Original Article

MedInform

DOI: 10.18044/MEDINFORM.2024111.1807

ISSUE 1, 2024

Patient pain and anxiety during dental treatment - are they affected by the presence of music in the dental practice

Krasimir Tsokov, Petar Bozhinov, Stanislav Nenov, Boyko Bonev

Department of Dental Public Health

Faculty of Dental Medicine, Medical University, Sofia

Abstract

Introduction: The healing properties of sound are well-documented. Anxiety and phobia are frequent issues in dental offices, where patients are notably sensitive to touch, sound, and pain. Music therapy has proven to be an effective and non-invasive method for reducing anxiety and enhancing the outcomes of medical treatments.

Materials & Methods: A cross-sectional survey was conducted from May 1, 2022, to January 31, 2024, using anonymous questionnaires across six regions as classified by EUROSTAT. Data collection combined both physical distribution by interviewers and electronic distribution of 1,000 survey forms, achieving a return rate of 50.40%. Data were analysed using absolute (n) and relative (%) frequencies, with the Chi-square test for dependency analysis, considering a p-value of <0.05 as statistically significant. SPSS 20 was used for data processing, and the music played in dental practices was prerecorded.

Results: Survey participants included 207 males (41.10%) and 297 females (58.90%). Age demographics showed 144 participants under 30 years old (28.60%), 94 between 31 and 40 years old (18.70%), 143 between 41 and 50 years old (28.40%), 80 between 51 and 60 years old (15.90%), and 43 over 60 years old (8.50%). A large portion of the patients, 74.40% (375 individuals), reported feeling calmer when music was played during dental procedures.

Conclusions: Music interventions are highly effective in reducing anxiety and pain among adult surgical patients. Additionally, music contributes positively to patient comfort during dental treatments.

Keywords: sound effects, healthcare, music therapy in healthcare, therapeutic sound, dental care.

Introduction

Music is an effective method for reducing stress by influencing the mind and relaxing the muscles. Extended waiting periods in the waiting room can have a negative effect on patients. The longer the wait, the more their anxiety tends to increase. Music is a very useful tool for diverting a patient's attention, allowing them to concentrate on the music rather than on the waiting time and upcoming procedures.

One of the significant challenges faced by today's dental practitioners is to deliver optimal dental care to patients who are extremely anxious. Thus, it is essential to identify strategies to lower anxiety levels without side effects. [1]

The therapeutic impact of sound is long recognized. Aboriginal people have utilized the profound sound vibrations of the "yidaki" (a wind instrument) to induce deep relaxation in listeners, while Tibetan monks have used Himalayan bowls, whose vibrations are touted as a universal remedy. From Native American healers who fast to receive a healing song [2], to the ancient Egyptians who invented "toning" (a technique that manipulates vowel sounds to produce therapeutic tones) [3]. The ancient Greeks employed music to enhance well-being [4], and sound has consistently been a powerful healing tool, both physically and emotionally [5, 6]. In recent decades, there has been a growing interest in the therapeutic benefits of music in healthcare, using it to address the physiological, psychological, and spiritual needs of patients [7, 8].

The American Dental Association advises patients to listen to music in the dental office as a means of distraction. This recommendation will be most effective if personalized. Experiment with different sounds and music to find what works best for you. If music doesn't soothe you, consider white noise as an alternative stress reducer. In a study, white noise helped 80% of infants fall asleep within five minutes. It offers a focal point while keeping you present during your dental visit. Fans, heaters, and online white noise playlists are excellent choices [9].

Anxiety and phobia among patients are frequent occurrences in dental offices [7], with these individuals being notably sensitive to touch, sounds, and pain [10]. Dental anxiety has been specifically defined as a condition of anxiety, nervousness, or unease regarding a dental procedure with an uncertain outcome [11], and it can worsen with loud noise [12]. Patients with anxiety might resist cooperation and pose more of a challenge to manage, as they often delay or completely avoid dental appointments.

On the other hand, the use of sound as a therapeutic measure in dental settings is increasingly discussed in academic circles. Music can serve as a self-regulation tool to decrease or control distress [13]. Music therapy is recognized as an effective, non-invasive, and economical intervention that reduces anxiety, thereby improving the results of medical procedures [11].

