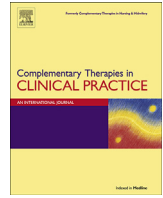




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## Changes induced by music therapy to physiologic parameters in patients with dental anxiety



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### ABSTRACT

**Introduction:** The aim of this study was to determine the effect of music therapy on patients suffering dental anxiety. In addition, a second objective was to determine the correlation between salivary cortisol and other physiologic parameters.

**Methods:** 34 patients were randomly assigned to the control group and the experimental group. For each patient was measured for salivary cortisol, stimulate salivary flow, blood pressure, heart rate, oxygen saturation and body temperature. Student t-test and Chi2 were applied to analyze significant differences between the studied variables before and after the unpleasant stimulation causes anxiety for dental treatment.

**Results:** Initially, both groups registered the same level of anxiety. In the second measurement, significant differences were registered in the salivary cortisol concentration, systolic and diastolic pressure, heart rate, body temperature and stimulated salivary flow for treated group with music therapy.

**Conclusion:** Music therapy has a positive effect in control of dental anxiety.

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## 1. Introduction

It has been estimated that the anxiety suffered during dental treatment, also called dental phobia, affects between 4% and 30% of patients worldwide [1–3].

Research has shown that a number of factors are consistently linked to a more frequent dental anxiety among these factors are personality traits, fear to feel pain, traumatic past dental experiences more particularly in childhood, previous fear induced by other family members who have suffered dental anxiety and fear of blood and wounds [4–7].

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM IV-R) [8], Dental anxiety is comprehended under the category of specific phobias, and there are several instruments

to evaluate dental anxiety. The most common scales are the Dental Anxiety Scale (in its original version DAS and modified version MDAS) and the Dental Fear Scale (DFS) [9].

Among the effects dental anxiety provokes is treatment interference, which generally generates total interruption of treatment, avoiding subsequent dental appointments [10–13].

Additionally, The behavior of patient anxiety and management attempts are a source of stress for the dental health professional [11–16]. Thus, anxiety for dental treatment leads to increase the costs derived from the extended appointments that in many cases exceed the available resources for dental care [12].

Dental anxiety is a stress factor, which causes certain effects on the body as an answer to real or perceived threats, both psychological and physiological. These effects include tachycardia, high blood pressure, hyperglycemia, mydriasis, hyperthermia, high cholesterol, cortisol secretion (generated by the activation of the hypothalamic-pituitary-adrenal (HPA) axis), negatively affecting important biological mechanisms and also being a risk factor in the development of certain systemic diseases [17–21].

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There are various methods to be used in order to decrease the anxiety caused by stress in a dental appointment. The available methods of conscious sedation in dentistry include inhalation sedation (nitrous oxide), conscious intravenous sedation and oral sedation, which have a range of undesirable side effects and risks, besides to increase the cost of dental treatment. In patients without dental ensure, the cost of the professional dental care is very important for adherence to the treatment. Thus, the use of alternative therapies as music therapy [22–24], which has gradually gained importance among complementary therapies due to it is not an invasive and it has proven to be very useful to reduce the negative impact of stress and prevent it. Music used in music therapy must be relaxing, which is characterized by a slow tempo, repetitive rhythm, gentle contours and strings. Music therapy may help patients to achieve optimal psychological balance during their dental visits [25–27]. Due to this, the objective of this research was to analyze the effect of music therapy in patients suffering dental anxiety. In addition, a second objective was to determine the correlation between salivary cortisol, saliva flow, blood pressure, heart rate, oxygen saturation and body temperature.

## 2. Methods

### 2.1. Subjects

The current study was carried out in private and public dental offices. The study was randomized, experimental and prospective, with a sample of 34 patients, over 18 years old, suffering from dental anxiety who attended to dental appointment. This investigation was approved by the Bioethics Committee of the Research Center of Advanced Studies in Dentistry, Autonomous University of Mexico State (UAEMex). Patient participation was voluntary, each patient sign an informed consent. The sample was divided randomly in a control group and an experimental group ( $n = 17$  in each group).

The control group was the one which did not use the experimental music (music therapy) and the experimental group was the one which received music therapy. Both groups were selected from the same population base.

