Tuning Out Tension: The Impact of Music on Pain Management and Emotional Regulation in Paediatric Dental Care- a review

Kiran Srinivas.B [1] , * Sangavi. R [2], R.Thaya [3], Indumathy Pandiyan [4] , Neelayathakshi G [5]

1) Undergraduate, Saveetha Dental College and Hospitals,Saveetha Institute of Medical and Technical Sciences,Saveetha University, Chennai, India.

Email Id: 151901072.sdc@saveetha.com

2)Senior Lecturer, Department of oral medicine, Radiology and special care dentistry.

Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences,

Saveetha University. Email id:Sangaviramesh12@gmail.com

3)B.D.S Third year Postgraduate student,Department of Conservative Dentistry and Endodontics,Sree Balaji Dental College and Hospital,Bharath Institute of Higher Education & Research,Narayana Puram, Pallikaranai, Chennai 600100 Tamilnadu, India

Email Id: ezhilthaya7@gmail.com

4)Senior Lecturer,Department of Public Health Dentistry ,Saveetha Dental College and Hospital ,Saveetha Institute of Medical and Technical Sciences, Saveetha University.

Email id:indumathym.sdc@saveetha.com

5)Post Graduate ,Department of Pediatric and Preventive Dentistry,DA Pandu Memorial RV Dental College.,Bangalore Karnataka

Email Id: drneelayathakshi@gmail.com

Corresponding author:Dr. Sangavi. R

Senior Lecturer, ,Department of oral medicine, Radiology and special care dentistry.

Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences,

Saveetha University. Email id:Sangaviramesh12@gmail.com

Abstract

This review delves into the latest research on music's effectiveness as a tool for managing pediatricpatients.Thereview is done to show the efficacy of audio distraction on pain and anxiety in paediatric patients. For a successful treatment in paediatric patients' management of pain, anxiety and behaviour is essential. Traditional behavioural techniques and pharmacological methods of management of child is not accepted by the parents today. Hence audio distraction, which is a non-aversive technique is introduced to improve the success rate of the treatment done in paediatric patients. Several researchers found that audio distraction decreases the anxiety of the patients during painful procedures.Use of audio distraction improves the behaviour of the children. Hence this method can be used for managing paediatric patient a dental sitting

Keywords
Anxiety, Dental treatment, Distraction, Pain, Music

Introduction:

Managing paediatric patients in a dental clinic is a challenging yet rewarding task. Unlike adult patients, children often require special care and attention to address their unique anxieties and fears. While pain management is crucial, fear of the unknown and dental anxiety are often the primary barriers to successful treatment.Recent advancements in pediatric dentistry offer various techniques to manage children's behaviour during dental procedures. One innovative approach is incorporating music into the dental setting. Research has shown that playing calming music can significantly reduce anxiety and improve children's cooperation, ultimately enhancing both the patient experience and the dentist's ability to deliver optimal care. Behaviour management techniques are essential tools for paediatric dentists. Open communication and clear education pave the way for positive and trusting relationships between the child, family, and dental team.The seeds of trust are sown before the first appointment, through written materials, open dialogue, and subtle signals like body language and smilesDental professionals need a diverse repertoire of behavior management strategies to accommodate the individual needs of each child. These techniques aim to:

1. Comfort the child: Create a relaxed and welcoming environment to minimize anxiety.
2. Relieve pain: Utilize appropriate pain management techniques to ensure a comfortable experience.
3. Perform procedures safely: Implement effective techniques to ensure the child's safety during treatment.
4. Promote cooperation: Encourage the child's participation and foster a sense of control during the procedure.
5. Gain patient and parent satisfaction: Ensure a positive experience for both the child and their parents.

By employing these strategies, dentists can effectively manage pediatric patients, leading to positive dental experiences for children and families.

Dental anxiety

Anxiety is a normal, though unpleasant, part of life, and it can affect us all in many different ways and at different times. In contrast, stress is something that comes and goes, appearing and vanishing with the external source causing it. Anxiety, however, can persist even if the cause is unclear to the sufferer.Dental anxiety is a term defined as a feeling of distress, upset, misery, and discomfort about dental treatment that is not actually connected to a specific external stimulus. According to Chadwick and Hosey (2003), anxiety is common in children, and the symptoms vary depending on the child's age. While toddlers might cry to express their anxiety, older children often find alternative ways to show their nerves. Concerns about the unknown and a lack of control, both common childhood anxieties, can be amplified during dental visits.. A child's ability to cope with dental procedures depends on their stage of development. Children can be cooperative, potentially cooperative, or unable to be cooperative (sometimes called pre-cooperative). Pre-cooperative children are the very young and those with specific disabilities for whom cooperation is difficult or impossible.[21]

