

# Influence of Music Therapy to Reduce Anxiety During Periodontal Surgical Procedures

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## ABSTRACT

**Objectives:** To evaluate the influence of music in reducing patients' anxiety during periodontal surgery. **Methods:** This is a clinical trial of involving fifteen patients undergoing periodontal surgery. Patients indicated for periodontal surgery were invited to participate in the study, and randomly assigned to music (n=8) or control (n=7) groups. Participants' dental anxiety were determined using the Corah Dental Anxiety Scale (CDAS) before and after the surgery, while their blood pressure (BP) and heart rate (HR) were recorded at pre-, intra- and post-procedures. Paired t-test was used to compare the statistical significant difference between pre- and post-procedural anxiety for both groups. **Result:** The participants of this study consist of 22 patients that underwent periodontal surgery procedures, with majority of the subjects (53.3%) were males (n=8) and the mean age was 50.8 (SD=13.21). The measurement of blood pressure increased in patients allocated in music group compared to control group were statistically significant with ( $p<0.05$ ). **Conclusion:** Our study suggests that music may reduce patients' anxiety while undergoing periodontal surgery. More details on the type and intensity of music may provide further value to the finding.

**Keywords:** music, dental anxiety, periodontitis, audio distraction.

## INTRODUCTION

Dental anxiety is described as a common condition related with avoidance of dental care and following health-related and psychosocial effects (Carlsson et al. 2015). Among the causes of anxiety is traumatic childhood experience during dental therapy and indirect learning from anxious family members or friends, exposure to frightful images of dentists in the media, the coping strategy of the person when encountered with past experienced and the insecure position of sitting on the dental chair (Appukuttan, 2016). Anxiety inevitably, will result into deferment or cancelation of a dental appointment entirely as suggested by Saatchi et al. (2015), hence poses a management challenge to clinicians and dental team, particularly in complex and lengthy procedures such as periodontal surgery.



Environment and ambience of a dental clinic has been suggested as one of the factor that can influence patient's anxiety while waiting for treatment. The effect of music, was reported to have reduced patients' systolic and diastolic blood pressure (Mejía-Rubalcava et al., 2015, Roohy et al., 2005). Instrumental music such as those composed by Enya have been shown to successfully reduced stress (Khalfa et al., 2003, Grocke & Wilgram, 2007). Such music was found to reduce cortisol levels in nervous participants who were required to do speak and do mental calculations in front of audience. They also found that exposing hospitalised patient to composed music using headphones throughout surgery helped to reduce stress while under treatment compared to patients not exposed to music.

However, not much information is available on whether music can reduce patient's anxiety during a periodontal surgical procedure. This study was aimed to investigate the effect of music on dental anxiety as perceived by patients, and on clinical blood pressure and heart rate of patients undergoing periodontal procedure.

## **MATERIALS AND METHOD**

A clinical trial was carried out at a government dental training institution with approved ethics for the conduct (reference REC/246/19). Twenty-two (n=22) patients indicated for periodontal surgery in the Postgraduate Periodontics Clinic were identified and invited to participate in this study. Purpose of the study were explained and written consents were obtained from participants before recruitment.

Initially, participants were asked to complete the Corah's Dental Anxiety Scale (CDAS) (Figure 1) to assess the pre-operative anxiety level and only participants with score  $\leq 18$  were included in this study as (inclusion criteria) because it was the maximum score for someone to be classified as fairly anxious (Corah et al., 1978). Those with a score of 19 or beyond were considered as highly anxious dental patients and therefore, they were excluded from this study.

NAME (NAMA) ..... DATE (TARIKH) .....