In order to select those participants that were suitable for this study, it is applied the Modified Dental Anxiety Scale in Spanish (MDAS) [28,29], and it was included only those patients who were anxious in accordance to MDAS and over 18 years old, both male and female. It is excluded those patients suffering systemic diseases as diabetes, high blood pressure, thyroid diseases, heart diseases, tumors, Cushing syndrome, those under permanent drug treatment with antihistamine, tricyclic antidepressant, anticholinergics, benzodiazepines, antihypertensives, diuretics, phenothiazines, clonidine hydrochloride and narcotic analgesics, estrogens, synthetic glucocorticoids (prednisone and prednisolone), androgens, phenytoin, depressive or hyperactive patients, and pregnant women.

### 2.2. Clinical tests

It was performing two measurements for this study: both during a morning appointment (9–12 a.m.) for posterior teeth extraction or endodontic treatment. Before the specific dental treatment was performed, the measurement was carried out in all cases.

In the first measurement, both groups were performed the same measurements of physiological parameters in the same manner to establish a baseline. To cause an unpleasant stimulus related to dentistry, each patient was placed in the dental chair with an angle at  $120^\circ$  and it was shown a new needle for local anesthesia.

Subsequently, the high-speed dental handpiece was working for 30 s, in order that the patient hears the distinctive sound produced. Then, the patient is sitting in another seat at a  $90^\circ$ -degree angle with his/her feet on the floor and his/her back straight.

Blood pressure and heart rate were measured with a validated automatic oscillometric device, (HEM-650INT Omron) on the left wrist and with their hand at heart level. It was placed a digital pulse oximeter (OXO006-100 Hergom) on the left thumb to measure oxygen saturation in the blood. A digital thermometer was also placed (VitalysVDT-ED) on the floor of the mouth to measure body temperature. Finally, the patient was chewing during 5 min a  $20 \times 20 \times 0.2$  mm piece of sterile polyethylene for stimulate flow salivary measurement, it was stored the saliva in a previously sterilized polyethylene container. The samples were transported under refrigerating conditions and then frozen to a  $-80^\circ\text{C}$  until were analyzed in the laboratory. For statistical analysis, the amount of secreted saliva was divided between the time of collection and expressed in mL/min. It was used the same standards for the second measurement, including the same time of application.

In the second measurement, for the control group, the measurement of the physiological parameters was performed in the same manner described above. In instead, the patients in the experimental group were asked to sit down in the dental chair and were given a pair of headphones (Sony MDR-MA100) for them to listen to 'Music instrumentals soothing, calming, positive relaxation Essence No. 1' (i tunes) for a period of 20 min. After that, the headphones were removed and it was performance the measurements.

### 2.3. Laboratory tests

Once the saliva samples were defrosted and centrifuged at 3000 rpm for 5 min and the concentration of cortisol was quantified by using a direct competitive immunoassay kit properly validated (Salimetrics TM State College, USA), and following the instructions provided by the manufacturer, the luminescent units at 450 nm with a microplate absorbance reader (Sunrise TM TECAN, Männedorf, Switzerland). All the samples were analyzed in a single step for ensure to validity of the test.

### 2.4. Statistical analysis

Descriptive analysis was performed to determine the distribution of each variable. For data analysis of differences between groups was used a Student *t*-test for independent samples for quantitative variables and  $\text{Chi}^2$  test for the qualitative variables. In addition, to determine the correlation between salivary cortisol level, stimulated salivary flow rate, blood pressure, heart rate, oxygen saturation and body temperature was used a Pearson correlation because the variables under study were approximately normally distributed. The data was analyzed by SPSS version 19 (Statistical Package for the Social Sciences Inc., Chicago IL, USA), the tests were significant if  $p \leq 0.05$ .

## 3. Results

The score of the Modified Dental Anxiety Scale was  $23.1 \pm 0.9$  and  $22.4 \pm 1.1$  for the control group and for the experimental group, respectively. There are no significant differences between groups (See Table 1). There are no significant differences in terms of age, gender, previous traumatic experiences, decayed, missing, and filled teeth index (DMFT), treatment and treated quadrant (See Table 1). Socioeconomic variables show that there are statistically significant differences in terms of occupation, education and marital status.

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