

Effects of music on dental care: a literature review

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ABSTRACT

Dental anxiety is a common problem in dental care due to its impact on patient behavior, treatment continuity, and clinical experience. This literature review aimed to examine the available scientific evidence on the effect of music, music therapy, and musical/sound-based auditory interventions on dental care in relation to anxiety, pain perception, and physiological parameters. A systematic search strategy was used, based on the PRISMA 2020 statement. The search was conducted in PubMed, Scopus, Web of Science, Cochrane Library, and SciELO, considering studies published between April 2014 and July 2025. Primary studies in humans, published in English, Spanish, or Portuguese, and with full-text access were included. Of 327 records identified, 47 duplicates were removed; the remaining 280 were screened by title and abstract, excluding 163; the full texts of the remaining 117 were then reviewed, of which 92 were excluded; finally, 25 studies were included in the review. The evidence showed more consistent effects on reducing dental anxiety, while results on pain and physiological parameters were more variable. It is concluded that music may constitute a complementary, safe, accessible, and low-cost strategy to improve the patient experience during dental care.

Keywords: music; music therapy; dental anxiety; dentistry; dental procedures.

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INTRODUCTION

Music is a form of human expression found across different cultures and historical periods, capable of evoking emotions, modulating affective states, and promoting relaxation responses. From a neuroscientific perspective, musical experience involves brain regions associated with emotion, memory, reward, and autonomic regulation, including the amygdala, hippocampus, nucleus accumbens, insula, and areas of the prefrontal cortex (1). Similarly, music has been reported to influence neurochemical systems associated with pleasure, motivation, stress, and social interaction, providing a basis for understanding its potential positive effects on psychological and physiological well-being (2).

In healthcare settings, music has been used as a complementary intervention in various clinical contexts, including hospitalized patients, intensive care units, surgical procedures, rehabilitation, and pain management. Its use has been primarily associated with reductions in anxiety, stress, and discomfort during healthcare delivery (3). In this regard, the World Health Organization (WHO) has indicated that the arts, including music, can contribute to overall well-being and health when incorporated as complementary resources within healthcare settings (4). These characteristics have increased interest in accessible, safe, and low-cost nonpharmacological interventions.

Dental anxiety, in turn, represents a significant concern in dental practice because of its impact on patient behavior, treatment continuity, and timely utilization of dental care. A systematic review with meta-analysis has estimated that the global prevalence of dental fear and anxiety among adults is approximately 15.3%, with high and severe levels affecting 12.4% and 3.3% of the population, respectively. This may manifest as restlessness, anticipatory fear, avoidance of dental appointments, or difficulty cooperating during procedures, which may contribute to delayed treatment and the progressive deterioration of oral health (5).

In response, several strategies have been proposed to improve patient experience during dental care. In addition to traditional, pharmacological, and behavioral approaches, music-based interventions have been considered a complementary alternative aimed at reducing anxiety and promoting a more comfortable clinical environment. These interventions may include listening to music before or during the procedure, using background music, or selecting music based on patient preference, depending on the study design or clinical setting (6). However, the available evidence varies by the type of music used, timing of application, duration of exposure, method of playback, instruments employed, and dental procedures evaluated.

Therefore, this article aims to conduct a literature review on the effects of music, music therapy, and musical/sound-based auditory interventions in dental care, with regard to anxiety, pain perception, and physiological parameters in patients undergoing dental procedures.

METHODOLOGY

The literature review employed a systematic search strategy that included studies published between April 2014 and July 2025. To ensure transparency in the identification, selection, and synthesis of studies, the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were used as a reference. A research question was formulated according to the PICO framework: In patients undergoing dental procedures (P), does exposure to music or musical/sound-based auditory interventions (I), compared with standard care without music or other nonpharmacological strategies (C), reduce anxiety, pain perception, or alter physiological parameters (O)? A narrative approach was adopted to identify and analyze the effects of music in dental care in terms of anxiety, pain perception, and physiological parameters.

