T2	80	88.85	8.31		<0.001*
Group 2-storytelling	T0	80	96.55	10.09	0.04*	0.04*
	T1	80	91.00	8.22		0.04*
	T2	80	90.55	8.05		0.81
Group 3-control	T0	80	95.35	12.31	0.19	-
	T1	80	98.05	9.21		-
	T2	80	97.80	10.11		-

*Statistically significant, [a]Repeated measures ANOVA test and [b]Bonferroni's post hoc test, T0-pre-operative period; T1-post-intervention period & T2-post-operative period.

Significant differences were found in mean heart rate within Storybook Group between time intervals (p=0.01). Specifically, T2 displayed significantly lower mean heart rate compared to T0 and T1 (p=0.03 and p<0.001 respectively), while no significant difference was noted between T0 and T1.

In Storytelling Group, a significant difference was observed between time intervals (p=0.04), with T2 showing significantly lower mean heart rate compared to T0 and T1 (p=0.04), yet no difference was found between T0 and T1. Control group exhibited no significant difference in mean heart rate between time intervals (Table 3).

Significant differences were observed in mean animated emoji scale scores within the Storybook group between time intervals (p<0.001). Specifically, T0 displayed significantly higher scores compared to T1 and T2 (p<0.001 and p=0.002 respectively), while no significant difference was found between T1 and T2. Similarly, within the Storytelling group, significant differences were found between time intervals (p<0.001), with T0 showing higher scores compared to T1 and T2 (p=0.002 and p=0.001 respectively), but no difference between T1 and T2. However, no significant difference was observed within the Control group between time intervals (Table 4).

DISCUSSION

Anxiety is an emotional state often described as the fear of the unknown. It is commonly expressed as an unpleasant feeling preceding the actual interaction with threatening stimuli. As per Agras et al anxiety linked to dental appointments and procedures ranks as the fifth most prevalent cause of anxiety, particularly among children.[7-10] Children who have not had prior dental experiences frequently convey anxiety, driven by the uncertainty of what lies ahead. It is crucial to alleviate a child's anxiety about dental treatment, not only to address immediate fears but also to prevent lingering apprehension that may persist into adulthood. Filewich reported that patients with extreme fear required roughly 20% more chair side time than those with less fear. This highlights the importance for dentists to acquire and utilize diverse management techniques to alleviate patients' fear and anxiety.[11] Behaviour management must be adaptable and tailored to each child. Comprehensive understanding of the cognitive, emotional, and social development of the child is essential for most behaviour management techniques. It is crucial that any approach to behavioural management be implemented with empathy and a genuine concern for the child's well-being. Paediatric dentists commonly employ non-pharmacological behaviour management techniques, including tell-show-do, distraction, modelling,

desensitization, and verbal communication, to address children's anxiety during pre-treatment visits. Among various approaches available, this research aimed to explore a psychological approach employing a self-designed dental storybook and storytelling as a behaviour management technique to alleviate dental anxiety in 5-12-year-old children.

Table 4: Comparison of mean animated emoji scale scores between different time intervals in each group using Friedman's test followed by Wilcoxon signed rank post hoc test.

Groups	Time	N	Mean	SD	P value[a]	P value[b]
Group 1-storybook	T0	80	2.45	1.00	<0.001*	<0.001*
	T1	80	1.45	0.76		0.002*
	T2	80	1.35	0.59		0.56
Group 2-storytelling	T0	80	2.75	0.79	<0.001*	0.002*
	T1	80	1.85	0.59		0.001*
	T2	80	1.60	0.68		0.16
Group 3-control	T0	80	2.85	0.99	0.58	-
	T1	80	2.70	0.87		-
	T2	80	2.80	0.77		-

*Statistically significant, [a]Friedman's test and [b]Wilcoxon signed rank post hoc test.

The story was designed to explain various oral conditions and their associated treatment modalities, assisting children in becoming more comfortable with the dental procedure and provide introductory information before dental procedure. The storybook provided an image-based approach to understand this information prior to dental treatment.