Role of emotions on pain and anxiety

The Mind-Body Connection: How Emotions Influence Pain Perception

Our mood and emotional state play a significant role in shaping our pain experience. This fascinating mind-body connection goes beyond mere perception and can actually amplify or diminish the intensity of pain we feel.[3]

Negative Emotions Fuel the Fire

Studies reveal that patients with negative emotions, like anxiety or depression, tend to perceive pain more acutely than those with positive emotions. For example, depressed cardiac patients often report earlier onset and longer duration of angina pain compared to their non-depressed counterparts, even when their heart conditions are similar. Similarly, research

shows a strong correlation between self-reported pain levels and depressive symptoms in individuals with chronic pain conditions.

The Dental Dilemma: Anxiety Amplifies Pain

This mind-body connection holds true even in acute pain scenarios, like dental procedures. The pre-operative anxiety a patient experiences can directly influence the degree of post-operative pain they feel. Experimental studies further substantiate this, demonstrating that interventions that uplift mood and induce positive emotions, like pleasant music or humorous videos, can significantly reduce pain perception. Conversely, factors that trigger negative emotions, such as the pungent odor of eugenol in a dental office, can exacerbate anxiety and strengthen negative conditioning towards dental care.[4][9]

Creating a Calming Environment

Recognizing the powerful influence of mood on pain perception emphasizes the importance of creating a calm and positive environment in healthcare settings, particularly in dentistry. Simple measures like pleasant music, nature sounds, calming aromatherapy, and even aesthetically pleasing decor can go a long way in easing patient anxiety and enhancing their overall experience.By fostering a positive atmosphere and addressing patients' emotional well-being, we can not only reduce their pain perception but also promote better overall health outcomes.[5]

Understanding the Stress Response:

Stress arises when the demands of our environment exceed our perceived ability to cope, jeopardizing our well-being. This triggers a complex neurophysiological response orchestrated by the central nervous system, particularly the limbic system and the hypothalamus [6].

The hypothalamus acts as a central control unit, communicating with two key ssystems: the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system (SNS) [8].

Working together, these systems activate various physiological and psychological processes to maintain homeostasis (internal balance) in the face of stress. This includes hormonal changes (cortisol release), cardiovascular activation, emotional processing, and more.[7]

Measuring Stress Response:

To assess the effectiveness of stress management interventions like music, researchers often evaluate stress biomarkers. Two readily available and non-invasive markers are:

- Cortisol: The "stress hormone," measured in saliva or blood, indicates HPA axis activity.
- Salivary alpha-amylase (sAA): An enzyme reflecting SNS activity, also measured in saliva.

These markers provide valuable insights into the body's stress response without the need for more invasive testing.

By understanding the mechanisms underlying stress and utilizing accessible measures of its impact, researchers can develop and evaluate effective stress management tools like music therapy. This holds immense promise for improving individual well-being and reducing the societal burden of stress-related health issues.[8]

Conventional method of managing paediatric patients [18]

When a Dentist Meets an Anxious Child: A Guide to Gentle Care

For dentists who don't regularly treat children, encountering an anxious young patient can be a unique challenge. Children often approach the dental chair with a mix of curiosity and apprehension, manifesting in "weird behaviors and mannerisms" as you mentioned. From fidgeting and crying to clinging to parents, these reactions are entirely normal and stem from the unfamiliar environment and potential fear of pain.

Preparing for the Wiggles:[19]

The key to handling an anxious child in the dental setting lies in preparation and empathy. The dental team should be equipped to create a welcoming and reassuring ambience. This might involve:

- Warm and friendly introductions: Get down to the child's level, make eye contact, and use their name.
- Explaining the process in simple terms: Avoid technical jargon and focus on what the child will feel and see. Show them the instruments beforehand and explain their uses in a playful manner.
- Creating a positive distraction: Play music, tell stories, or offer age-appropriate toys and books to divert attention from the unfamiliar surroundings.

Beyond the Wiggles: Building Cooperation

While managing immediate anxiety is crucial, a dentist's role extends beyond calming the child for the appointment. It's equally important to instill coping mechanisms for future dental visits. This can be achieved through:[15]

- Tell-show-do technique: Demonstrate the procedure on a model or even the child's hand before performing it in their mouth.
- Relaxation exercises: Teach simple breathing techniques or mindfulness exercises to help the child control their anxiety.
- Positive reinforcement: Praise the child for their bravery and cooperation throughout the appointment.