Inclusion and exclusion criteria

Studies published between April 2014 and July 2025, written in English, Spanish, or Portuguese, and available in full text were included. Studies were required to explicitly address the use of music, music therapy, or musical/sound-based auditory interventions administered before or during dental procedures and to report at least one outcome related to anxiety, pain perception, or physiological responses, such as heart rate, blood pressure, cortisol levels, or other clinical indicators. Primary studies were considered, including randomized controlled trials, quasi-experimental studies, and observational studies. Duplicate articles, editorials, letters to the editor, protocols, narrative reviews, systematic reviews, meta-analyses, and studies in which the effect of music could not be independently, comparatively, or distinctly identified from that of other nonpharmacological interventions applied simultaneously were excluded.

Search strategy

The search was conducted in five electronic databases: PubMed, Scopus, Web of Science, Cochrane Library, and SciELO. Filters restricted the results to articles published between April 2014 and July 2025, available in full text, involving human subjects, and published in English, Spanish, or Portuguese.

The search string combined controlled vocabulary, such as MeSH in PubMed, with free-text terms using Boolean operators. The general search strategy was as follows: (“music therapy” OR “music intervention” OR “music listening” OR “audio distraction” OR “binaural beats” OR “white noise” OR “music”) AND (“dental anxiety” OR “dental fear” OR “dental procedures” OR “dentistry” OR “dental treatment” OR “oral surgery” OR “endodontic treatment”) AND (“pain” OR “pain management” OR “stress” OR “heart rate” OR “blood pressure” OR “cortisol” OR “physiological response”).

In regional databases such as SciELO, equivalent terms in Spanish and Portuguese were used. In Spanish, the search strategy was as follows: (“terapia musical” OR “intervención musical” OR “escucha musical” OR “distracción musical” OR “música”) AND (“ansiedad dental” OR “miedo dental” OR “procedimientos dentales” OR “tratamiento dental” OR “odontología”) AND (“dolor” OR “manejo del dolor” OR “estrés” OR “frecuencia cardíaca” OR “presión arterial” OR “cortisol” OR “respuesta fisiológica”). In Portuguese, the search strategy was as follows: (“musicoterapia” OR “intervenção musical” OR “escuta musical” OR “distracção musical” OR “música”) AND (“ansiedade odontológica” OR “medo odontológico” OR “procedimentos odontológicos” OR “tratamento odontológico” OR “odontologia”) AND (“dor” OR “manejo da dor” OR “estresse” OR “frequência cardíaca” OR “pressão arterial” OR “cortisol” OR “resposta fisiológica”).

Study selection and data extraction

The study selection process followed the general phases proposed by the PRISMA framework. Initially, 327 records were identified through searches of the five aforementioned electronic databases. After removing 47 duplicate records, 280 unique records remained for the initial assessment. During the screening phase, 280 records were reviewed by examining their titles and abstracts. At this stage, 163 records were excluded because they did not directly address the use of music, music therapy, or musical/sound-based auditory interventions in dental care; they were not primary studies; they did not assess variables related to anxiety, pain, or physiological parameters; and they did not meet the criteria regarding language, publication period, or full-text availability. Subsequently, 117 full-text articles were assessed for eligibility. Of these, 92 studies were excluded for reasons such as: being narrative reviews, systematic reviews, meta-analyses, protocols, editorials, or letters to the editor; not presenting outcomes directly related to the musical intervention; falling outside the established publication period; lacking full-text availability; or not allowing the effect of music to be distinguished from that of other interventions applied simultaneously. Finally, 25 primary studies that met the eligibility criteria were included. These studies evaluated the effects of music, music therapy, or musical/sound-based auditory interventions in patients undergoing dental procedures (Figure 1).