Deshpande et al concluded that a self-designed dental storybook used as an adjuvant was found to be promising behaviour modification technique for 5-7-year-old children as compared to behaviour modification without storybook. However, in the study we conducted we compared image-based storybook with verbal storytelling and found that verbal story telling also aids in reducing anxiety.[1] In our current study, a notable distinction in the pulse rate of children was elicited between the storytelling intervention group and the control group. This finding aligns with the research conducted by Aminabadi et al where they concluded that storytelling can effectively contribute to children's cognitive development and progress, resulting in a significant decrease in situational anxiety and the perception of pain during dental procedures.[3] In the present clinical study, the evaluation of dental anxiety comprised an examination of physiological and behavioural measuring scales/parameters. Sympathetic stimulation, reflecting anxiety or fear in children, manifests as an elevated pulse rate.[12] Thus, the pulse rate was employed as an indicator of dental anxiety, measured using a pulse oximeter. For behavioural parameters, Animated emoji scale (AES) which was proposed by Setty V et al. was used to quantify and evaluate anxiety. the assessment of dental anxiety using AES demonstrated a significant correlation with VPT, and children expressed a preference for the former due to the absence of confusion with figures, a common issue with VPT cards where certain figures resembled each other and were often challenging to interpret. Additionally, considering the current generation's familiarity with expressing emotions through emojis on social networking applications, AES becomes particularly appealing to young children as it includes animated emoticons.[6] The findings of this study suggest that utilizing a dental storybook has a favourable influence on children, serving as an efficient strategy for behaviour management to alleviate dental anxiety.

Limitations

The sample size was limited and could be expanded to encompass a larger population. Additionally, storytelling using self-designed storybook, originally printed only in English, has the potential to be translated into multiple languages to enhance comprehension.

CONCLUSION

The self-designed storybook can function as a simple yet effective tool when employed before dental procedures. It contributes to enhancing patient awareness and motivation to initiate dental care, ultimately ensuring a future free from cavities in children.

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REFERENCES

1. Deshpande A, Jain A, Shah Y, Jaiswal V, Wadhwa M. Effectiveness of self-designed dental storybook as behavior modification technique in 5-7 year-old children: A randomized controlled study. J Indian Soc Pedod Prev Dent. 2022;40:253-9.
2. Alsaadoon AM, Sulimany AM, Hamdan HM, Murshid EZ. The Use of a Dental Storybook as a Dental Anxiety Reduction Medium among Pediatric Patients: A Randomized Controlled Clinical Trial. Children. 2022;9(3):328.

3. Aminabadi NA, Vafaei A, Erfanparast L, Oskouei SG, Jamali Z. Impact of pictorial story on pain perception, situational anxiety and behavior in children: a cognitive-behavioral schema. J Clin Pediatr Dent. 2011;36(2):127-32.
4. labduljabbar R, Almutawa M, Alkathiri R. An Interactive Augmented and Virtual Reality System for Managing Dental Anxiety among Young Patients: A Pilot Study. Appl Sci. 2023;21:432-9.
5. Gozin F, Tabe BF, Esmaeili M. Audio–visual storytelling for reducing dental anxiety in Iranian children: a randomized controlled trial. Eur Arch Paediatr Dent. 2022;12:102-9.
6. Setty JV, Srinivasan I, Radhakrishna S, Melwani AM, DR MK. Use of an animated emoji scale as a novel tool for anxiety assessment in children. J dent Anesth Pain Med. 2019;19(4):227-33.
7. Zhao Z, Han F, Ma X. Live emoji: A live storytelling vr system with programmable cartoon-style emotion embodiment. Available at: https://ieeexplore.ieee.org/ document/8942384. Accessed on 20 November 2023.
8. Marion IW, Nelson TM, Sheller B, McKinney CM, Scott JM. Dental stories for children with autism. Spec Care Dentist. 2016;36(4):181-6.
9. Folayan MO, Idehen EE. Effect of information on dental anxiety and behaviour ratings in children. Eur J Paediatr Dent. 2004;5(3):147-50.
10. Agras S, Sylvester D, Oliveau D. The epidemiology of common fears and phobia. Compr Psychiatr. 1969; 10:151-6
11. Filewich RJ. Treatment of the agoraphobic dental patient. Dent Clin North Am. 1988;32:723-33.
12. Yelderman M, New W. Evaluation of pulse oximetry. Anesthesiology. 1983;59:349-52.

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