Music has been shown to bring about significant improvements in mood, alleviate pain and anxiety, enhance cardiovascular health, and increase attention and social integration [12]. Literature suggests that the impact of music in therapeutic dental procedures has not been thoroughly explored.

Noise is described by McGeoch, P.D., and Rouw, R as an undesirable and unpleasant sound [14]. The most commonly researched effect of noise on dental patients is anxiety. The fear or anxiety triggered by noise in the dental clinic is among the top reasons people avoid dental visits [15]. Dental offices are often perceived by patients as unwelcoming and anxiety-inducing due to loud noises [16]. Noise from dental equipment can irritate or stress patients of all ages, with children being particularly vulnerable. Noise is the most detrimental sensory stimulus for children who react negatively to sensory inputs, followed by touch, odors, and the backward tilt of the examination chair [17].

Research has shown that dental anxiety is more prevalent in older children. The anxiety rates are 21% for 5-year-olds and 17% for 8-year-olds, but they increase dramatically to 76% for 12-year-olds and 64% for 15-year-olds [18].

Effective management of a child's behavior and anxiety is essential for cooperative patients and successful dental treatments [19].
Studies in psychoacoustics have led researchers to explore how brain waves are influenced by various sounds. They have found that specific frequencies can affect brain wave activity, potentially raising levels of serotonin and reducing cortisol, the stress hormone [20].
Doctor Margaret Patterson and Dr. Ifor Capel have explored how alpha brain waves could enhance serotonin levels. Dr. Capel notes, "We believe every brain center emits pulses at a specific frequency based on the dominant neurotransmitter it releases. Essentially, the brain's internal communication relies on frequency. We assume that transmitting electrical energy at, for instance, 10 Hz will activate certain cells in the lower brain stem, as they usually operate at this frequency range" [7, 21].
Research from the British Academy of Sound Therapy indicates that sound influences several aspects like physical relaxation, imagery, ineffability, and transcendence of time and space, contributing to a positive mood, insight, and a sense of unity in both live and recorded settings. It leads to profound relaxation, particularly during what is termed an "altered state of consciousness" (ACS), similar to being asleep or the moments before sleep. In this state, theta brain waves align with therapeutic sounds, promoting a deep relaxation that can last and potentially alter behavior during stressful situations [22, 23].
Music can integrate these therapeutic approaches, especially in dental environments where fear predominates. Studies have demonstrated numerous health benefits from music, including improved behavioral and emotional well-being, reduced stress and anxiety, better healthcare experiences and satisfaction, and easier healing and postoperative processes [7, 24].
A practical approach to harness the benefits of distraction is through the use of calming background music, which patients can listen to via headphones to drown out ambient noise [7, 15, 25].
It has been confirmed that musical interventions effectively reduce preoperative anxiety and alleviate postoperative pain [26].
This benefit can be maximized by providing music and personalizing the music selection for each patient.

P.S.

Does the thought of going to the dentist fill you with dread? Do you feel anxious while sitting in the dentist's chair? Are you unnerved by the sound of dental instruments? Have you ever tried listening to relaxing music to help manage your anxiety?
Typically, the relaxing music used to control anxiety doesn't have lyrics.

Materials and Methods

Between May 1, 2022, and January 31, 2024, a cross-sectional survey was carried out nationwide, involving patients in dental practices of registered dental physicians from the 28 district BgDA colleges. Data on patients were allocated into six regions as per EUROSTAT classifications. Data collection involved a hybrid approach: 1,000 survey cards were handed out by interviewers in person and sent electronically. An electronic form link was also provided. Out of these, 504 questionnaires were returned, achieving a 50.40% response rate. The survey evaluated patients based on gender, age, and their experience of being treated with background music and the genre of music played. Statistical methods: The study's data were compiled using both absolute (n) and relative (%) frequencies. A Chi-square test was utilized to assess the studied relationships, with statistical significance set at $p<0.05$. The data analysis was performed using SPSS 20. The music played in the dental offices where the study was conducted was pre-recorded.

Aim

To assess the influence of music on patient anxiety and behavior during dental treatments.

Results

The survey results indicate that 41.10% of the participants are male, while 58.90% are female (Fig. 1).