Norman Corah's Dental Anxiety Scale  
(Skala Tahap Ketakutan Pergigian Norman Corah)

1) If you had to go to the dentist tomorrow for a check up, how would you feel about it?  
*Sekiranya anda terpaksa pergi ke doktor gigi esok untuk pemeriksaan gigi, bagaimana perasaan anda?*

a. I would look forward to it as a reasonably enjoyable experience.  
*Saya akan menantikannya sebagai pengalaman yang cukup menyenangkan.*

b. I wouldn't care one way or the other.  
*Saya tidak kisah.*

c. I would be a little uneasy about it.  
*Saya akan berasa agak tidak selesa mengenainya.*

d. I would be afraid that it would be unpleasant and painful.  
*Saya akan takut bahawa ia menjadi tidak menyenangkan dan menyakitkan.*

e. I would be very frightened of what the dentist would do.  
*Saya akan menjadi sangat takut akan apa yang dilakukan oleh doktor gigi itu.*

2) When you're waiting in the dentist's office for your turn in the chair, how do you feel?  
*Apabila anda menunggu di pejabat doktor gigi untuk giliran anda, bagaimana perasaan anda?*

a. Relaxed.  
*Relaks.*

b. A little uneasy.  
*Tidak menyenangkan.*

c. Tense.  
*Tegang.*

d. Anxious.  
*Bimbang.*

e. So anxious that I sometimes break out in sweat or almost feel physically sick.  
*Sangat bimbang sehinggakan kadang-kadang saya berpeluh atau hampir sakit secara fizikal.*

3) When you're in the dentist's chair waiting while the dentist gets the drill ready to begin working on your teeth, how do you feel?  
*Apabila anda berada di kerusi pergigian menunggu sementara doktor gigi menyediakan barangan untuk merawat gigi anda, bagaimana perasaan anda?*

a. Relaxed.  
*Relaks.*

b. A little uneasy.  
*Tidak menyenangkan.*

c. Tense.  
*Tegang.*

d. Anxious.  
*Bimbang.*

e. So anxious that I sometimes break out in sweat or almost feel physically sick.  
*Sangat bimbang sehinggakan kadang-kadang saya berpeluh atau hampir sakit secara fizikal.*

4) Imagine you're in the dentist's chair to have your teeth cleaned. While you're waiting and the dentist or hygienist is getting out instrument which will be used to scrape your teeth around gums, how do you feel?  
*Bayangkan anda berada di kerusi pergigian untuk membersihkan gigi anda. Semasa anda sedang menunggu doktor gigi atau pakar kebersihan pergigian sedang mengeluarkan instrumen yang akan digunakan untuk mengikis gigi sekitar gusi, bagaimana perasaan anda?*

a. Relaxed.  
*Relaks.*

b. A little uneasy.  
*Tidak menyenangkan.*

c. Tense.  
*Tegang.*

d. Anxious.  
*Bimbang.*

e. So anxious that I sometimes break out in sweat or almost feel physically sick.  
*Sangat bimbang sehinggakan kadang-kadang saya berpeluh atau hampir sakit secara fizikal.*

Scoring For Corah's Dental Anxiety Scale (CDAS)

Figure 1: Corah's dental anxiety score questionnaire

Other inclusion criteria in this study were; (i) healthy individuals between 18 and 45 years, , (ii) patients requiring periodontal surgery, and (iv) patients who agree to participate in this study. The exclusion criteria were: (i) patients with nervous disorder and (ii) patients with hearing deficits or tinnitus.

Patients' haemodynamic variables including systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) were recorded at pre-, intra-, and postoperatively. The patient's SBP (mmHg), DBP (mmHg) and HR (bpm) were measured using a calibrated digital blood pressure sphygmomanometer.

Instrumental music track in duration of 3 to 5 minutes each from Watermark album by Enya was chosen to be played throughout the surgical procedure. At the end of the surgery, the music were stopped and anxiety level was again assessed using the CDAS questionnaire. All the data were then tabulated and compared using Paired t-test in SPSS version 23.

## RESULTS

The participants of this study consist of 22 patients that underwent periodontal surgery procedures. In Figure 2, three (n=3) patients were excluded because of the postponement of surgery due to elevated blood pressure. Nineteen (n=19) patients were randomly divided into two groups; eleven (n=11) patients having music during periodontal surgical procedures (Group A) and eight (n=8) patients having the procedures without listening to music (Group B) as control group. Three (n=3) patients from music group withdrew themselves from the research due to feeling uncomfortable while wearing headphones during the procedures. One (n=1) patient from control group withdrew herself due to feeling anxious while having procedure. Fifteen (n=15) patients completed the clinical trial.