Shifting Tides: Moving Away from Restraint

Traditional methods like papoose boards and hand-over-mouth techniques, while effective in some cases, are increasingly viewed with concern due to potential negative emotional impact. The dental community is now shifting towards more positive and collaborative approaches, with distraction techniques emerging as a popular choice.[15]

Remember, every child is unique, and their anxiety will manifest differently. By employing a variety of tools and fostering a patient and understanding environment, dentists can transform a potentially stressful experience into a positive one, laying the foundation for a lifetime of good dental hygiene habits.

Tell show do

Tell-Show-Do: Building Trust and Comfort in Paediatric Dentistry

Introducing dental instruments and procedures can be daunting for children. Unfamiliar objects and sounds can trigger anxiety, especially when they don't understand their purpose. The Tell-Show-Do technique is a cornerstone of pediatric dentistry, aiming to gradually familiarize children with instruments and procedures, building trust and reducing anxiety.

The Four Steps of Tell-Show-Do:[16]

1. Tell: Explain the procedure in age-appropriate language, using simple words and avoiding technical jargon. Speak slowly and clearly, emphasizing the positive aspects of the procedure. This initial conversation helps address worries and reframe the experience in a non-threatening light.

2. Show: Demonstrate the instrument or procedure ona toy, or the hand of the child. Keep demonstration short and calm, avoiding exaggerated movements. This visual element allows the child to see what to expect, reducing the fear of the unknown.

3. Do: Perform the procedure as described and demonstrated. Consistency builds trust and reduces anxiety. If any adjustments are necessary, explain them beforehand and ensure the child understands.

Voice control

This technique utilizes controlled modification of voice volume, pace and tones, to influence the child's behaviour. This technique is usuallyutilized for the uncooperative or distracted patient to gain their attention. Voice guidance shouldn't be interrupted and shouldn't reflect

negativity in the child's behaviour; it should be used to establish authority. It is not used among children who are under age, differently abled, or emotionally immature. Once the required behaviour is achieved from the child, it is praised and positively incorporated into the treatment. It is mandatory to appreciate the kid for the behaviour. This act of behaviour shouldn't be misinterpreted as showing anger towards the child.[16]

Protective stabilisation

Protective stabilization involves restricting the patient's a movement during the dental internment in order to reduce the risk of injury to everybody while allowing safe conclusion of treatment. There are various types of protective stabilization can be incorporated in the dental treatment ranging from a family member or a caregiver holding the kid's hands to the utilisation of a stabilisation tool (i.e., papoose board or pedo wrap). Informed consent must be obtained from the parent or the guardian about the use of protective stabilization, and if a family member haveany problem at any time to the use of protective stabilization, the technique should be terminated immediately without any delay.This protective stabilisation technique is not encouraged a lot as they may cause respiratory issues, we do not utilize it.[17]

HOME

HOME, defined as the Hand-Over-Mouth (HOM) technique, may appear invasive to onlookers, but in reality, it is not. It involves briefly restraining the child in the dental chair and placing a gentle hand over their mouth. This is done to help the child focus on the dentist's voice amidst their crying. Covering the nose is avoided while the mouth is covered. Once the child becomes quiet, the dentist calmly and politely explains that the hand will be removed as soon as the crying stops. When this happens, the child is praised for their cooperation. If crying resumes, the hand may be placed back over the mouth.The goal of the HOM technique is to gain the child's attention, enable communication, reinforce positive behavior, and demonstrate that avoidance is unproductive. It is recommended for children aged 4-9 years only, in situations where communication is lost or during temper tantrums.Parental consent is essential, and the technique is strictly prohibited for children too

young to understand the dentist's instructions or for those with intellectual or emotional disabilities.[20]

Behaviour guidance technique

Behaviour guidance is a technique used by practitioners to help patients detect appropriate and inappropriate behaviours, learn problem-solving strategies, and develop impulse control, self-esteem and empathy [1] It's an interactive process involving the entire dental team, the patient, and the parent. The aim is to create effective communication, alleviate fear and anxiety, deliver a quality dental care, build a reliable relationship between the dentist and the child/parent, and develop the child's positive attitude toward dental care. Knowledge of the scientific basis of behaviour guidance in communication, tolerance, empathy, cultural sensitivity, and flexibility are essential for proper implementation. Behaviour guidance can never be used as punishment for misbehaviour, a power assertion, or involve any strategy that hurts, shames, or belittles a child. Both non-pharmacological and pharmacological behavior guidance techniques are used to alleviate anxiety, nurture a positive dental attitude, and perform quality oral health care to the kids.[2]

