

# Efficacy of a Guided Music Meditation App as an Audio Distraction Tool for Reducing Anxiety in Children During Dental Treatment

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## ABSTRACT

**Background:** In Paediatric Dentistry, effective behaviour management is vital to address common anxiety in children during dental procedures. The current trend involves utilizing mobile apps for convenient, cost-effective mindfulness meditation, offering accessible exercises without the need for professional guidance.

**Aim:** This study investigates the Music Meditation App's efficacy as an innovative audio-distraction aid, merging modern technology with ancient meditation practices to revolutionize anxiety control and enhance the paediatric dental experience.

**Methods:** Conducted at Ahmedabad Dental College and Hospital, this prospective, randomized controlled trial involved 40 participants (6-14 years). Two groups were formed: Control (traditional treatment) and Intervention (Zen Lounge Music Meditation app). Outcome measures included pulse rate and Venham Anxiety Index, assessed before and 15 minutes after treatment initiation.

**Results:** Statistical analysis revealed significant differences in anxiety levels between groups before ( $p=0.017$ ) and after treatment ( $p<0.0001$ ). The control group showed increased anxiety levels, while the Music App group exhibited lower anxiety levels (30% relaxed) during treatment. Pulse rates increased for Control (95.6 to 103.85) and decreased for the Music App group (105 to 97.7).

**Conclusion:** The Music Meditation App demonstrated effectiveness as an audio-distraction aid, significantly reducing anxiety levels and pulse rates in paediatric dental patients. Findings align with previous studies on audio interventions in dental settings, emphasizing the potential benefits of integrating sound-based techniques for improved patient experience.

**Keywords:** Audio distraction, Music Meditation App, Anxiety

## INTRODUCTION

Effective behavior management is a cornerstone in pediatric dentistry as it directly impacts the successful delivery of necessary dental care for children.<sup>1</sup> “Wright (1975) defined behavior management as the means by which the dental health team effectively and efficiently performs treatment for a child patient and at the same time instils a positive dental attitude.<sup>2</sup> Common non-pharmacological behavior

management techniques encompass Tell-Show-Do, Non-verbal communication, Voice control, Modelling, Distraction, Positive reinforcement, Hand Over Mouth Exercise, and Protective stabilization.<sup>3</sup> Children often feel anxious during dental treatment due to their fear of unfamiliar or potentially threatening situations. This anxiety can impact the success of the treatment as well as the child's experience of pain.<sup>4</sup> Distraction involves redirecting an

individual's focus away from potentially distressing situations or thoughts. Mc Caul and Mallet emphasized the limited capacity of human attention. According to their theory, concentrating on anxiety-inducing stimuli can heighten the perception of anxiety. Therefore, by diverting attention away from these triggers, individuals may experience a reduction in their perception of anxiety.<sup>5</sup>

In recent times, there has been a notable emphasis on utilizing mobile applications (apps) to provide mindfulness meditation. These apps offer individuals convenient access to short mindfulness exercises at any given moment, often at minimal or no cost, and without the necessity of a trained professional. Moreover, apps equipped with integrated behavioral features can encourage consistent practice, a crucial element for successful treatment. While these mobile apps can offer meditation practices catering to various health conditions their effectiveness in alleviating depression and anxiety remains somewhat limited based on available evidence.<sup>6</sup>

This study explores the effectiveness of the Music Meditation App as an audio-distraction aid, aiming to alleviate pediatric patients' anxiety during dental procedures. By merging modern technology with ancient meditation practices, it seeks to revolutionize anxiety control, offering innovative audio distraction methods for an enhanced pediatric dental experience.

## MATERIALS & METHODS

This research was conducted at Ahmedabad Dental College and Hospital in Ahmedabad, Gujarat, spanning from September 2022 to October 2022. The study was designed as a prospective, randomized controlled trial with a sample population of 40 participants. Study Design: Prospective, Randomized Controlled Trial.

### Inclusion Criteria:

1. Age group: 6 to 14 years.

2. Patients scheduled for dental treatments involving the use of syringe and/or Airtor.
3. ASA 1 (American Society of Anesthesiologists) physical status classification.