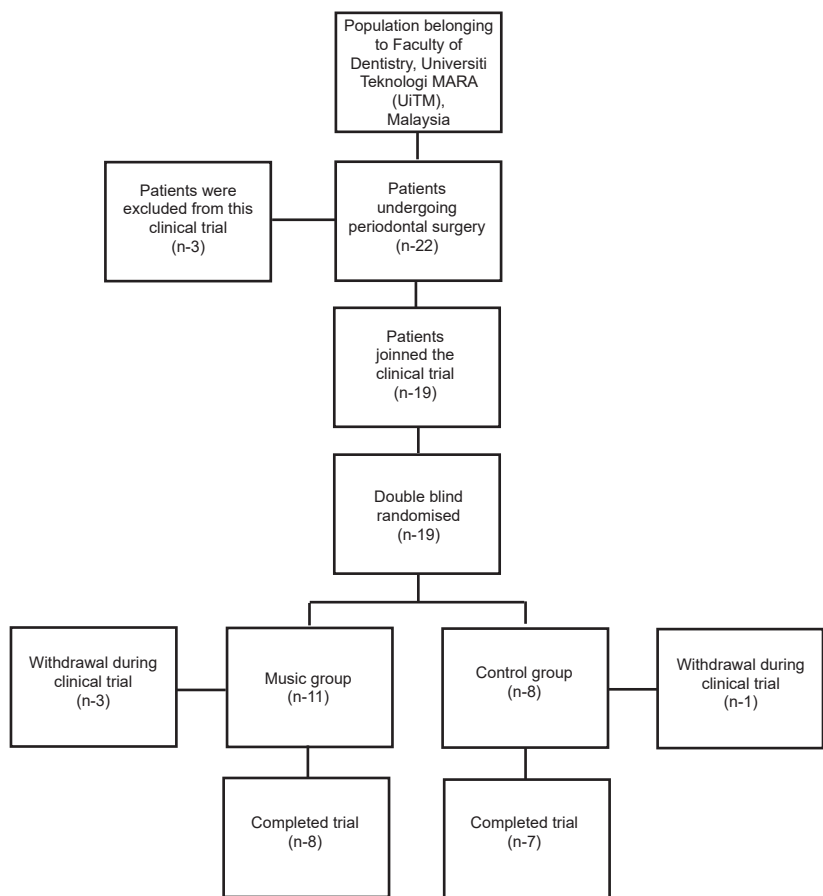


Figure 2: Trial profile

Majority of the subjects (53.3%) were males (n=8) and the mean age was 50.8 (SD=13.21). Twenty percent (n=3) of the subjects had hypertension as their underlying disease. The demographic distribution that consists of age, gender, and underlying systemic diseases is listed in Table 1.

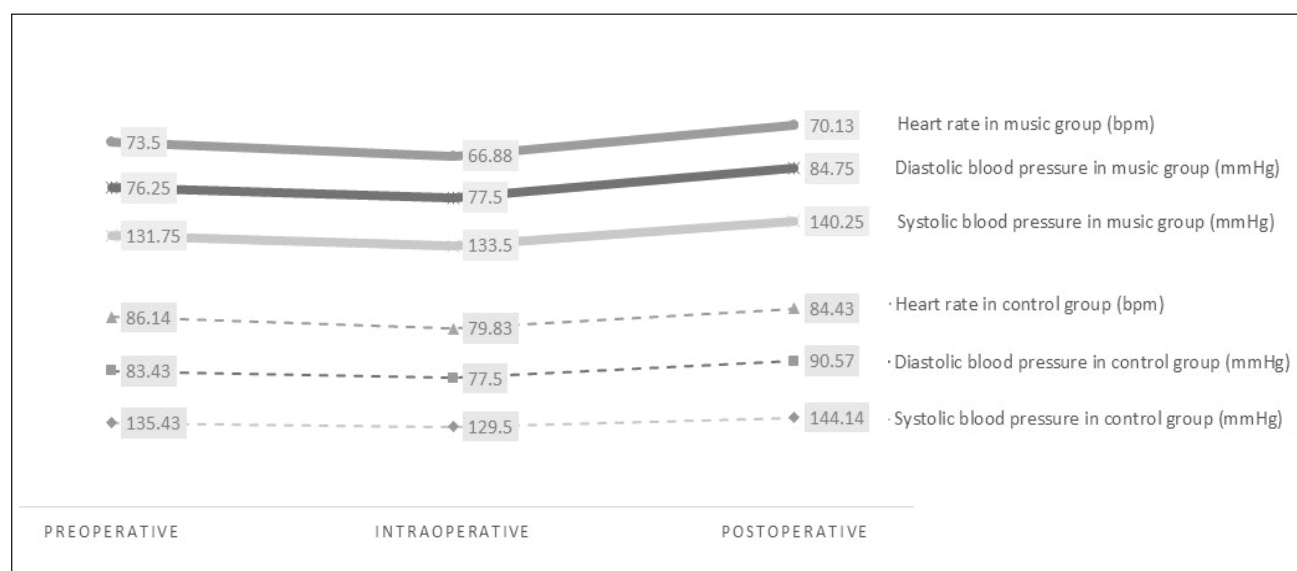
**Table 1: Demographic distribution of participants**