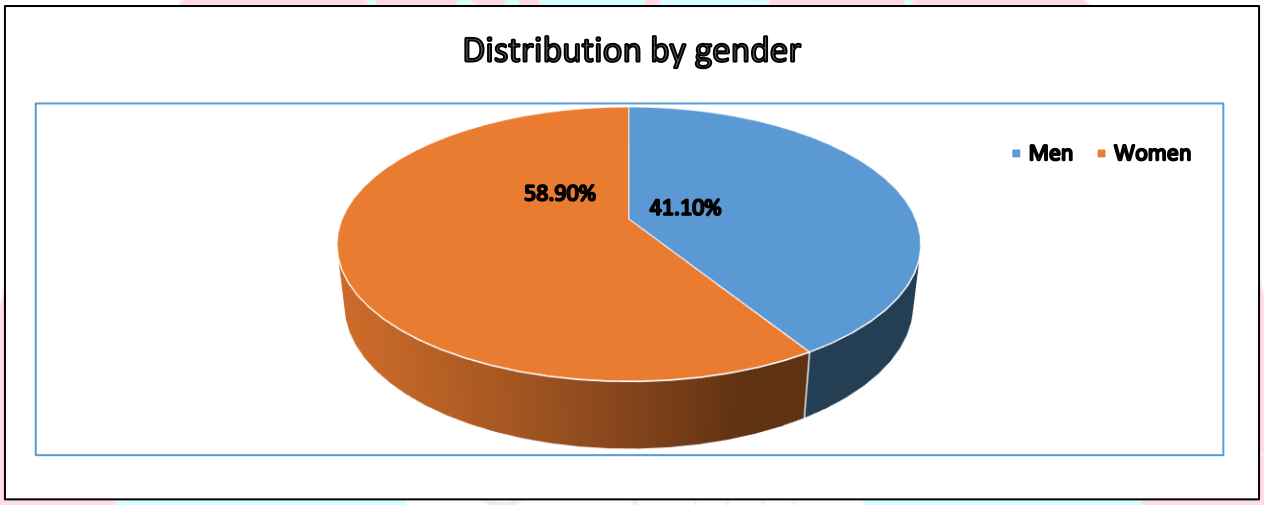

Fig.1 Distribution by gender of the patients

Participants' ages are distributed as follows: 28.60% are under 30 years old, 18.70% are between 31 and 40 years old, 28.40% are between 41 and 50 years old, 15.90% are between 51 and 60 years old, and 8.50% are over 60 years old. The largest groups are the under 30s and those between 41 and 50 years old(Fig.2).