### Exclusion Criteria:

1. ASA 2 or higher.
2. Age below 6 years.
3. Especially abled children.

**Groups:** sample population was divided into 2 groups of 20 patients each.

1. Group 1 (Control): Patients undergoing dental treatment in the traditional way.
2. Group 2 (Intervention): Patients undergoing dental treatment with the Music Meditation app (Zen Lounge) as an audio distraction tool. (figure 1)

### Outcome Measures:

1. Pulse rate: Measured before treatment and 15 minutes after treatment initiation.
2. Venham Anxiety Index: Assessed before treatment and 15 minutes after treatment commences.

### Materials:

- Pulse Oximeter for measuring pulse rates.
- Smartphone for accessing and playing the Zen Lounge app. (figure 1)
- Earphones/Headphones for delivering audio.
- Venham Anxiety Scale for evaluating anxiety levels. (figure 2)

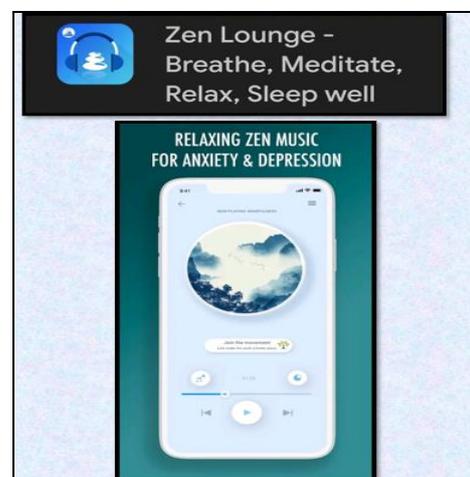


Figure 1: music meditation app (Zen lounge)

Score	Criteria
0	Relaxed: smiling ,willing , able to converse, displays behavior desired by the dentist.
1	Uneasy: concerned , may protest briefly to indicate discomfort, hands remain down or partially raised. Tense facial expression, high chest. Capable to cooperating.
2	Tense: tone of voice, question and answers reflect anxiety. During stressful procedure, verbal protest, crying, hands tensed and raised, but not interfering very much. Protest more distracting and troublesome. Child still complies with the request to cooperate.
3	Reluctant: pronounced verbal protest, crying. Using hands to stop procedure. Treatment proceeds with difficulty
4	Interference: general crying, body movements sometimes needing physical restraint. Protest disrupts procedure.
5	Out of contact: hard loud crying, swearing, screaming. Unable to listen, trying to escape. Physical restraint require.

Figure 2: Venham clinical co-operation scale

### Data Collection:

1. Baseline measurements of pulse rate and the Venham Anxiety Index were taken before the dental treatment began.
2. Group 2 listened to the Zen Lounge Music Meditation app using earphones/headphones during their dental treatment.
3. post-treatment measurements of pulse rate and the Venham Anxiety Index were recorded 15 minutes after the treatment started for both groups.
4. Data analysis was performed to compare anxiety levels between the control and intervention groups.

**Ethical Considerations:** This study will strictly adhere to ethical guidelines, encompassing patient confidentiality, obtaining informed consent from guardians, and securing institutional review board approval.

### STATISTICAL ANALYSIS

The collected data underwent analysis utilizing IBM SPSS software version 20. Categorical variables were presented in terms of frequency (n) and percentage (%), while continuous variables were reported as mean and standard deviation (SD). For the comparison of categorical variables, the Chi-square test was employed, and the student t-test was utilized to assess the

differences in continuous variables between two groups.

### RESULT

The study comprised two groups, namely Group 1 (Control) and Group 2 (Music App), each consisting of 20 samples, resulting in an equal distribution of 50% in each group. (Table 1)

Table 1: Demographic Data of study population.

	Frequency	Percent
Control	20	50.0
Music app	20	50.0
Total	40	100.0

The comparison of anxiety levels before treatment revealed distinct patterns. In the Control group, 35% of participants were relaxed, 55% uneasy, 10% tense, and 0% reductant. Conversely, the Music App group exhibited 0% relaxed, 65% uneasy, 30% tense, and 5% reductant. Statistical analysis using the Chi-square test indicated a significant difference in anxiety levels before treatment (p-value = 0.017). Subsequently, at the 15-minute mark during the treatment, the Control group displayed 0% relaxed, 40% uneasy, 45% tense, and 15% reductant, while the Music App group showed 30% relaxed, 70% uneasy, 0% tense, and 0% reductant. The Chi-square test indicated a highly significant difference in anxiety levels after treatment (p-value < 0.0001). (Table 2 and 3)

Table 2: Comparison of anxiety level before the treatment in two groups.