Variables	N=15
Age, Mean±SD	50.80±13.21 (95% CI: 43.48-58.12)
Gender, N (%)	
Male	8 (53.3)
Female	7 (46.7)
Underlying systemic disease(s), N (%)	
No systemic disease	8 (53.3)
Hypertension	3 (20.0)
Dyslipidemia	1 (6.7)
Diabetes mellitus	1 (6.7)
Back pain	1 (6.7)
Anxiety	1 (6.7)
Types of periodontal surgery, N (%)	
Open flap debridement	10 (66.7)
Surgical crown lengthening	4 (26.7)
Implant placement	1 (6.7)

Mean CDAS preoperatively for music and control group were 7.25 and 7.14 respectively. Table 2 shows pre-, intra-, and postoperative mean SBP (mmHg), mean DBP (mmHg), and mean HR (bpm) of music and control groups whilst Figure 3 shows pre-, intra-, and postoperative mean SBP (mmHg), mean DBP (mmHg), and mean HR (bpm) comparison between groups.

**Table 2: Pre-, intra-, and postoperative mean SBP (mmHg), mean DBP (mmHg), and mean HR (bpm) of music and control groups**

Variables	Music group Mean (SD)	Control group Mean (SD)	Mean difference (95% CI)	t statistics (df)	p value
Preoperative systolic blood pressure (mmHg)	131.75 (17.63)	135.43 (14.97)	-3.68 (-26.23, 18.87)	-0.369 (9)	0.721
Intraoperative systolic blood pressure (mmHg)	133.50 (21.02)	129.50 (11.47)	4.00 (-19.43, -27.33)	0.394 (8)	0.704
Preoperative diastolic blood pressure (mmHg)	76.25 (6.85)	83.43 (7.28)	-7.18 (-17.30, 2.94)	-1.605 (9)	0.143
Intraoperative diastolic blood pressure (mmHg)	77.50 (13.03)	77.50 (3.57)	0.00 (-12.59, 12.59)	0.000 (8)	1.000
Preoperative heart rate (bpm)	73.50 (16.84)	86.14 (10.70)	-12.64 (-28.68, 3.39)	-1.704 (13)	0.112
Intraoperative heart rate (bpm)	66.88 (16.55)	79.83 (6.15)	-12.96 (-27.27, 1.36)	-1.811 (12)	0.095



**Figure 3: Pre-, intra-, and postoperative mean SBP (mmHg), mean DBP (mmHg), and mean HR (bpm) comparison between groups**

Statistical analysis was performed by using paired t-test in SPSS ver. 23. The comparison of patients' haemodynamic variables (Table 3) was done between the readings pre- and intraoperatively. The postoperative readings were not used in comparison as the postoperative readings were taken after patient sit upright for a few minutes from supine position for hours.