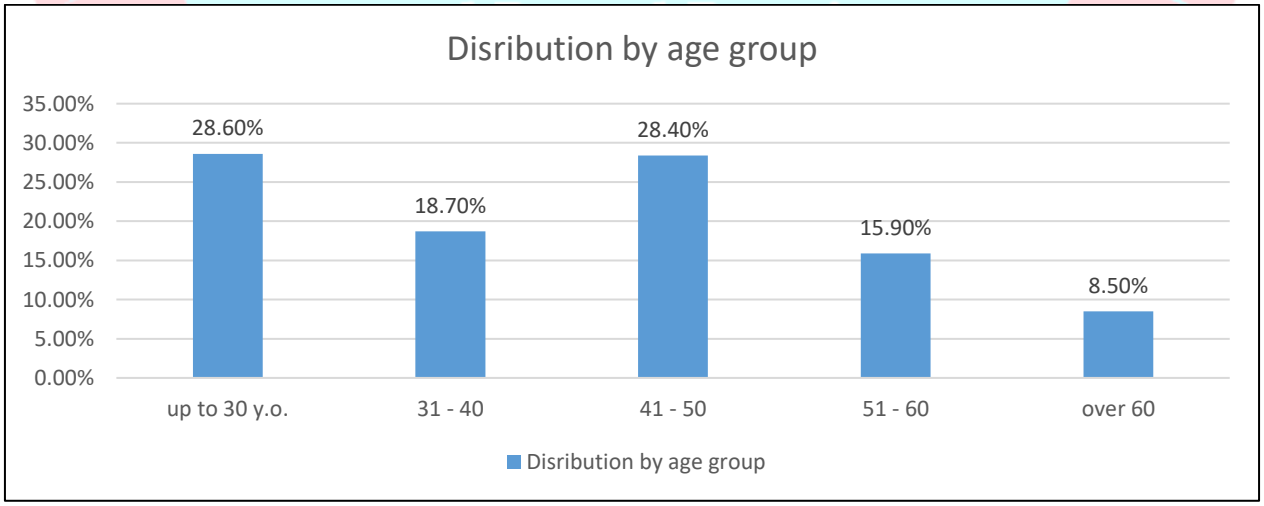

Fig.2 Age group distribution

For 25.60% of participants, having music in the dental office makes no difference. For 24.60%, it is extremely important, and for nearly half—49.80%—it is considered important (Fig.3).

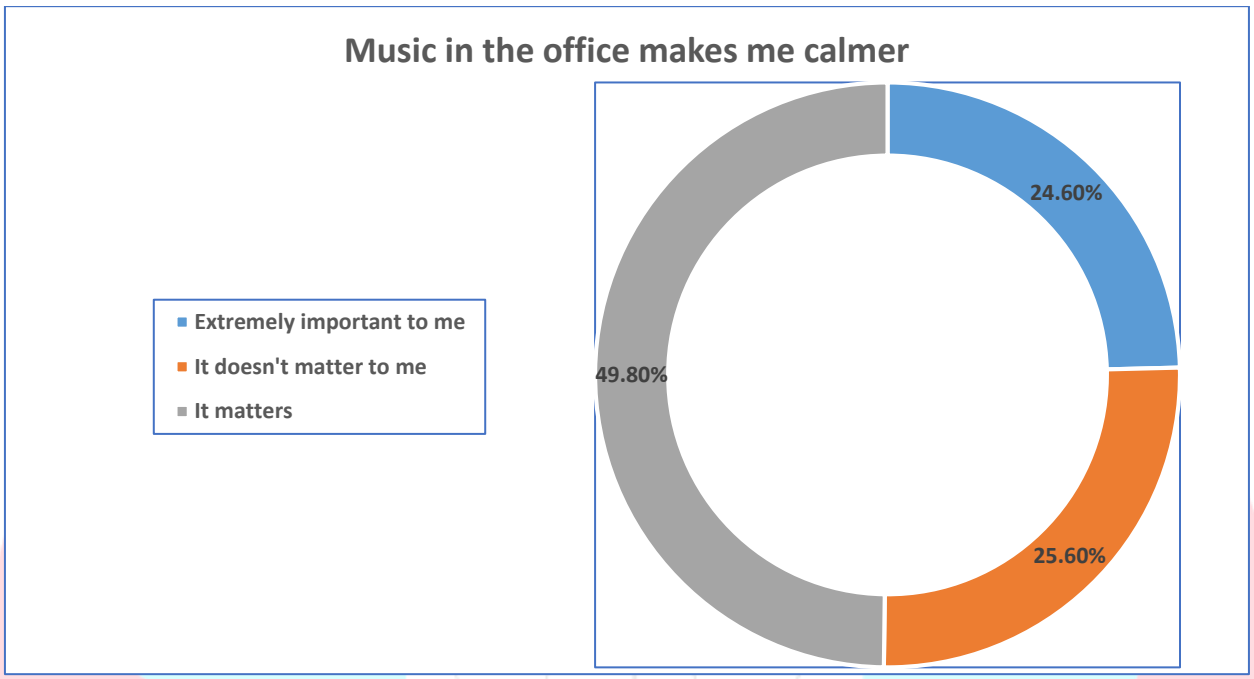

Fig. 3 Influence of music on patient behavior during dental treatment

The study shows that the importance of music in the dental office is perceived similarly among genders, with 25.90% of men and 25.10% of women finding it insignificant. There is no statistically significant relationship between gender and the impact of music in the dental setting. The importance of music is nearly the same for both men and women, being extremely significant for 24.20% of men compared to 25.10% for women (Table 1).

