ORIGINAL ARTICLE

Effect of Music Therapy on Reducing Anxiety and Alleviating Physiological Stress in Patients Undergoing Dental Extractions - An evidence based study

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ABSTRACT

Background

Dental anxiety is prevalent and significant challenge for patients undergoing extractions. It not only make the dental visit unpleasant but can also complicate the process for both patients and dental care providers. Current approaches for managing dental anxiety involve distraction techniques, psychotherapeutic and cognitive therapy. Among these, music therapy has emerged as a particularly promising intervention due to its low cost, minimal risk, and wide applicability. Research suggests that music therapy may offer substantial benefits in reducing anxiety, alleviating pain perception, and improving overall patient outcomes, making it a valuable adjunct in the management of dental anxiety during extractions. Therefore the aim of this research was to evaluate consequences of music therapy on dental anxiety level in individuals undergoing surgical extractions through a questionnaire based approach.

Methodology

A total of 100 patients visiting the outpatient department and indicated for extraction were requested to provide there experience in a Corah's Dental Anxiety Scale (DAS) questionnaire and were then subjected to listen music. Dental anxiety levels namely systolic and diastolic pressure and heart rate were evaluated prior and subsequent to music therapy. The data acquired were then analysed employing SPSS software.

Result

The study demonstrated that dental anxiety was associated with significant hemodynamic changes, including increase in systolic and diastolic blood pressure, in addition to heart rate, with the rise in diastolic pressure being particularly notable. A moderate level of anxiety was most prevalent (n=44), while fewer participants exhibited severe anxiety (n=14). In the cohort aged over 50 years, mild to moderate anxiety was predominantly observed, especially in males.

Conclusion

Music, with its ability to engage both the mind and emotions, is often seen as a powerful psychological and even spiritual tool for promoting relaxation and emotional well-being. Consequently, music therapy may serve as an anxiolytic intervention for stressful dental treatments.

Keywords

Dental anxiety, Music therapy, Tooth extraction, Hemodynamic changes, Corah's Dental Anxiety Scale, Anxiety reduction, Heart rate, Blood pressure, Questionnaire-based study, Non-pharmacological intervention

INTRODUCTION

Dentophobia is a worldwide concern that affects a substantial portion of the population, often preventing individuals from seeking dental care or undergoing treatments, which can lead to poor oral health outcomes.[1] It ranges from mild discomfort to intense fear, and is thought

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to stem from a variety of factors, including negative past experiences, aglophobia, the unsettling sounds and sensations of dental procedures, challenges in managing salivation, swallowing, bleeding, and wounds, and, finally, handling of sharp instruments.[2] It remains a persistent global challenge, affecting 6-15% of adults and 5.7-19.5% of children.[3] Physiological stressors, such as elevated heart rate, increased blood pressure, and heightened muscle tension, frequently accompany dental anxiety, amplifying the discomfort and making dental visits even more stressful. These physiological reactions not only make the dental visit unpleasant but can also complicate the process for both patients and dental care providers.[2] Current approaches to managing dental anxiety include distraction techniques, psychotherapeutic or pharmacological interventions, and cognitive therapy.[4] One promising intervention that has been studied for its effectiveness in attenuating both dental anxiety and its physiological impact is music therapy.[5]

Music therapy, which uses the power of music to foster relaxation, emotional expression, and overall well-being, is increasingly being integrated into healthcare settings as a means to reduce anxiety and alleviate stress.[6] The key mechanisms through which music therapy may work include providing relaxation and distraction by offering a focal point of attention that diverts the patient's mind from the anxiety-provoking dental environment, inducing calming effects through slow-tempo classical music or nature sounds that activate the parasympathetic nervous system to reduce physiological stress, and regulating mood by enhancing positive emotions, reducing negative ones, and promoting a state of calm to help mitigate fear and tension.[6][7]

