Music as a Non-Pharmacological Method for Anxiety Management in Routine Dental Procedures

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Citation: Mohannad Alif and Shehreyar Chaudhry. "Music as a Non-Pharmacological Method for Anxiety Management in Routine Dental Procedures". EC Dental Science 17.10 (2018): 1710-1718.

Abstract

Background: Dental anxiety has always been one of the significant reasons why patients avoid dental clinics and are often challenging to manage. Many non-pharmacological methods have been introduced to manage dental anxiety with musical therapy being one of them.

Objective: This study is being conducted to assess whether music has an effect in reducing anxiety levels in patients during routine dental procedures.

Methods: In this study, 70 patients who attended Luzan Dental Center volunteered and consented to participate in the study. Inclusion criteria was patients who require routine dental treatment, not extensive rehabilitation or invasive surgical treatment. Participants were randomly assigned into two groups, the control group (N = 35) and the study group (N = 35). Patients in the study group were exposed to music during dental procedure. Both groups were assessed using Corah's dental anxiety scale before and after treatment.

Results: In this study, there were 39 males (55.7%) and 31 females (44.3%). Mean age was 32.7 (SD:9.6). Music therapy was effective in reducing anxiety during the procedures, participants in the study group had significantly lower anxiety scores (B: -2.1, 95% CI: -2.5, -1.6; p = 0.00) compared to the control group. In addition, patients who received simple surgical treatment and root canal therapy reported more anxiety than patients who received regular restorative and periodontal treatment (B = -0.52, 95% CI: -1.04, 0.01; p = 0.05).

Conclusion: Music has been shown to be an effective non-pharmacological approach to reduce dental anxiety among patients during routine dental procedures.

Keywords: Music; Non-Pharmacological Method; Anxiety Management; Dental Procedures

Introduction

Dental anxiety has always been one of the significant causes of poor oral health where patients avoid showing up in the dental clinics and getting their necessary treatments done. Such patients are often difficult to treat and might be even misdiagnosed because of the jeopardized dentist-patient relationship [1].

Music in some terms defined by cultures as to be the key to understanding life, a set of musical notes set together to make a harmonica that can affect people all the way from nervous and endocrine system to blood, heart rhythm and beat, a mood changer that can take people from being stressful to being relaxed and full of life, as it can affect electric inductions of nerve fibers, stimulating and even depress them [2].
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The purpose of our literature review is to demonstrate the effect of music on alleviating the patient’s anxiety levels during dental procedures ranging from operative procedures, periodontal, simple surgical and endodontic treatments in the UAE as a large amount of patients seen in the clinic present with varying levels of dental anxiety.

Anxiety levels in a patient may increase dramatically if the patient experiences agitation while undergoing dental treatment. Anxiety levels vary in intensity between patients, epidemiological studies have suggested a significant number of patients with problematic levels that such anxiety keeping them from seeking dental care. In a survey of the general population in the United States approximately 15.5% of the respondents surveyed had some degree of dental fear and were dental treatment avoiders affecting their oral health status and the use of services [3]. Procedures in dentistry tend to arouse more stress compared to others. Some of which are extractions, the sight of a needle, syringe, even the sound of the hand piece. While another dental school based study specified that periodontal treatment followed by root canal therapy and oral surgery have been reported to be the most anxiety provoking procedures [4]. Awareness of the level of anxiety of the patient may help the dentist anticipate his behaviour and be better prepared to take measures to help alleviate the fear.

In an attempt to reduce this anxiety, effective treatment options include pharmacological strategies, hypnosis, and behavioural interventions. Behaviourally oriented treatments include systematic desensitisation and the use of relaxation to weaken the feeling of threat while being exposed to the dental procedures. Since dentally anxious patients reported that they prefer non-pharmacological intervention, and with the advent of recording techniques and the possibility for music to be played at any time and in any place easily, musical therapy has been recommended as a method to bring into play to reduce stress in the dental clinic. The inclusion of music or rhythmic speech with medical treatment has a long history and has been commonly used in traditional treatments to heal and fortify the soul. Musicians were employed by the Romans and ancient Greeks in facilitating healing in spas and rest therapy approaches [5]. For that reason studies have been made using music therapy in the dental clinics to relief patients off their dental anxiety and stress [2,4,5,8,12,15,16].