Table 1 Dependency of music's influence on patient behavior by gender

Music in the office makes me calmer/relaxed	extremely important to me	N	72 men	52 women	124	0,966
		%	24,2%	25,1%	24,6%	
	it doesn't matter to me	N	77	52	129	
		%	25,9%	25,1%	25,6%	
	it matters	N	148	103	251	
		%	49,8%	49,8%	49,8%	

p<0.05

Patients generally believe that music helps entertain the dental physician during their duties, a sentiment that strengthens with age. Among those under 30 years old, 64.60% hold this view, which incrementally rises to 64.90% in the 31-40 age group, 72.10% in the 41-50 age group, and 72.50% among those 51-61 years old. Additionally, as the participants' age increases, although they represent a smaller portion of the sample, there's a slight rise in the belief that music distracts the dentist (Table 2).

Table 2 Patient opinions by age group regarding the impact of music on dentist behavior during procedures

Do you think that music affects the dentist in any way?		Age group					Total	P
		Up to 30	31-40	41-50	51-60	over 60		
Yes, it brightens it up	N	93	61	104	58	26	342	0,821
	%	64,6%	64,9%	72,7%	72,5%	60,5%	67,9%	
He hardly hears her because he is focused on my treatment	N	38	24	29	15	10	116	
	%	26,4%	25,5%	20,3%	18,8%	23,3%	23,0%	
For most of the treatment time, the music is drowned out by the noise of the equipment	N	11	7	8	5	5	36	
	%	7,6%	7,4%	5,6%	6,3%	11,6%	7,1%	
It interferes with his concentration	N	2	2	2	2	2	10	
	%	1,4%	2,1%	1,4%	2,5%	4,7%	2,0%	
Total	N	144	94	143	80	43	504	
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	

p<0.05

Similar to dental physicians, the most favored type of background music during dental procedures is classical (Fig.4).

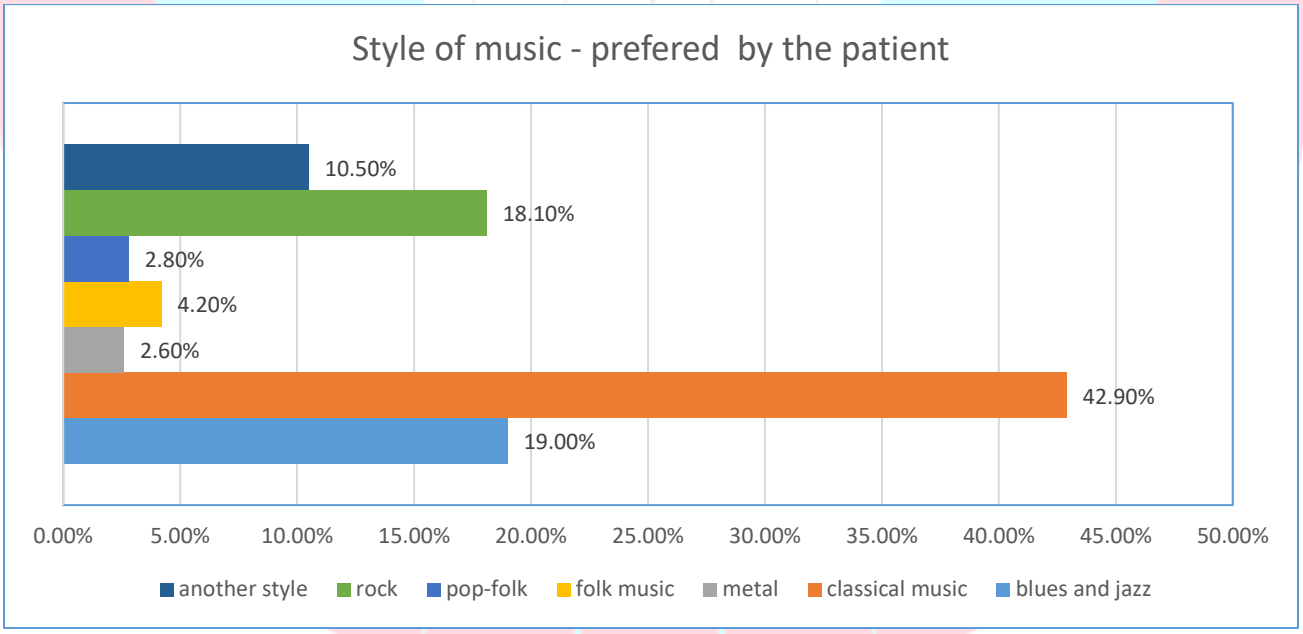

Fig. 4 Distribution by Preferred style of music by patients during dental treatment

According to the study data, there is a statistically significant correlation between the type of preferred music and variables such as gender, age, and education level among the patients (Tables 3 and 4).