The Sound of Relief: Exploring Music as a Stress Management Tool

Chronic stress wreaks havoc on our individual health, impacting everything from our physical well-being to our cognitive and emotional processes. It also carries a significant financial burden on society. As a result, developing affordable and accessible stress management techniques has become a top priority for researchers. This readily available and widely accepted intervention has shown promise in mitigating stress-related physiological, intellectual, and emotional effects. Its economic affordability, non-invasive nature, and ease of use make it particularly appealing for both prevention and management of stress and stress-related health issues.

The layers of music therapy:[10]

Music therapy, the practice of using music as a psychological tool to enhance healing and well-being, unfolds through several key layers. These layers may involve:

- Discovering your musical preferences: Discussing the types of music that resonate most with you sets the stage for a personalized experience.
- Creative music-making: Engaging in musical expression, even through improvisational activities like drumming or playing along with the therapist, fosters a sense of empowerment and can even interrupt pain perception at a neurological level.

"Music therapy is about creative spontaneity and reflection that works to change the pain response," explains music therapist Paul Nolan, MCAT, director of the Music Therapy Programs at Drexel University.

Each step contributes to the success of music therapy:[14]

- The therapeutic relationship: A strong and trusting connection between the therapist and client is crucial. Music therapists are not only skilled musicians but also trained in psychology, physiology, and building rapport.
- Musical preference: Listening to music you find personally enjoyable promotes greater relaxation and engagement. While research often includes classical music, Nolan emphasizes that any genre that brings you comfort or joy is fair game.
- The creative act: Actively making music, even in simple ways, provides a powerful tool for managing pain and stress. This collaborative process can offer lasting relief and even improve sleep quality for those struggling with insomnia.
- Reflection: Discussing your emotions and thoughts evoked by the music with your therapist helps you learn to actively leverage music for self-soothing and maintaining calmness, even beyond the therapy session.

By peeling back these layers, music therapy reveals its potential to enhance well-being and empower individuals to cope with pain and stress in a therapeutic and creative way.

Role of music in pain control

The power of music in enriching our lives has fueled a surge of research, particularly exploring its use in healthcare. For children undergoing medical procedures, music can work wonders as a form of distraction, alleviating pain and distress. Studies show that pre- and intra-procedural music calms patients, enhances cooperation, and even reduces post-operative pain.Interestingly, the magic doesn't necessarily lie in familiarity. While recent brain studies suggest that familiar music activates emotion regulation and reward centers more than unfamiliar tunes, a diverse blend of rhythms, instruments, themes, and even karaoke can prove equally effective as distractions.[14] Unfamiliar music, with its novelty, might even be more engrossing for some children.The complexity of choosing the right music extends to the emotional and lyrical content. Studies reveal that happy music versus sad music, and lyric-free versus lyric-filled music, activate different brain regions with varying intensity. These nuances play a crucial role in a music intervention's success, leaving many questions unanswered. Should patients choose their own songs? Which genre or style holds the most calming power? One thing remains clear: music works. While research continues to unravel the intricate tapestry of musical influence on the brain, we can see its immediate effects in the clinic. Patients' vital signs, often elevated before music therapy, gradually decrease throughout the session, returning to normal by the end. This tangible reduction in stress and anxiety speaks volumes about music's therapeutic potential.[12]

Clinical studies

A study by AR Prabhakar et al. produced statistically significant results, demonstrating that music can effectively reduce children's anxiety during medical procedures. They measured children's oxygen saturation levels both before and after music therapy, with positive results supporting the study's effectiveness [13].Similarly, a systematic review by the Joanna Briggs Institute compared two groups: one receiving standard care without music and another exposed to music therapy. The music group exhibited a significant reduction in pulse rate, indicating a decrease in anxiety However, not all studies paint the same picture. A contrasting study by Jennifer et al. concluded that audio distraction, including music, was not an effective means of reducing anxiety, pain, or uncooperative behavior during pediatric dental procedures. Interestingly, though, their findings revealed that the children still enjoyed

listening to music during their visits. These contrasting results highlight the complexity of utilizing music therapy in healthcare. While some studies demonstrate clear clinical benefits, others suggest limited effectiveness. Further research is necessary to identify the specific types of music, delivery methods, and patient populations for whom music therapy offers the greatest benefit.[11]

Conclusion:

This review suggests that playing music during dental procedures effectively reduces children's anxiety. This, in turn, leads to lower post-operative pain and more cooperative behaviour in the clinic. Patients responded positively to the music and expressed a desire to hear it during future visits.