This research methodology requires the gathering of relevant data regarding cultural history, music background, and anxiety levels of patients undergoing dental treatment. We aim to shed light on the following questions in our research. Firstly, is dental anxiety and stress considered an issue in delivering high quality treatment to patients. Secondly, can noticeable effects on anxiety be produced using non-Pharmacological methods. Third, is Music both professional and efficient way to relax patients during treatment. Finally, should we adopt Music in the medical and dental field.

This case study will utilise quantitative data collection tools, it’s based in a clinical trial setting that recognizes the importance of delivering music individually to a patient, and patient - doctor interaction.

Corah’s Dental Anxiety Scale

In an attempt to prove that music during dental treatment makes a difference, a clinical trial performed by I Olszewska., et al. [16] was composed of n = 200, 120 females and 80 males divided randomly into two groups of n = 100, a controlled group and a non-controlled group, each participant completed a questionnaire prior the treatment which contained questions from Corah’s Dental Anxiety Scale (CDAS), questions based on the Dentist Rating of patients’ adjustment to initial treatment (DR) and the Patient Rating of tension (PR) after treatment has been done. In results, the controlled group in PR was 2.7 ± 0.5, DR 2.5 ± 0.3, while in the non-controlled group in PR was 1.9 ± 0.3, same with DR. which clearly shows that in the non-controlled group who were listening to music were less anxious and obliging to the treatment better in all age groups and gender.

Background music vs public reaction

As the curiosity has been raised about such matter, studies in the music industry were made to demonstrate that indeed music is an important element in our life and it does make a change. A study was done in the UK [6] relating to background music and its effect on the
Music in hospital settings

While reviewing music’s use in hospitals, it was found that it will even reduced pain and hence enhancing the effects of anaesthesia in patients. Favourable impact was more in children compared to adult’s response and females more positively than males [7].

Music enhanced behavioural changes

Music can also affect brainwaves, either to increase the power of perception or depressing it, as a study made to test brainwaves of children under the effect of music [8] showed that elementary school age children exhibited increased activity levels and good behaviour, especially in children with emotional and behavioural difficulties.

Aggression vs upbeat music distraction

As people started viewing some genres of music being able to impose the idea of aggression in an individual or prompting them into committing crimes due to music related violence, a study was done to test the compelling of such concept on adolescents and teenagers exposed to violent and aggressive genres of music [9]. Results showed that this type of music is nothing but an indirect effect to the environmental factors that promote aggression with the help of this type of music, hence increasing the probability of being violent, while a quiet environment may give rise to deviated behaviour.

Biological changes in brain tissue

Music therapy has even proved itself effective with neuro-medical conditions and restoring motor functions for example motor capacities in Parkinson’s patients and other motor disorders that arise from brain trauma [10]. In an analysis of pain intervention methods, it was found that music therapy specifically targeted pain and fatigue [11].

Brain signals and brain activities spike while listening to music as emotions are aroused such as sad, happy, or neutral as per a functional MRI study of mood states induced by classical music. Although there were limitations with the music’s aim in provoking a stimulus in this study, but different lobes of the brain under fMRI where stimulated and lighted up according to different types of music-invoked emotional response. Sad stimulus led to increased activation in the right medial temporal structures, happy stimulus led to increased activation in the bilateral ventral and left dorsal striatum, left anterior cingulated cortex and left para-hippocampal gyrus. In comparison to language, music activates a large number of systems including the cerebellum, which process rhythm, the frontal lobes a region which processes musical structures, and the mesolimbic system which is involved in arousal and pleasure [11].

Instrumental vs lyrical

The effect of music depends on many factors, some of which are the genres, being instrumental or lyrical, the tempo, etc. instrumental music was found to have stimulated both positive and negative responses since it only involves the musical instrument and expresses what no words can say in relation to the patient’s self perceptions, while lyrical music has found to invoke more negative responses than positive since the lyrics may conflict with what the background music intends to say. But still, groups of people with no musical arousal showed unexpected decrease in positive and negative mood scores [13].

Dental procedures, age groups and gender

In the Nigerian teaching hospital, dental anxiety was evaluated among patients undergoing various dental treatments and the levels were compared with those of similar studies conducted with subjects from different socioeconomic backgrounds [14]. The questionnaire was based on the Corah’s Dental Anxiety Scale and analysis of variance (ANOVA) was employed to compare the mean DAS scores. As a result, females recorded higher total scores than males 7.49 ± 2.96 and 7.16 ± 3.44. As per the age group, patients in the 24-34 years
showed the highest scores compared to < 24, 35 - 49 and > 50 years groups. When considering dental anxiety in relation to the various types of treatment, anxiety prior to root canal therapy was found to be the highest (9.30 ± 2.84) followed by extractions (8.38 ± 3.18) and fillings (7.30 ± 2.95). In contrast, anxiety prior to scaling was found to be the lowest (4.35 ± 0.74).