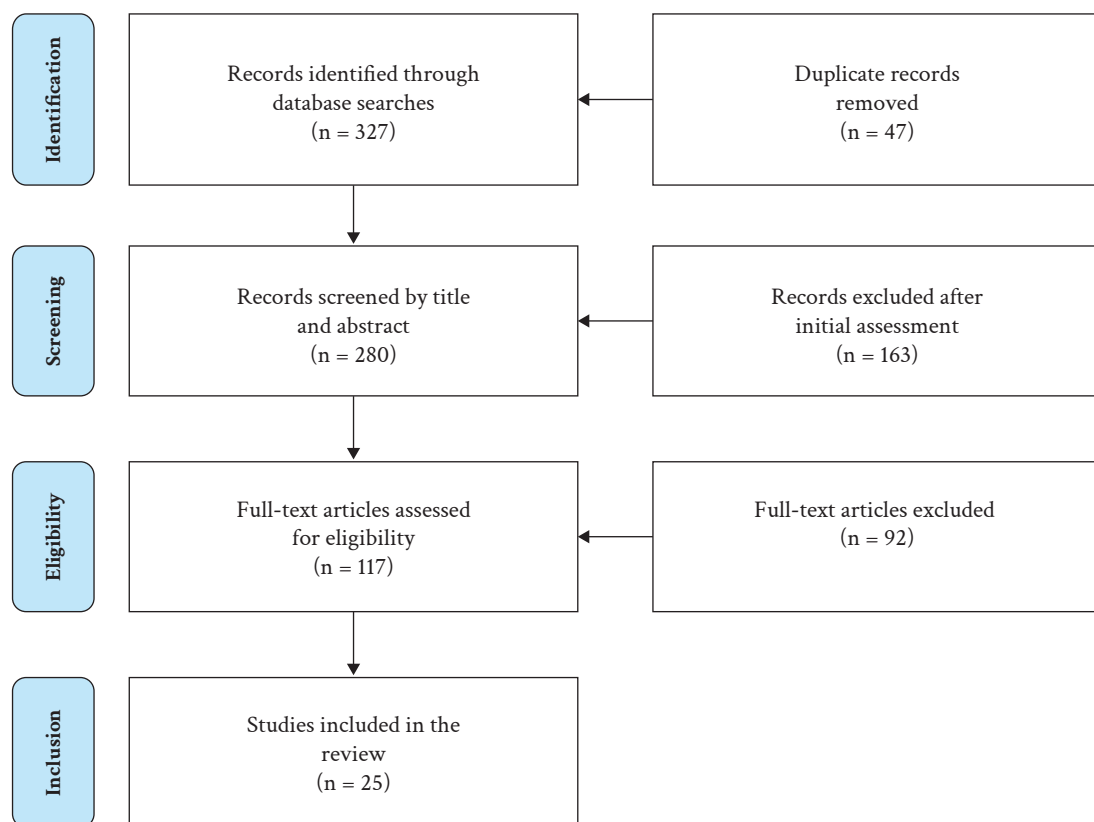


Figure 1. Flow diagram of the study identification, screening, eligibility, and inclusion process.

Data extraction was performed using a standardized data extraction form that included the following variables: author(s), year of publication, country, study design, sample size, age group, type of musical intervention, dental procedure, variables assessed, and main findings.

Data analysis

The information collected was organized into a comparative matrix. Subsequently, a qualitative synthesis of the findings was performed, grouping the studies according to the main variables of interest—*anxiety, pain perception, and physiological parameters*—as well as the type of musical or auditory intervention applied. No meta-analysis was performed due to methodological heterogeneity among the studies, particularly with regard to research designs, sample characteristics, dental procedures, measurement instruments, and modalities of musical or sound-based interventions. The methodological characteristics of the studies were described narratively, taking into consideration the study design, population, dental procedure, type of intervention, and outcomes assessed.

RESULTS

A total of 25 studies (7–31), published between April 2014 and July 2025, were included. These studies evaluated the effects of music, music therapy, or musical/sound-based auditory interventions in patients undergoing dental procedures. Of these, 22 studies were randomized controlled trials or other randomized designs, whereas 3 were clinical or comparative studies that were not explicitly described as randomized. The studies were conducted in 14 countries: Mexico, Italy, Japan, Indonesia, Brazil, Chile, India, Turkey, Saudi Arabia, Thailand, Iran, Nigeria, the United Arab Emirates, and Pakistan. The countries with the largest number of studies were India, with 5 studies; Turkey, with 4; Iran, with 3; and Japan, Brazil, and Chile, with 2 studies each. Sample sizes ranged from 34 to 225 participants, for a total of 2,033 participants. Regarding age groups, 18 studies were conducted in adults, 6 in pediatric or adolescent populations, and 1 in school-aged children.