**Table 3: Pre- and intraoperative mean SBP (mmHg), mean DBP (mmHg), and mean HR (bpm) comparison between groups**

Variables	Groups	Preoperative	Intraoperative	Difference	Mean difference (95% CI)	t statistics (df)	P value
Systolic blood pressure (mmHg)	Music group	131.75	133.50	↑1.75	1.70 (-4.51, 7.91)	0.62 (9)	0.551
	Control group	135.43	129.50	↓5.93			
Diastolic blood pressure (mmHg)	Music group	76.25	77.50	↑1.25	2.20 (-3.60, 8.00)	0.86 (9)	0.413
	Control group	83.43	77.50	↓5.93			
Heart rate (bpm)	Music group	73.50	66.88	↓6.62	5.86 (0.02, 11.69)	2.17 (13)	0.049*
	Control group	86.14	79.83	↓6.31			

\*p<0.05

The mean SBP and DBP between before and during intervention was not statistically significant ( $p>0.05$ ). The mean SBP and DBP increased in music group intraoperatively compared to control group. The mean SBP and DBP in music group during the surgery increased by 1.75 mmHg and 1.25 mmHg respectively. The current study was 95% confirmed that the mean difference of SBP and DBP in the population lies between -4.51, 7.91 mmHg and -3.60, 8.00 mmHg respectively.

However, the mean HR between before and during intervention was statistically significant ( $p<0.05$ ). The mean HR decreased in both groups intraoperatively. The mean HR in music and control group during the surgery decreased by 6.62 bpm and 6.31 mmHg respectively. This study was 95% confirmed that the mean difference of HR in the population lies between 0.02, 11.69 bpm.

Based on Table 4, mean CDAS in both groups was reduced postoperatively compared to mean preoperative CDAS but there was not statistically significant ( $p>0.05$ ). The mean postoperative CDAS in music and control group decreased by 0.62 and 0.14 respectively. The present study was 95% sure that the mean difference of CDAS among the participants lies between -0.19, 0.99.

**Table 4: The comparison of mean CDAS pre- and postoperatively between groups**

Group	Mean Corah dental anxiety scale (CDAS)		Difference	Mean difference (95% CI)	t statistics (df)	P value
	Preoperative	Postoperative				
Music	7.25	6.63	↓0.62	0.40 (-0.19, 0.99)	1.47 (14)	0.164
Control	7.14	7.00	↓0.14			

## DISCUSSION

American Psychiatric Association (2015) described stress as A state of complete physical, mental and social well-being and not just the absence of sickness or frailty. Since anxiety could lead to many complications, some interventions are necessary to help lessen the adrenaline rush. Nightingale (2007) found that some windy or stringy music can soothingly calm the patients since this creates an environment that helps in the healing process.

Appukuttan (2016) proposed that the anxiety shows unappealing experiences for both patients and dentists, and these patients were most likely to present with poor oral health, more missing and decayed teeth, poor periodontal status, including requiring complicated procedures during acute emergency condition. It has been proven that anxious patients have more caries, missing and non-restorable teeth than non-anxious patients (Appukuttan, 2016). Dental anxiety and fright in patients may result in a longer management as, it is difficult to manage them along the procedure and they are often uneasy with their treatment.

The experience in periodontal surgery is not usually life-threatening procedures. However, invasive procedures using a scalpel and post-operative pain and recovery trigger dental anxiety. (Croog et al., 1995) The administration of local anaesthesia during procedures is also inducing anxiety. In addition, Astramskaitė et al. (2016) agreed with the study done by López-Jornet et al. (2014) that the block type local anaesthesia is triggering more anxiety than infiltrative injection.

Periodontal surgery is one of the invasive dental treatments that may trigger anxiety among the patients due to tissue invasion and longer procedure (Croog et al., 1995). This procedure can be divided into 4 categories (Lang et al, 1993):

1. surgical procedures for pocket elimination or pocket reduction
2. treatment of osseous defects
3. procedures for access to the root surface
4. procedures for mucogingival problems

In order to measure the quantitative score for dental anxiety, Nagarajan et al. (2017) mentioned multiple- and single-item self-reporting questionnaires available for evaluating anxious and phobic patients such as Corah's Dental Anxiety Scale (CDAS), Modified Dental Anxiety Scale (MDAS), Spielberger State-Trait Anxiety Inventory, Stouthard et al.'s Dental Anxiety Inventory, Kleinknecht et al.'s Dental Fear Survey (DFS), and Gatchel's 10-point fear scale. Meanwhile, single-item questionnaires that were suggested are the Dental Anxiety Question, Seattle survey item, a Finnish single dental anxiety question, the visual analog scale and a single-item dental anxiety-and-fear question. However, none of these existing instruments has been regarded as a benchmark, as they have their own limitations. Corah's Dental Anxiety Scale (Corah, 1969) was applied in this study due to the reliability and validity to measure dental anxiety. (Corah et al., 1978). According to Kvale et al. in 1998, CDAS helped in sorting up the anxious patient and borderline patient into their group, with 90% and 85% success rate respectively.