Materials and Methods

Data collection will consist of two questionnaires, visual observance, and short patient interviews.

The target population of the research has been set for n = 200, with expectancy of compliance of n = 100 minimum of patients to be assessed randomly and assigned into two groups, the control group and the study group. Inclusion criteria are patients who require routine dental treatment, not extensive rehabilitation or invasive surgical treatment. Inclusion criteria for music would be relaxing tunes with low beat and tempo.

A written patient information and consent form will be signed, Pre-operative modified questionnaire from Corah’s Dental Anxiety Scale (CDAS) in which it’s a patient-based evaluation survey where the patient marks how they feel before the procedure. A dentist rating questionnaire where the dentist rates the patients' adjustment to treatment from 1 to 6 (1 being high and 6 being low). During the treatment, Music will be delivered from an MP3 player and headphones directly to the patient's ears creating an isolated setting and away from hand piece noise, then the post-operative CDAS questionnaire asking the patient to rate how tense they felt during the treatment.

To make sure of a proper quantitative approach, randomised selection of patients undergoing simple surgical or routine dental treatments, as patients will be supervised by one of the researchers to be positive that the quality has been given as promised.

During the proposed clinical trial, the randomisation will be done by a 3rd party who is blinded from the study to divide the patients in to study and control groups minimising any form of bias in the results, and careful supervision during the process of data collection so reliable and replicable results would be obtained.

Data analysis

Data analysis will be done after the collection has been completed and will be analysed using medical statistics software (ANNOVA) to make results as accurate as possible and minimise any errors, and the final data will be organised in Microsoft Excel.

Results will be compared from the control and study group, to show which of them experienced a lesser anxiety state.

Results

In the study there were 39 males (55.7%) and 31 females (44.3%). Mean age was 32.7 (SD: 9.6). From the questionnaire results, four groups were identified (Low, Medium, High, And severe). In the Low anxiety levels group (n = 20), 66% were male and 35% were female. Moderate anxiety group (n = 35) 57% males and 43% females. High level anxiety group (n = 10) 30% males and 70% females. Severe Anxiety group (n = 5) 40% males and 60% females reported severe levels of anxiety.
Marital status showed a difference between single and married patients, as single group only reported highest in the severe anxiety levels (66.7%), while married patients reported anxiety levels higher than single patients in all the other categories of anxiety but the difference is not statistically significant (Figure 2).

Of the age group, people in the range of 15 - 25 years old, 44.4% of them reported low levels of anxiety, 16.7% had moderate levels of anxiety, 16.7% in the high anxiety category, while 22.2% reported severe levels of anxiety. Of the age group 26 - 35, 65.3% reported no to low levels of anxiety, 25% had moderate anxiety levels, 7.1% had high levels of anxiety, and 3.6% reported severe levels of anxiety. The age group of 36 - 45, 53.3% reported no to low levels of anxiety, 33.3% had moderate levels of anxiety, 6.7% high anxiety levels, and 6.7% reported severe levels of anxiety. Finally, the age group 46 - 70, 66.7% reported no to low levels of anxiety, 22.2% had moderate levels of anxiety, 11.1% had high levels of anxiety, while 0% reported severe levels of anxiety but these findings are not statistically significant (Figure 3).
Music therapy was effective in reducing anxiety during the procedures, participants in the music group had significantly lower anxiety scores ($B = -2.1$, 95% CI: -2.5, -1.6; $p = 0.00$) compared to the control group. Post-operative anxiety levels were 25% low in the control group while 75% in the music group. On the contrary, high post-operative anxiety levels were 100% in the control group while 0% in the music group. In addition, patients who received surgical treatment and root canal therapy reported more anxiety than patients who received general dental treatment ($B = -0.52$, 95% CI: -1.04, 0.01; $p = 0.05$) (Figure 4).