Table 1. Methodological characteristics and main findings of the studies included in the review (2014–2024).

No.	Authors	Year	Country	Study design	Sample	Age group	Musical intervention	Procedure	Variables assessed	Main findings
1	Mejía-Rubalcava et al. (7)	2015	Mexico	Randomized controlled trial	34	Adults	Music therapy	Dental care in patients with anxiety	Anxiety, salivary cortisol, salivary flow rate, BP, HR, SpO ₂ , temperature	Music therapy produced favorable changes in anxiety and physiological parameters.
2	Di Nasso et al. (8)	2016	Italy	Randomized controlled trial	100	Adults	432-Hz music	Endodontic treatment	Anxiety, systolic BP, diastolic BP, HR	432-Hz music reduced systolic BP, diastolic BP, and HR during the procedure.
3	Miyata et al. (9)	2016	Japan	Randomized controlled trial	86	Adults	Music before the procedure	Extraction of impacted teeth under intravenous sedation	Anxiety, HR variability, sympathetic activity	Music reduced sympathetic activity associated with preoperative anxiety in patients with dental fear.
4	Maulina et al. (10)	2017	Indonesia	Randomized controlled trial	225	Adults aged 18–45	Classical music and Islamic religious music	Dental extraction	Anxiety, systolic/diastolic BP, plasma norepinephrine	Islamic religious music significantly reduced norepinephrine levels and BP compared with classical music and the control group.

BP = blood pressure; HR = heart rate; SpO₂ = peripheral oxygen saturation.

Table 1. (Continuation).

No.	Authors	Year	Country	Study design	Sample	Age group	Musical intervention	Procedure	Variables assessed	Main findings
5	Santana et al. (11)	2017	Brazil	Randomized controlled trial	50	Adults aged 18–40	Classical music auditory stimulation	Endodontic treatment	HR variability, autonomic modulation	Musical stimulation favorably influenced autonomic regulation during endodontic treatment.
6	Rojas-Alcayaga et al. (12)	2018	Chile	Multicenter randomized controlled trial	176	6-year-old children	Musical distraction	Pediatric dental care	Dental anxiety, treatment adherence, oral health	Musical distraction was evaluated as a strategy to reduce anxiety and improve treatment adherence in children.
7	Packyanathan et al. (13)	2019	India	Randomized controlled trial	50	Adults	Music therapy	Dental extraction	Dental anxiety	Music therapy reduced anxiety levels in patients undergoing dental extraction.
8	Yamashita et al. (14)	2019	Japan	Randomized controlled trial	34	Adults aged 20–40	Relaxing classical music	Extraction of an impacted mandibular third molar	Anxiety, HR, autonomic nervous system	Music reduced postoperative anxiety and sympathetic activity during the surgical phases.
9	Aravena et al. (15)	2020	Chile	Randomized controlled trial	42	Adults aged 15–40	432-Hz and 440-Hz music	Dental extraction	Dental anxiety, salivary cortisol	Music reduced clinical anxiety; 432-Hz music reduced salivary cortisol levels.
10	Gulnazar and Kupeli (16)	2020	Turkey	Randomized controlled trial	80	Adults aged 40–70	Turkish classical music, Western classical music, and slow rock	Dental implant surgery	Dental anxiety, BP, HR, SpO ₂	Music reduced dental anxiety; Turkish and classical music were more effective than slow rock.
11	Kupeli and Gulnazar (17)	2020	Turkey	Randomized controlled trial	80	Adults aged 18–30	Turkish music, Western classical music, and soft rock	Third molar surgery	Dental anxiety, HR, mean AP, SpO ₂	Western classical music significantly reduced anxiety associated with third-molar surgery.
12	Tshiswaka y Pinheiro (18)	2020	Brazil	Clinical study	40	Children	Music during dental care	Pediatric dental treatment	Anxiety, pain, SpO ₂	Music was considered a nonpharmacological alternative for reducing anxiety during pediatric dental care.
13	Wazzan et al. (19)	2021	Saudi Arabia	Randomized controlled trial	46	Adults	Music therapy	Urgent dental treatment	Anxiety, salivary cortisol, HR, BP, temperature	No conclusive evidence was found regarding the effect of music on anxiety and physiological stress.
14	Janthasila and Keerasitiroj (20)	2023	Thailand	Factorial randomized controlled trial	128	School-aged children	Music therapy alone and combined with aromatherapy	Pediatric dental care	Anxiety, dental fear, physiological parameters	The combination of music therapy and aromatherapy reduced anxiety and fear more effectively than either treatment alone.