Limitations:

- Limited long-term data: Most studies focus on immediate treatment effects, lacking information on music's long-term impact on dental anxiety or behaviour.
- Individual variability: The effectiveness of music therapy likely varies based on individual preferences, personality, and prior dental experiences.
- Limited research on specific music types and genres: While research explores music's general effect, studies investigating the impact of specific musical styles or genres on paediatric patients are scarce.

Future scope:

- Investigate long-term effects: Long-term studies assessing music's impact on dental anxiety and behaviour beyond immediate treatment are needed.
- Personalization of music therapy: Exploring the efficacy of tailoring music selection and delivery methods to individual patient preferences and needs.

- Neuroimaging studies: Utilizing brain imaging techniques to understand the neurological mechanisms underlying music's therapeutic effects in pediatric dental patients.

Reference

1)Allen, Keith D., R. T. Stanley, and K. McPherson. "Evaluation of behaviour management technology dissemination in paediatric dentistry." Pediatr Dent 12.2 1990: 79-82.

2)Lawrence SM, McTigue DJ, Wilson S, Odom JG, Waggoner WF, Fields Jr HW. Parental attitudes toward behaviour management techniques used in paediatric dentistry. Pediatr Dent. 1991;13:151-5.

3)Haythornthwaite JA, Benrud-Larson LM. Psychological aspects of neuropathic pain. Clin J Pain 2000; 16:S101–5.

4)Villemure C, Bushnell MC. Cognitive modulation of pain: how do attention and emotion influence pain processing? Pain 2002; 95:195–9.

5)Geisser ME, Roth RS, Theisen ME, Robinson ME, Riley JL 3rd. Negative affect, self-report of depressive symptoms, and clinical depression: relation to the experience of chronic pain. Clin J Pain 2000; 16:110–20.

6)Martelli MF, Auerbach SM, Alexander J, Mercuri LG. Stress management in the health care setting: Matching interventions with patient coping styles. Journal of Consulting and Clinical Psychology. 1987;55:201.

7)Villemure C, Bushnell MC. Cognitive modulation of pain: how do attention and emotion influence pain processing? Pain 2002; 95:195–9.

8)8. Haythornthwaite JA, Benrud-Larson LM. Psychological aspects of neuropathic pain. Clin J Pain 2000; 16:S101–5.

9) American Academy of Paediatric Dentistry. Policy on medically necessary care. Pediatr Dent 2015;37:18-22.

10)Pereira CS, Teixeira J, Figueiredo P, Xavier J, Castro SL, Brattico E. Music and emotions in the brain: familiarity matters. PLoS One. 2011;6:e27241

11)Brattico E, Alluri V, Bogert B, et al. A functional MRI study of happy and sad emotions in music with and without lyrics. Front Psychol. 2011;2:308.

12)Joanna Briggs Institute Music interventions for dental anxiety in paediatric and adult patients JBI XXX Best Practice 15:1 2011 | 11

13)Prabhakar A R, Marwah N, Raju O S. A comparison between audio and audiovisual distraction techniques in managing anxious pediatric dental patients. J Indian Soc Pedod Prev Dent 2007;25:177-82

14)Jennifer Creem Aitken, DMD, MS Stephen Wilson, DMD, MA, PhD Daniel Coury, MD Amr M. Moursi, DDS, PhD The effect of music distraction on pain, anxiety and behavior in pediatric dental patients .Pediatric Dentistry – 2002; 24:2,

15) Park M. Non-pharmacologic Management of Patients with Special Health Care Needs. 2013.

16) Ilieva E, Beltcheva A. Non-pharmacological management of the behaviour of pediatric dental patients. Folia Med (Plovdiv) 1999;41:126-31.

17) Luscre DM, Center DB. Procedures for reducing dental fear in children with autism. J Autism Dev Disord1996;26:547-56.

18) Fayle S, Crawford PJ. Making dental treatment acceptable to children. Dent Profile 1997;4:18

19). American Academy of Paediatric Dentistry Guidelines for behaviour management. Pediatr Dent 1998;20:27-32.

20). Levitas TC. HOME-hand over mouth exercise. ASDC J Dent Child 1974;41:178-82.

21)Appukuttan DP. Strategies to manage patients with dental anxiety and dental phobia: literature review. Clinical, cosmetic and investigational dentistry. 2016 Mar 10:35-50.