![Figure 4](image)

**Figure 4**

**Discussion**

Since the beginning of time it was known that certain types of music can influence the human brain emitting electrical impulses that stimulate as well as inhibit responses and emotions [5,8]. The influence of such relaxing music on reducing stress symptoms is not yet completely known, however it has been proven that it can stimulate nerves by releasing endorphins resulting in calming the fight or flight reaction. In this study the study group who received music as a way to reduce their anxiety showed lower levels of tension by the end of the treatment (75%) who had post tension being lower ($B = -2.1$) rather than the control group who received no musical interference (80%) and had post tension ranging from moderate to high, with a $P$ value of ($P = 0.00$) which makes the results highly significant (Figure 4). This comes in support of the previous researches that proved classical music is the most relaxing and has the strongest influence on human brain waves, leading people into states of deep relaxation [12].

Another fact established in our study is that music can influence anxiety levels in patients regardless of their post-operative stress, but with a reduced effect on severely anxious patients as they have recorded a post tension of lowest being 2 and highest of 4. It was evident as well that music therapy does not depend on age, sex, marital status, or treatment modality, it has lowered anxiety levels regardless.

Anxiety levels pre-operatively were much higher in females (66.7%) compared to males (33.3%). There are a number of theories that attempt to explain this higher incidence of stress in women. Many factors have been implicated, including biological, psychological, and social factors. For instance, they produce more stress hormones than men do, and the female sex hormone progesterone averts the stress hormone system from turning itself off as it does in men [17].
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Another interesting finding that this paper highlighted was that patients reported being more anxious before simple surgical dental treatments (P value = 0.05) compared to routine dental treatment. Reasons contributing to such differences may be the invasive and traumatic procedure of a surgery. Sounds of the hand pieces were found to trigger more activity in the primary auditory areas of the brain and hence cause a more intense response. For future studies, it would be useful to compare between the different fields of dentistry to contrast patients’ stress perceptions of each.

Limitations

The first limitation we encountered was the sample size, as the sample was lower than what we expected to encounter; this was due to the inflow of patients into the clinic that fit into the inclusion criteria. However, this provides the opportunity to further the study into expanding a larger sample group to include all levels of dental treatments and compare the anxiety levels.

As the chief interest of our study was the anxiolytic effect of music, the pieces were solely selected on their ability to induce relaxation in our patients. Other modes of music genres to compare what has the greatest anxiety reducing effect on the general population.

Another limitation was the mode of application of the music played, listening to the tracks through headphones was sometimes causing annoyance to the patients specially when lying down in the supine position. Communication was difficult between the dentist and the patient and vice versa and hence it was not of complete comfort to both. To solve such issue it may be superior to introduce the music via a sound system in the dental clinic for better effect of harmony and generality. Also, a further comparison between the headphones or background music could show which has a better soothing effect on the patient since direct music induction will act on the conscious part of the brain, while indirect background music will act on the subconscious, and this would be an interesting difference to investigate.

Patients who had severe anxiety, although reported slight reduction in their anxiety levels in our clinical trial, they actually cannot be relaxed under the influence of non-pharmacological means alone but the need for specialist interference as they might have psychological issues and must be treated by adjunctive therapy with pharmacological means.

The dentist rating of the patients willingness to the treatment was found to be insignificant in our randomised trial (p = 1.21). The explanation to which we may owe this result to, is that the dentists were not controlled or kept constant or had any professional training in the psychiatry field. Different dentists were asked to evaluate the patients' behavior and manageability; therefore each gave a rating according to their own perspective of what willingness is. To overcome this, a separate investigator who has a background in the psychological field may be used to assess the patients and thus reduce bias.

Conclusions

- Participants who listened to music during dental treatment experienced less anxiety compared to those who didn't with a high statistical significance.
- Patients who had medium and high levels of anxiety preoperatively had a significant reduction in their postoperative stress and fear levels.
- Patients undergoing general treatment were more relaxed and comfortable during their dental visit compared to those undergoing treatments.
- Females were found to be more anxious than males pre-operatively.
- Married participants were more anxious than singles in the moderate and high levels whereas single patients were more severely anxious than married ones.
- Patients belonging to the age group of 15 - 25 years were found to be more stressful than participants of ages 40 - 70.
- Influence of music as a relaxation method was highly significant with no delection to age, sex, or marital status.
- Music has been proven to be a very useful tool in making dental treatment in clinics more pleasant and relaxing.
- Further research is still required to accurately assess the anxiolytic effect of music as there are many other points to look into this topic.

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Summary

After looking at the results and coming to our conclusion, it is quite evident that musical therapy is a professional non-pharmacological method to lower anxiety and eases the delivery of treatment, and is worth dentists’ attention around the world in order to be used to replace pharmacological methods or be used in conjunction with it in the fight against dental anxiety.

Bibliography

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*Volume 17 Issue 10 October 2018*

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