BP = blood pressure; HR = heart rate; SpO₂ = peripheral oxygen saturation.

Table 1. (Continuation).

No.	Authors	Year	Country	Study design	Sample	Age group	Musical intervention	Procedure	Variables assessed	Main findings
15	Sadeghi et al. (21)	2023	Iran	Randomized crossover trial	60	Children aged 4–8	Music versus a children's story	Pulpotomy and stainless-steel crown	Anxiety, pain, pulse/behavior	The study compared music and a children's story as auditory distraction techniques during pediatric dental treatment.
16	Karapicak et al. (22)	2023	Turkey	Randomized controlled trial	70	Adults	Patient-selected music	Posterior occlusal caries restoration	Dental anxiety, diastolic BP	Patient-selected music reduced dental anxiety and diastolic BP.
17	Bhusari et al. (23)	2023	India	Randomized controlled trial	45	Children aged 6–12	Monaural and binaural beats	Dental restoration	Dental anxiety, pulse	Auditory beats reduced anxiety according to the Venham Picture Test.
18	Olaopa et al. (24)	2024	Nigeria	Randomized controlled trial	146	Adults aged 21–55	Music therapy	Mandibular third-molar surgery	Anxiety, pain, physiological parameters	Music showed no significant anxiolytic or analgesic benefit during third-molar surgery.
19	Lal et al. (25)	2024	India	Randomized controlled trial	60	Adults	Music listening compared with iatrosedation	Crown preparation	Dental anxiety	Music was evaluated as an anxiety-reduction strategy during crown preparation.
20	Assari et al. (26)	2024	Iran	Clinical trial	50	Adults	Relaxing sounds/selected music	Impacted third-molar surgery	Anxiety, pain, BP, HR	Patient-selected relaxing music/sounds substantially reduced anxiety during surgical extraction.
21	Abdulhameed et al. (27)	2024	United Arab Emirates	Randomized controlled trial	90	Adults	Music versus informational videos versus control	Endodontic treatment and retreatment	Patient anxiety	Listening to music reduced anxiety compared with informational videos and control during endodontic treatment.
22	Kuppusamy et al. (28)	2025	India	Randomized controlled trial	80	Children and adolescents	Musical drama and musical listening	Dental care	Dental anxiety	The study evaluated active and passive musical interventions to reduce dental anxiety in pediatric and adolescent populations.
23	Zaki et al. (29)	2025	Pakistan	Randomized controlled trial	99	Adults	432-Hz music versus binaural beats	Endodontic treatment	Preoperative dental anxiety	Both 432-Hz music and binaural beats reduced preoperative anxiety during endodontic treatment.
24	Mousavi et al. (30)	2025	Iran	Randomized controlled trial	90	Adults	European and Iranian classical music and aromatherapy	Endodontic treatment of mandibular molars	Anxiety, injection pain, BP, HR	Music and aromatherapy did not significantly reduce BP or HR.
25	Karagoz et al. (31)	2025	Turkey	Single-blind randomized controlled trial	66	Adults	Music alone or music combined with white noise	Impacted third-molar surgery	Anxiety, pain, comfort	Music alone or combined with white noise reduced anxiety during the procedure, although the reduction was not statistically significant.

BP = blood pressure; HR = heart rate; SpO₂ = peripheral oxygen saturation.