Before treatment		Group		Total
		Control	Music app	
Relaxed	N	7	0	7
	%	35%	0%	17.5%
Uneasy	N	11	13	24
	%	55%	65%	60.0%
Tense	N	2	6	8
	%	10%	30%	20%
Reductant	N	0	1	1
	%	0%	5%	2.5%
TOTAL	N	20	20	40
	%	100.0%	100.0%	100%
Chi square value = 10.167, p-value = 0.017*				

Table 3: Comparison of anxiety level at 15 minutes during the treatment.

Before treatment		Group		Total
		Control	Music app	
Relaxed	N	0	6	6
	%	0.00%	30.00%	15.00%
Uneasy	N	8	14	22
	%	40.00%	70.00%	55.00%
Tense	N	9	0	9
	%	45.00%	0.00%	22.50%
Reductant	N	3	0	3
	%	15.00%	0.00%	7.50%
TOTAL	N	20	20	40
	%	100.00%	100.00%	100.00%
Chi square value = 19.636, p-value = <0.0001*				

Pulse rates before and during treatment were also examined, revealing a significant increase for the Control group (95.6 to 103.85) and a decrease for the Music App group (105 to 97.7), supported by paired t-tests (p-values: 0.003 for Control, 0.028 for Music App). (Table 4)

Table 4: comparison of pulse rates before and 15 minutes during treatment in two groups.

PULSE RATE					
	Group	N	Mean	Std. Deviation	p-value
Before Treatment	Control	20	95.6	5.762	0.003*
	Music app	20	105	11.397	
15 min during Treatment	Control	20	103.85	6.9	0.028*
	Music app	20	97.7	9.825	

Additionally, crosstabulation demonstrated a significant association between anxiety levels before and during the treatment for the Control group (Chi-square value = 7.193, p-value = 0.126) but not for the Music App group (Chi-square value = 4.615, p-value = 0.99). (Table 5)

Table 5: cross tabulation of anxiety level among study groups.

Before treatment * 15 min during treatment Crosstabulation								
Patient No.				15 min during treatment				Total
				relaxed	uneasy	tense	reductant	
control	Before treatment	relaxed	N	5	2	0	7	
			%	62.5%	22.2%	0.0%	35.0%	
		uneasy	N	3	5	3	11	
			%	37.5%	55.6%	100.0%	55.0%	
	tense	N	0	2	0	2		
		%	0.0%	22.2%	0.0%	10.0%		
	Total			N	8	9	3	20
				%	100.0%	100.0%	100.0%	100.0%
Chi-square value – 7.193, p-value: 0.126								
music app	Before treatment	uneasy	N	6	7		13	
			%	100.0%	50.0%		65.0%	
		tense	N	0	6		6	
			%	0.0%	42.9%		30.0%	
	reductant	N	0	1		1		
		%	0.0%	7.1%		5.0%		
	Total			N	6	14		20
				%	100.0%	100.0%		100.0%
Chi-square value – 4.615, p-value: 0.99								

Paired samples t-tests further confirmed a highly significant difference in anxiety levels before and after treatment for both groups (p-values < 0.0001). (Table 6)

Table 6: Paired Samples Statistics

Patient No.			Mean	N	Std. Deviation	Std. Error Mean	p-value
control	Pair 1	Before treatment	.75	20	.639	.143	<0.0001*
		15 min during treatment	1.75	20	.716	.160	
music app	Pair 2	Before treatment	1.40	20	.598	.134	<0.0001*
		15 min during treatment	.70	20	.470	.105	

## DISCUSSION

The study involving 20 participants from control group and a music app group, which assessed anxiety levels and pulse rates before and during treatment, complements the findings from Singh *et al.*'s (2014)<sup>7</sup> research on sixty children undergoing dental extraction. Both studies indicate the potential of using music or audio interventions to alleviate anxiety during dental procedures. In the music app study, there was a significant reduction in anxiety levels and pulse rates during treatment, contrasting with increased anxiety observed in the control group. Singh *et al.*'s study, on the other hand, exposed children to headphones during dental extraction, resulting in statistically significant reductions in pulse rate, systolic blood pressure, and vibratory perception threshold compared to baseline.