Table 3 Patients' preferred style of music by gender during treatment

Style of music - preferred by the patient		Gender		Total	p
		women	men		
blues and jazz	N	63	33	96	<0,001
	%	21,2%	15,9%	19,0%	
classical music	N	134	82	216	
	%	45,1%	39,6%	42,9%	
metal	N	3	10	13	
	%	1,0%	4,8%	2,6%	
folk music	N	13	8	21	
	%	4,4%	3,9%	4,2%	
pop-folk	N	6	8	14	
	%	2,0%	3,9%	2,8%	
rock	N	39	52	91	
	%	13,1%	25,1%	18,1%	
another style	N	39	14	53	
	%	13,1%	6,8%	10,5%	
Total	N	297	207	504	
	%	100,0%	100,0%	100,0%	

p<0.05

Table 4 Patients' preferred style of music by age group during treatment

Style of music - preferred by the patient		Age group					Total	p
		Up to 30	31-40	41-50	51-60	over 60		
blues and jazz	N	29	20	21	17	9	96	0,021
	%	20,1%	21,3%	14,7%	21,3%	20,9%	19,0%	
classical music	N	50	40	67	38	21	216	
	%	34,7%	42,6%	46,9%	47,5%	48,8%	42,9%	
metal	N	1	4	3	4	1	13	
	%	,7%	4,3%	2,1%	5,0%	2,3%	2,6%	
folk music	N	4	3	6	4	4	21	
	%	2,8%	3,2%	4,2%	5,0%	9,3%	4,2%	
pop-folk	N	10	0	2	1	1	14	
	%	6,9%	0,0%	1,4%	1,3%	2,3%	2,8%	
rock	N	28	15	33	9	6	91	
	%	19,4%	16,0%	23,1%	11,3%	14,0%	18,1%	
another style	N	22	12	11	7	1	53	
	%	15,3%	12,8%	7,7%	8,8%	2,3%	10,5%	
Total	N	144	94	143	80	43	504	
	%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	

p<0.05

Table 5 Patients' preferred style of music by the degree of their education, during treatment

Style of music - preferred by the patient		4. What is your education:		Total	p
		Higher	Secondary		
blues and jazz	N	64	32	96	0,007
	%	19,2%	18,8%	19,0%	
classical music	N	146	70	216	
	%	43,7%	41,2%	42,9%	
metal	N	12	1	13	
	%	3,6%	,6%	2,6%	
folk music	N	12	9	21	
	%	3,6%	5,3%	4,2%	
pop-folk	N	3	11	14	
	%	,9%	6,5%	2,8%	
rock	N	60	31	91	
	%	18,0%	18,2%	18,1%	
another style	N	37	16	53	
	%	11,1%	9,4%	10,5%	
Total	N	334	170	504	
	%	100,0%	100,0%	100,0%	

p<0.05

Discussion

Nilsson et al., 2008 [27], conducted a systematic review of 42 randomized controlled trials examining the effects of music interventions in perioperative settings. They found that music interventions had a positive impact on reducing patients' anxiety and pain in about half of the studies reviewed.
Ullmann et al., 2008 [28], in a descriptive study, found that music helped 78.9% of participants feel calmer and more efficient. We confirm this finding with 74.40%.
Ullmann et al., 2008 [28], also found that classical music was the most requested type (58%). Similarly, we find that classical music is the preferred choice among our patients during treatment, at 42.90%.
Thoma et al., 2014 [29], studied 92 volunteer patients, with 46 listening to music for 10 minutes and a control group of 46 waiting in silence. They observed that state anxiety levels significantly decreased in the music group post-intervention compared to the control group (1/90) = 8.06; p = 0.006).
In a pilot study, Gupta et al., 2020 [30] among 50 adult patients at The Clinic at Birmingham Dental Hospital found that using earphones during treatment concluded that music helps patients feel more relaxed during dental treatment. The majority of patients reported that music lowered their anxiety, pain, and discomfort (92%), with nearly half (48%) saying that music facilitated communication with the dental team, and 90% expressing a desire for music during their next dental visit. Our patients also believe that music lightens the mood for the dentist in 67.90% of cases, facilitating communication with the dental team, while only 2.00% feel that music distracts the dentist.