The significance of the auditory perception is highlighted due to the fact that it develops prior to sight during the embryonic stage, making it the earliest functioning sense in development of humans.[4,7] Over the past two decades, the anxiolytic impact of music have been extensively studied in various medical contexts, including cardiac, surgical, and oncological treatments. This research provides a logical foundation for the growing integration of music therapy across both dental and medical disciplines, alongside the treatment of addictions to tobacco, alcohol and drugs. Additionally, music has the unique ability to divert attention from stressful stimuli, such as background noise, and redirect it toward a more pleasurable emotional state, further enhancing its therapeutic value.[8]

In the dental field, the fear of extractions is a prevalent form of dental anxiety, often triggered by concerns about pain, the perceived invasiveness of the procedure, or past negative experiences.[5] For many patients, the sight of blood during an extraction can intensify fear and discomfort, triggering a powerful emotional reaction, while the sounds and sensations of the procedure further heighten anxiety. As a result, individuals may delay or avoid necessary dental care, which can lead to more complex dental issues and long-term oral health complications.[9]

Therefore, current study attempted to evaluate the impact of music therapy on patients' dental anxiety undergoing surgical tooth extractions, by assessing their anxiety levels before and after the music therapy using hemodynamic changes.

MATERIALS AND METHODS

The analytical cross sectional study was carried out following approval from the Institutional Ethics Committee (KIIT/KIMS/IEC/1859/2024) of Kalinga Institute of Dental Sciences, Bhubaneswar. The study included patients over the age of 18 who were indicated for dental extraction, medically fit, free from mental or physical disabilities, and had provided informed consent to participate. Individuals with diabetes hypertension, xerostomia, pregnancy, or suffering from chronic, systemic, or endocrine disorders, as well as those on chronic medication such as antidepressants, antihistamines, or anticholinergics, were excluded from the study. Based on the established inclusion and exclusion criteria, the study included 100 patients in total.

Participants were provided with comprehensive information regarding the study and, upon giving informed consent, were instructed to complete the Modified Corah's Dental Anxiety Scale (DAS), a validated and reliable instrument for evaluating dental anxiety [10,11]. This scale includes four straightforward questions, each with five possible response options, designed to assess the participant's subjective feelings about visiting the dentist, awaiting in the office and anticipating procedures, for instance drilling and scaling. The anxiety score is determined based on the participant's responses, ranging from "1" (not anxious) to "5" (extremely anxious). The sum of the scores, with higher totals designate greater anxiety. The total

score can range from "4" (indicating minimal anxiety) to "20" (indicating severe anxiety or phobia). Scores between "9" and "12" suggest moderate anxiety, "13" to "14" indicate high anxiety, and scores between "15" and "20" reflect severe anxiety or dental phobia.

Before the surgical procedure, participants were asked to listen to music through noise-cancelling earphones, which were sterilized for the purpose of the study. Before and after music therapy, clinical parameters, including blood pressure and heart rate, were assessed by using Dr. Morepen Automatic Blood Pressure Monitor BP-02. The standard operating procedures (SOP) for exodontia were then followed as per protocol. All the surgical tooth extractions were undertaken by a single oral surgeon.

The data collected was compiled and analyzed using SPSS software (version 29) for statistical evaluation.

RESULT

The study included 100 participants among of whom 44 were females and 56 were males, with majority of patients aged above 50 years. The demographic details are summarized in **Table 1**. Based on the questionnaire results most participants experienced moderate level of anxiety (n=44) while fewer of severe anxiety (n=14) **(Figure 1)**

Mild and moderate anxiety were observed in 23% of males each, while in females, moderate anxiety was more prevalent, affecting 21%. **(Table 2)** Severe anxiety was more prevalent in females compared to that of males. In the cohort aged above 50 years, mild to moderate anxiety was predominantly observed. Conversely, in the 21-30 year age group, 5% of participants demonstrated severe anxiety, followed by 14% exhibiting moderate anxiety. **(Table 3)**

The mean systolic and diastolic blood pressure before music therapy were 138 mm Hg and 85 mm Hg, respectively, while the mean heart rate was 87 beats per minute. After music remedy, the systolic and diastolic blood pressure lowered to 131 mm Hg and 83 mm Hg, respectively, and the mean heart rate reduced to 83 beats per minute **(Table 4)**. Statistical analysis revealed significant changes in all parameters ($p = 0.001$), including the paired differences in the physiological measures, indicating a notable reduction in blood pressure and heart rate following the music therapy session.