Therapeutically, music intervention has been found to be very useful to lessen anxiety (Kaempf & Amodei, 1989; Lahmann, 2008; Lai et al, 2008; Nilsson, 2008; Mejía-Rubalcava et al, 2015; Chandure et al., 2017; Maulina et al., 2017; Bradt and Teague, 2018; Maybodi et al. 2018). In 1989, Kaempf and Amodei found that their experimental group had a significantly lower respiration rate than the control group. By introducing the patient to sedative music, they found respiration rates in experimental group after music intervention was significantly reduced after 20 minutes than in the control group. However, both the experimental and control group seems beneficial when there were lowered SBP and anxiety test scores.

In 2015, Mejía-Rubalcava et al. summarized that music helps in reducing patient dental anxiety by looking at their cortisol concentrations in patient's saliva, as cortisol is an important biomarker to investigate the stress level. They found that by introducing music to the patient, there's significant differences were noted in the salivary cortisol concentration, SBP, DBP, HR, body temperature and stimulated salivary flow, compared to the control group. The current research also showed the decrease of HR intraoperatively.

Review done by Nilsson (2008) suggested that music has been used in health care services to lessen patient perception of pain, anxiety scores, and stress level, even though the specific mechanism of these therapies are not clearly understood. Nilsson found that music intervention to patients had a very positive impact in perioperative settings. Lahmann et al, (2008) compared a brief relaxation method with music distraction and with a control group and found that both interventions reduced dental anxiety significantly. In a study done by Bradt and Teague (2016) case group were given music to listen to prior dental treatment, to prevent anxiety arising, as the patient is waiting for the treatment to start.

In the current study, SBP and DBP increased among the patients in the music group compared to control group. This result is different from the results of past studies (Kaempf and Amodei, 1989; Mejia-Rubalcava et al., 2015) that concluded the lowered blood pressure intraoperatively. Regardless of this difference, there were studies done by Lai et al. (2008) and Roohy et al. (2005) partially in the same path as the current study. Lai et al. (2008) reported that music intervention during root canal treatment reduces subjects' anxiety level but music does not affect SBP and DBP. Roohy et al. (2005) reported that there was no significant difference between the anxiety level, physiological responses, HR and respiratory rate in two groups before intervention but there were only differences in the level of anxiety and mean of arterial blood pressure in the intervention group.

There were definite reasons why the result was not satisfying enough. Limitations arose during the research was done. Some of the patients withdrew from the surgery procedure due to various reasons, which were elevated blood pressure, complaints of not comfortable to wear headphones, refused as they want to focus more on what the operator are doing and had concern if the complication will happen throughout the surgery. For instance, elevated blood pressure caused the surgery to be called off to avert any complications along the procedure. Moreover, uncomfortable feeling to use headphones were aroused when it involved surgeries at the posterior tooth since they need to tilt their heads, following the operator's instructions. Next was the determination to focus on what operators will be doing in the procedure cause them to withdraw from the research and last but not least, patients concerned if something bad happens during the procedure, so they were preferably not joining the research as the therapy will be intimidating to them.

Despite of music therapy such as both active and receptive music can be useful to improve health or functional outcomes, this study shows that music intervention increasing the blood pressure and lowering the heart rate. However, the current study could not conclude that music is less effective to reduce anxiety during periodontal surgical procedures as the smaller sample size. As recommendation for the use of future studies, a larger sample is needed to get better results on music to reduce anxiety during periodontal surgical procedures. The usage of earphones is better and making the patients feel comfortable to wear them along the surgical procedures as they will not restrict the movement of the patient's head.

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