Conclusion

Listening to music before dental treatment can reduce anxiety levels more than waiting in silence.
Music intervention significantly alleviates anxiety and pain in adult surgical patients.

Music serves as a psychological tool to soothe oneself, making music therapy a viable anxiolytic option for stressful dental procedures.
Music is beneficial in helping patients feel more comfortable during dental treatment.

References

1. Tamgadge S., Dept of Oral & Maxillofacial Pathology and Microbiology DY Effect of music therapy on adult patients undergoing dental treatment procedures, Volume 5 Issue 4 - 2017 Janvi Chandure, Sandhya Tamgadge, Avinash Tamgadge DY Patil Dental College, India Correspondence: Patil Dental College, School of dentistry, Sector 7, Nerul, Navi Mumbai, Maharashtra, India, Published: December 19, 2017, International Clinical Pathology Journal
2. Medicinanarrativa. Available online: https://www.medicinanarrativa.eu/sound-therapy-and-well-being-some-scientific-studies} (accessed on 15 September 2022).]
3. Soulveda. Available online: https://www.soulveda.com/wellbeing/sound-healing-in-ancient-egypt/ (accessed on 21 September 2022).46]
4. Kühlmann, A.Y.R. The Sound of Medicine: Evidence-Based Music Interventions in Healthcare Practice; Erasmus University Rotterdam: Rotterdam, The Netherlands, 2019.
5. Thaut, M.H. Music as therapy in early history. Prog. Brain Res. 2015, 217, 143–158.
6. Sheppard, A.; Broughton, M.C. Promoting wellbeing and health through active participation in music and dance: A systematic review. Int. J. Qual. Stud. Health Well-Being 2020, 15, 1732526.
7. Antoniadou M., P. Tziovara, C. Antoniadou The Effect of Sound in the Dental Office: Practices and Recommendations for Quality Assurance—A Narrative Review ,
8. Moola, S.; A. Pearson, C. Hagger Effectiveness of music interventions on dental anxiety in paediatric and adult patients: A systematic review. JBI Libr. Syst. Rev. 2011, 9, 588–630.
9. Relaxing Music for Anxiety Control at the Dentist, Halloween!! Who Should Be CPR Certified?, available at: http://www.southcenterdental.com/blog/2018/11/relaxing-music-for-anxiety-control-at-the-dentist]
10. Nitanee van der Weijden F., A. Mehran Hussain, L. Tang, D. Else Slot, The effect of playing background music during dental treatment on dental anxiety and physiological parameters: A systematic review and meta-analysis,
11. . 6.- Victor X Fu, P. Oomens, N. Merkus et all. The Perception and Attitude Toward Noise and Music in the Operating Room: A Systematic Review, Affiliations expand, PMID: 33677147, DOI: 10.1016/j.jss.2021.01.038
12. Toker S. International Journal of the care of the injured, https://www.injuryjournal.com/article/S0020-1383(08)00393-8/fulltext, LETTER TO THE EDITOR| VOLUME 40, ISSUE 1, P109, JANUARY 2009Download Full Issue, The sounds of music or the sounds of silence in the operating room, , DOI:https://doi.org/10.1016/j.injury.2008.08.037
13. Kühlmann Y. R. , A. de Rooij, L. F. Kroese , M. van Dijk, at all. Meta-analysis evaluating music interventions for anxiety and pain in surgery available at <https://www.academia.edu/107243229/Meta_analysis_evaluating_music_interventions_for_anxiety_and_pain_in_surgery>, Systematic review
14. McGeoch, P.D.; Rouw, R. How everyday sounds can trigger strong emotions: ASMR, misophonia and the feeling of wellbeing. Bioessays 2020, 42, e2000099.
15. Muppa, R.; Bhupatiraju, P.; Duddu, M.; Penumatsa, N.V.; Dandempally, A.; Panthula, P. Comparison of anxiety levels associated with noise in the dental clinic among children of age group 6–15 years. Noise Health 2013, 15, 190–193.
16. Shapiro, M. Melmed, R.N.; Sgan-Cohen, H.D.; Eli, I.; Parush, S. Behavioural and physiological effect of dental environment sensory adaptation on children's dental anxiety. Eur. J. Oral Sci. 2007, 115, 479–483.