The mean systolic blood pressure decreased after intervention across all age groups: from 142 to 136.25 for 18-20 years, from 132.71 to 125.07 for 21-30 years, and from 128.25 to 125.75 for 31-40 years. However, the changes in systolic blood pressure were statistically insignificant. But, for diastolic blood pressure, the mean decreased significantly. The mean heart rate decreased in the 18-20 years (88.62 to 85.12) and 21-30 years (86.17 to 83.03) groups, but remained nearly unchanged in the 31-40 years group (78.62 to 78.12), with no statistical significance in heart rate changes. **(Table 5)**

Statistical significance was found when gender was compared with systolic blood pressure.($p=0.011,0.001$) Before the intervention, the mean systolic blood pressure was 136.64 for males and 139.45 for females, decreasing to 131.25 and 131.40, respectively, after the intervention. The mean diastolic blood pressure decreased from 85.26 to 83.48 for males and from 85.72 to 81.88 for females. Additionally, the mean heart rate decreased for both males and females, reaching 83.10 and 83.88, respectively, after the intervention. **(Table 6)**

DISCUSSION

Dental anxiety is recognized as a significant issue that disrupts both the work and performance of dental professionals.[12] The anticipation of a dental procedure can lead to a marked increase in anxiety levels. Patients experiencing dental anxiety often exhibit signs of refusal during treatment, which can be categorized into physiological, behavioural, cognitive, and emotional symptoms.[13] Amidst these, physiological symptoms—like shortness of breath, hyperventilation, tachycardia, hypertension, elevated respiration rate, nausea, and vomiting—are particularly concerning, as they may contribute to the failure of the treatment. More importantly, dental anxiety is a key factor in the series of dental escapade, where anxious individuals delay seeking treatment, leading to a deterioration of their oral health over time. [4][12][13] While much research has focused on dental anxiety in adults, studies from various countries have also examined this issue, revealing that approximately one-sixth of patients experience dental anxiety. Even in the context of routine dental procedures, such as dental hygiene treatments, anxiety levels can be significantly elevated.[14]

In this study, moderate anxiety levels were observed in both male and female participants, with female patients exhibiting a higher prevalence of severe anxiety

compared to males. Woodmansey et al. evaluated patient anxiety levels using the Corah DAS and found that most patients visiting a dental clinic set up at a university experienced little to moderate anxiety.[15] In contrast, a further study that assessed anxiety employing the Modified Dental Anxiety Scale across four distinct clinic settings— including a university dental school and both private and public hospital clinics—found that just 13.6% of patients displayed high levels of anxiety. This version of the Modified Dental Anxiety Scale also incorporates additional questions specifically addressing concerns about local anesthetic injections in the gums. [16]

The use of music therapy for reducing anxiety is a long-established practice, with roots tracing back to ancient times, including the classical era and the Middle Ages. [17] The ability of music therapy to reduce anxiety and stress can be attributed to various physiological and psychological mechanisms.[18] Research consistently demonstrates that music has a significant impact on both subjective feelings of anxiety and objective physiological measures. The impact of music intervention extends beyond specific procedures and gender. A systematic review of randomized controlled trials revealed that music was effective in reducing anxiety in female patients undergoing colposcopy, a procedure often associated with elevated anxiety and negative emotional reactions in many women. This suggests that music can serve as a beneficial tool for managing anxiety in a variety of clinical settings, regardless of the procedure or patient demographics. [19][20] In our study, compared to males high level of anxiety was seen more in females.

Most of the existing published work braces the idea that music is capable of having a positive impact on patients' emotional states and physiological responses to anxiety. While numerous studies have explored the effects of music in medical and surgical treatments, relatively few have specifically investigated its impact on dental procedures. Only a small number of studies have focused on the role of music therapy in reducing dental anxiety during surgical extractions.[9][21] We specifically selected music for this study because it has been shown to positively influence both the body and mind, helping to stimulate emotions, motivate patients, evoke memories, and alleviate tension.