Across the dental procedures evaluated, 6 studies involved dental extractions or third-molar surgery, 5 involved endodontic treatment, 3 involved general pediatric dental care, 2 involved dental restorations, 1 involved dental implant surgery, 1 involved crown preparation, 1 involved pulpotomy with stainless steel crown placement, 1 involved urgent dental care, and 1 involved the extraction of impacted teeth under intravenous sedation.

Regarding the variables assessed, 23 studies included anxiety, dental fear, or patient anxiety as a primary or secondary variable. Of these, 19 reported favorable findings associated with music or musical/sound-based auditory interventions, including reduced anxiety or dental fear and improved procedural tolerance. Four studies reported inconclusive effects, no significant differences, or limited benefits regarding anxiety.

Pain perception was assessed in 6 studies, primarily during invasive procedures such as third-molar surgery, endodontic treatment, pediatric dental care, and pulpotomy. Three of these studies reported favorable effects on pain or improved procedural tolerance, whereas the remaining three found no clear benefits or reported limited effects.

Physiological parameters were evaluated in 15 studies, including heart rate, blood pressure, mean arterial pressure, peripheral oxygen saturation, salivary cortisol, salivary flow rate, temperature, heart rate variability, sympathetic activity, and autonomic modulation. Of these, 11 reported favorable physiological changes, such as decreased heart rate, reduced blood pressure, lower sympathetic activity, or reduced salivary cortisol. In the other 4 studies, physiological changes were nonsignificant or inconclusive.

Regarding the type of intervention, 17 studies used music or music therapy as the primary intervention, whereas 8 evaluated comparative, combined, or complementary auditory interventions, including aromatherapy, children's stories, informational videos, iatrosedation, monaural and binaural beats, dramatization with a musical component, and white noise. Among these 8 studies, 2 included music combined with or compared with aromatherapy, 1 compared music with a children's story, 1 compared music with informational videos, 1 compared music with iatrosedation, 2 included auditory beats, and 1 evaluated music alone or combined with white noise.

The styles of music used were diverse. Five studies used classical music or classical musical auditory stimulation; 2 evaluated 432-Hz music; 2 used patient-selected music; 2 evaluated Turkish music, Western classical music, slow rock, or soft rock; 1 compared classical music with Islamic religious music; 1 used relaxing music; 1

used relaxing sounds; 1 evaluated dramatization with a musical component and music listening; and 2 included monaural or binaural beats.

According to age group, 18 studies were conducted in adult populations and 7 in pediatric, adolescent, or school-aged populations. In adults, musical interventions were applied primarily during surgical, endodontic, restorative, and urgent procedures, with anxiety, pain, and physiological parameters being the most frequently assessed factors. In pediatric, adolescent, and school-aged populations, music was used mainly as a distraction technique, behavioral management strategy, or complementary intervention during dental care, with anxiety, dental fear, behavior, pain, pulse, oxygen saturation, and other physiological indicators being evaluated.

DISCUSSION

The main finding of this review was that the available evidence shows a more consistent effect of music on dental anxiety than on pain perception or physiological parameters. This trend suggests that musical interventions may act primarily as emotional regulation and distraction strategies during dental care, rather than as interventions with a uniform effect across all clinical outcomes assessed. This is consistent with the findings reported by Bradt and Teague (6), who indicated that musical interventions may be useful for reducing anxiety in dental patients, although they cautioned that the results should be interpreted carefully due to the methodological heterogeneity of the available studies. Similarly, studies such as those by Mejía-Rubalcava et al. (7), Di Nasso et al. (8), Packyanathan et al. (13), Karapicak et al. (22), and Lal et al. (25) reported favorable effects of music on anxiety across different dental procedures, reinforcing its potential as a nonpharmacological intervention during clinical care.

One possible explanation for this effect is that music acts as a distracting stimulus capable of redirecting the patient's attention away from elements that commonly trigger fear in the dental setting, such as the sound of dental instruments, anticipation of pain, or a perceived loss of control. This interpretation is consistent with the findings of Miyata et al. (9), who observed that music before dental surgery could modulate sympathetic activity associated with preoperative anxiety. Similarly, Santana et al. (11) found that musical auditory stimulation influenced autonomic responses during endodontic treatment, supporting the notion that music may have not only a subjective effect but also a physiological effect.