17. Baseer, M.A.; Al Saffan, A.; AlMasoud, S.M.; Dahy, W.T.; Aldali, H.W.; Walid Bachat, A.M.; Walid Bachat, R.M.; AlMugeiren, O.M. Noise levels encountered in university dental clinics during different specialty treatments. J. Fam. Med. Prim. Care 2021, 10, 2987–2992.
18. Ainscough, S.L., Windsor, L. & Tahmassebi, J.F. A review of the effect of music on dental anxiety in children. Eur Arch Paediatr Dent 20, 23–26 (2019). https://doi.org/10.1007/s40368-018-0380-6]
19. Brookins J., K. T Williams, T. Brookins, Impact of Music on Behavior, during Dental Treatment, * 1Principal Investigator, Alabama State University, USA 2Study Co-investigator, Alabama State University, USA *Corresponding author: Tabitha Brookins, PhD, Study Co-investigator, Alabama State University, 915 S. Jackson Street, Montgomery, AL 36105 Submission: October 02, 2017; Published: February 12, 2018]
20. Sheppard, A.; Broughton, M.C. Promoting wellbeing and health through active participation in music and dance: A systematic review. Int. J. Qual. Stud. Health Well-Being 2020, 15, 1732526.
21. Medicinanarrativa. Available online: https://www.medicinanarrativa.eu/sound-therapy-and-well-being-some-scientific-studies} (accessed on 15 September 2022).
22. The British Academy of Sound Therapy. Available online: https://www.britishacademyofsoundtherapy.com/sound-affects/ (accessed on 30 April 2022).
23. Batt-Rawden, K. The role of music in a salutogenic approach to health. Int. J. Ment. Health Promot. 2010, 12, 11–18.
24. Jiang, S. Positive Distractions and Play in the Public Spaces of Pediatric Healthcare Environments: A Literature Review. HERD 2020, 13, 171–197.
25. Nissan, S.; Yochman, A.; Blumer, S.; Kharouba, J.; Peretz, B. Children's responses to sensory stimuli and their behavior in the dental office. J. Clin. Pediatric Dent. 2017, 41, 10–17.
26. Franzoi MAH, Paula ÉS de, Martins G. Musical Intervention Directed To Child And Adolescent In Surgical Situation: A Systematic Review, J Nurs UFPE on line., Recife, 7(spe):5645-55, Sept., 2013, DOI: 10.5205/reuol.4773-39313-1-SM.0709esp201302
27. Nilsson, U. The anxiety and pain reducing effects of music interventions: A systematic review. AORN J. 2008, 87, 780–807.
28. Ullmann, Y.; Fodor, L.; Schwarzberg, I.; Carmi, N.; Ullmann, A.; Ramon, Y. The sounds of music in the operating room. Injury 2008, 39, 592–597.
29. Thoma, M.V.; Zemp, M.; Kreienbühl, L.; Hofer, D.; Schmidlin, P.R.; Attin, T.; Ehlert, U.; Nater, U.M. Effects of Music Listening on Pre-treatment Anxiety and Stress Levels in a Dental Hygiene Recall Population. Int. J. Behav. Med. 2015, 22, 498–505.
30. Gupta, A.; Ahmed, B. Experience of listening to music on patient anxiety during minor oral surgery procedures: A pilot study. Br. Dent. J. 2020, 228, 89–92.

Corresponding author:

Krasimir Ts.Tsokov,
Department of Dental Public Health, Faculty of Dental Medicine, Medical University, Sofia
1 G. Sofiyski blvd, 1431 Sofia
Tel.: +359 889 251 788
e-mail: k.tsokov@fdm.mu-sofia.bg

Tsokov K, Bozhinov P, Nenov St. Bonev B, Patient pain and anxiety during dental treatment - are they affected by the presence of music in the dental practice. Medinform 2024; 11(1):1807-1816.