Furthermore, music therapy is a painless, non-invasive intervention that offers calming and anxiety-reducing effects. Compared to pharmacological treatments and other therapeutic approaches, it is cost-effective, as it has no need of extensive investment in specialized equipment or training. Additionally, since sound is not constrained by geography or time, it can readily impact the neurological system and change brain waves, thereby modulating both the psychological and physiological states of an person.[22] Studies shows noradrenaline levels in plasma as a marker of dental anxiety.[23]

When implementing music intervention is a critical element; initiating music preceding the start of dental treatment may assist mitigate the development of anxiety during the waiting period. This approach was utilized in our study, where patients began listening to music before the extraction procedure. Additionally, it is suggested that patients be encouraged to diligently engage with the music, instead of listening passively. self-reported anxiety was successfully reduced by music therapy; it failed to significantly affect self-reported stress or mood. Furthermore, although few studies let participants to select their own musical choices with the expectation of enhanced anxiety reduction, our study employed standardized music for the intervention.[24]

Minimizing external distractions is crucial, as stressful background noise is often prevalent in dental settings. Certain stimuli have been directly associated with heightened anxiety, contributing to dental fear. These include the metallic sound of dental instruments, the noise of drills, the presence of sharp tools, the use of rubber dams, and even conversations among dental staff. These factors can trigger exaggerated responses and increase levels of anxiety in patients.[25] A study conducted at Pacific Dental College, India, examining dental anxiety before surgical tooth extractions in 164 oral surgery patients, found that 35.5% of participants reported a fear of injections. [26]

The difference was statistically significant ($p > 0.05$) in the measured physiological measurements prior to and following the intervention. This finding was in accordance with the results of Gupta et al., who observed a progressive reduction in heart rate during minor oral surgery approaches. Additionally, Gupta et al. carried out multiple heart rate measurements at various intervals, whereas our study only recorded two readings: one before the treatment began and one at the end.[21] In contrast, Kim et al. found no significant

differences in blood pressure between groups, but the group that received music therapy experienced a significantly smaller change in heart rate compared to the control group.[9]

A significant reduction in hemodynamic changes was observed, with systolic blood pressure decreasing by 7.84 mmHg, diastolic blood pressure by 6.5 mmHg, and heart rate by 5 beats per minute. All changes were statistically significant, as determined by paired t-test analysis (P value < 0.05). These findings underscore the efficacy of music therapy in patients experiencing dental anxiety while having extractions. Nevertheless, in contrast to our results, a study found that those who engaged in the classical music exhibited a rise in NAP levels, as well as in both systolic and diastolic blood pressure.[23]

This study sought to determine whether lyric-free, soothing, and relaxing music helped reduce dental anxiety among individuals needing extractions and the results were found to be statistically significant. However, the study has some limitations. Larger sample sizes in future studies are needed to explore the effects of music therapy on reducing dental anxiety and stress. Additionally, factors such as salivary cortisol levels, body temperature, and the influence of variables like gender, education, painkiller and caffeine consumption, and the number of previous dental appointments were not taken into account in this study.

CONCLUSION

The results of this study suggest that music therapy can help reduce blood pressure and heart rate in patients, thereby alleviating dental anxiety. While it is not a substitute for pain management or anaesthesia during dental extractions, music therapy serves as a beneficial adjunct, helping to ease anxiety, enhance pain tolerance, and create a more comfortable experience for patients. For individuals who experience anxiety or nervousness about dental procedures, incorporating music therapy can significantly improve their overall experience and contribute to better mental and physical health outcomes. Given its affordability, minimal risk, and wide applicability, integrating music therapy into dental practices could be a highly effective strategy for improving patient care.