Nevertheless, the results were not consistent across all studies. Studies such as those by Wazzan et al. (19) and Olaopa et al. (24) did not find conclusive or significant benefits of music on anxiety, pain, or certain physio-

logical parameters. This difference may be explained by variations in the type of procedure, timing of music administration, duration of exposure, patient's baseline anxiety level, method of administration, and type of music used. Therefore, although the evidence reviewed tends to support the use of music, its effects should not be assumed to be homogeneous across all dental settings.

Regarding pain, the findings were less consistent than those observed for anxiety. This may be because pain during dental procedures depends on multiple factors, such as anesthetic technique, procedural complexity, the patient's previous experience, and individual pain threshold. In this regard, music may function more as an emotional modulation and distraction strategy than as a direct analgesic intervention. This interpretation is consistent with the findings of Sadeghi et al. (21), who compared music and children's stories as auditory distraction techniques in pediatric dentistry, and Assari et al. (26), who evaluated relaxing sounds or patient-selected music during third-molar surgery.

In terms of physiological parameters, the studies reviewed suggest that music may be associated with favorable changes in indicators related to the stress response, such as heart rate, blood pressure, salivary cortisol, and autonomic activity. This is consistent with the findings described by Chanda and Levitin (2), who proposed that music may influence neuroendocrine and autonomic mechanisms. These findings are also consistent with those reported by Maulina et al. (10), Aravena et al. (15), and Gulnagar and Kupeli (16), in which musical interventions were associated with favorable changes in physiological variables during dental procedures. However, other studies, such as that by Mousavi et al. (30), did not find significant changes in certain cardiovascular parameters, indicating that the physiological response to music may vary depending on the study design and clinical characteristics of the intervention.

An important aspect identified in this review was the diversity of musical interventions used. Some studies employed classical music, relaxing music, or 432-Hz music, whereas others allowed patients to select their music or evaluated auditory interventions such as binaural beats, white noise, or dramatization with a musical component. This variability may broaden the possibilities for clinical application; however, it also makes direct comparisons across studies more challenging. For example, Karapicak et al. (22) and Assari et al. (26) highlighted the value of patient-selected music, suggesting that individual preference may increase ac-

ceptance of the intervention and enhance its anxiolytic effect. In contrast, studies involving combined interventions, such as those by Janthasila and Keeratisiroj (20) and Mousavi et al. (30), should be interpreted with caution because the reported effects may not be attributable exclusively to music.

In pediatric populations, music appears to serve primarily as a distraction technique, a means of emotional support, and an adjunct to behavioral management. This is consistent with the studies by Rojas-Alcayaga et al. (12), Tshiswaka and Pinheiro (18), Bhusari et al. (23), and Kuppusamy et al. (28), in which musical or auditory interventions were administered during dental care for children or adolescents. These findings are relevant because dental anxiety at an early age may affect cooperation during dental visits and influence the patient's future relationship with dental services. In adults, by contrast, music was more frequently used during surgical, endodontic, or restorative procedures, where its usefulness appears to be more closely associated with reducing anticipatory anxiety, regulating physiological responses, and increasing comfort during treatment.

The main strength of this review is that it integrates recent studies conducted in different clinical settings, providing a broad perspective on the use of music in dental care. In addition, it considers psychological outcomes, pain, and physiological parameters, thereby providing a comprehensive approach to the phenomenon. However, the heterogeneity of study designs, procedures, measurement instruments, types of music, and methods of administration limits the ability to draw definitive conclusions. This limitation was also highlighted by Bradt and Teague (6), who emphasized the need for better-standardized studies on musical interventions for dental anxiety.

CONCLUSIONS

The findings suggest that music may constitute a safe, accessible, low-cost complementary strategy for improving the patient experience during dental care, particularly concerning anxiety. However, its effects on pain and physiological parameters appear to be more variable and should therefore be interpreted with caution. Further research should provide more precise descriptions of the type of music used, exposure duration, volume, timing of administration, mode of administration, and the patient's musical preference. Studies should also use validated instruments and comparable study designs to more clearly determine its clinical effectiveness.

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