Similarly, the prospective interventional study by Challa and Moses (2022)<sup>8</sup>, involving 60 paediatric subjects undergoing dental procedures with audio distraction aids, aligns with the theme of utilizing sound-based interventions to reduce anxiety. Both studies emphasize the importance of incorporating innovative techniques, such as music or audio distraction, in paediatric dentistry to enhance the overall comfort and experience of young patients.

Furthermore, while Antoniadou *et al.*'s (2022)<sup>9</sup> narrative review of 96 articles explores the impact of sound in dental offices, it provides a broader perspective by highlighting the negative impact of noise and the positive influence of music. The collective findings from these studies underscore the potential benefits of incorporating music or sound-based interventions in dental settings to mitigate

anxiety and enhance the overall well-being of patients, particularly in paediatric dentistry. Lastly, Divya Singh's study on white noise in paediatric dentistry demonstrated its remarkable effectiveness in alleviating anxiety among children aged 4-8 during dental procedures. This aligns with the broader theme of utilizing sound, in this case, white noise, which is like music meditation sound as an innovative and valuable audio distraction technique in paediatric dentistry, as also suggested in the reviewed studies.<sup>10</sup>

## CONCLUSION

The Music Meditation App demonstrated efficacy in reducing anxiety levels and pulse rates during paediatric dental procedures. The study supports the integration of innovative audio distraction techniques in paediatric dentistry to enhance the overall patient experience. Findings align with existing literature emphasizing the positive impact of sound-based interventions in dental settings.

### Declaration by Authors

**Ethical Approval:** Approved

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**Conflict of Interest:** The authors declare no conflict of interest.

## REFERENCES

1. Roberts JF, Curzon ME, Koch G, Martens LC. Behaviour management techniques in paediatric dentistry. *European Archives of Paediatric Dentistry*. 2010 Aug; 11:166-74.
2. Non-Pharmacologic approaches in behavior management. In: Wright G Z, Kupietzky A (Eds.) *Behavior management in dentistry for children*. Second edition. Iowa;England: Wiley Blackwell;2014.p63-91
3. Swarna K, Prathima GS, Suganya M, Sanguida A, Selvabalaji A. Recent advances in non-pharmacological behaviour management techniques in children—an overview. *IOSR J Dent Med Sci*. 2019; 18:18-21.
4. Agarwal N, Dhawan J, Kumar D, Anand A, Tangri K Effectiveness of Two Topical Anaesthetic Agents Used Along with Audio Visual Aids in Paediatric Dental Patients. *J. clin. diagn* 2017;11: 80-83.
5. Garrocho-Rangel A, Ibarra-Gutiérrez E, Rosales-Bérber M, Esquivel-Hernández R, Esparza-Villalpando V, Pozos-Guillén A A Video Eyeglasses/Earphones System as Distracting Method During Dental Treatment in Children: A Crossover Randomised and Controlled Clinical Trial. *Eur J Paediatr Dent* 2018; 19:74-9.
6. Huberty J, Puzia ME, Green J, Vlisides-Henry RD, Larkey L, Irwin MR, Vranceanu AM. A mindfulness meditation mobile app improves depression and anxiety in adults with sleep disturbance: Analysis from a randomized controlled trial. *General Hospital Psychiatry*. 2021 Nov 1; 73:30-7. The Vancouver citation style typically uses numerical references in the order they appear in the text. Here is the provided information formatted in Vancouver style:
7. Singh D, Samadi F, Jaiswal JN, Tripathi AM. Stress reduction through audio distraction in anxious pediatric dental patients: an adjunctive clinical study. *Int J Clin Pediatr Dent*. 2014 Sep;7(3):149-152.
8. Challa R, Moses J. Audio distraction technique in the management of anxious pediatric dental patients. *Int J Pedodont Rehabil*. 2022 Jun 30;7(1):28-34.
9. Antoniadou M, Tziouvara P, Antoniadou C. The Effect of Sound in the Dental Office: Practices and Recommendations for Quality Assurance—A Narrative Review. *Dent J*. 2022 Dec 5;10(12):228.
10. Singh D, Jain A, Jain D, Goyal V. Effect of white, brown, and pink noises on anxious pediatric dental patients. *Cardiometry*. 2022 Dec 1; 25:1252-1258

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