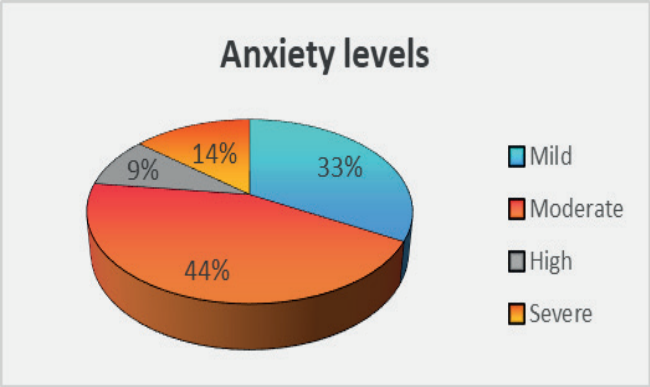

Figure 1 - Anxiety levels among the study participants

TABLE 1 – Descriptive Staistics Among The Study Participants

Variables	Frequency	percentage
AGE		
18-20	8	8.0
21-30	28	28.0
31-40	8	8.0
41-50	18	18.0
>51	38	38.0
GENDER		
Female	44	44.0
Male	56	56.0
ANXIETY LEVEL		
Mild	33	33.0
Moderate	44	44.0
High	9	9.0
Severe	14	14.0

TABLE 2- Comparision of Gender with Anxiety Level

	High Anxiety	Mild Anxiety	Moderate Anxiety	Severe Anxiety	Total	Chi square	df	p value
Male	5	23	23	5	56	5.100	3	.165
Female	4	10	21	9	44			
Total	9	33	44	14	100			

TABLE 3 – Comparision of Age With Anxiety Level

Age (years)	High Anxiety	Mild Anxiety	Moderate Anxiety	Severe Anxie	Total	Chi square	df	p value
18-20	1	2	3	2	8	7.134	12	.849
21-30	2	7	14	5	28			
31-40	1	4	3	0	8			
41-50	3	6	6	3	18			
>51	2	14	18	4	38			
Total	9	33	44	14	100			

TABLE 4 - Comparison of Different Physiological Parameters (MEAN) Before and After Music Therapy

Physiological parameters	Before		After		Sig.	Paired differences		
	Mean	SD	Mean	SD		Mean	SD	P value
BP Systolic	137.88	20.86	131.32	19.09	**.000***	6.56	7.43	**.000***
BP Diastolic	85.47	9.21	82.78	5.80	**.000***	2.69	6.59	**.000***
Heart Rate	87.02	16.27	83.45	12.32	**.000***	3.57	6.33	**.001***

***significant**

Test applied - Paired t test

TABLE 5 - Comparison of Physiological Parameters with Age Before and After Intervention

		Before			After		
Physiological parameters	**Age**	**Mean**	**SD**	**p value**	**Mean**	**SD**	**p value**
BP Systolic	18-20	142.0000	26.51145	.270	136.2500	29.14863	.215
	21-30	132.7143	24.52037		125.0714	20.80229	
	31-40	128.2500	14.24028		125.7500	9.03564	
	41-50	141.3333	14.87200		134.6667	14.84033	
	>51	141.2105	19.81285		134.4737	18.04160	
BP Diastolic	18-20	89.7500	14.07886	.039	83.7500	3.61544	.003*
	21-30	81.7857	10.04198		79.8571	6.53035	
	31-40	82.5000	10.01428		81.0000	5.65685	
	41-50	88.9444	6.69040		86.2778	5.08522	
	>51	86.2632	7.35466		83.4474	5.00107	
Heart Rate	18-20	88.6250	16.91101	.312	85.1250	13.62180	.459
	21-30	86.1786	15.53027		83.0357	11.25622	
	31-40	78.6250	16.58689		78.1250	11.46968	
	41-50	93.0000	17.63019		87.3889	13.71191	
	>51	86.2368	15.78647		82.6579	12.33820	

TABLE 6 - Comparison of Physiological Parameters with Gender Before and After Intervention

		Before			After		
Physiological parameters	**Gender**	**Mean**	**SD**	**p value**	**Mean**	**SD**	**p value**
BP Systolic	Male	136.6429	16.85492	.011	131.2500	14.87677	.001
	Female	139.4545	25.19640		131.4091	23.59180	
BP Diastolic	Male	85.2679	7.94868	.296	83.4821	5.30177	.205
	Female	85.7273	10.71049		81.8864	6.34737	
Heart Rate	Male	86.3214	15.90209	.509	83.1071	11.73600	.361
	Female	87.9091	16.87549		83.8864	13.15068	

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