

Impact of passive music intervention in subjects with self-reported moderate to high dental anxiety undergoing ultrasonic scaling procedure

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Original Article

Abstract

BACKGROUND AND AIM: The purpose of the present study was to evaluate the impact of passive music intervention in patients with moderate to high dental anxiety undergoing ultrasonic scaling procedure.

METHODS: Eighty healthy subjects with an anxiety score of 13-25 by Modified Dental Anxiety Scale (MDAS) in a randomised controlled trial (RCT) were recruited into study and control groups. Study group of forty subjects underwent ultrasonic scaling procedure with pre-recorded instrumental music intervention. Forty subjects in control group received the same dental treatment without music intervention. Physiologic parameters such as pulse rate (PR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) were recorded twice (before and at the end of procedure) for both groups. Dental anxiety experience was recorded using Visual Analogue Scale (VAS) for all the subjects at the end of study program. Repeated measure analysis of variance (ANOVA) was used to test the significant mean difference between pre- and post-measurements of all clinical parameters among study and control groups. Independent samples t-test was applied to analyze VAS inter-group significance.

RESULTS: The mean values of PR (pre and post) as well as SBP and DBP (pre and post) were statistically significant for study group as compared to control group. Mean values of PR (pre and post) and SBP and DBP (pre and post) showed statistically significant reduction in study group compared to control group. Post-therapy VAS score was significantly lower in the study group as compared to the control group. P-value was maintained at < 0.05.

CONCLUSION: Music intervention during ultrasonic procedure helps reduce dental anxiety in subjects with moderate to high dental anxiety levels.

KEYWORDS: Dental Anxiety; Music Therapy; Pulse Rate; Blood Pressure; Ultrasonic Surgical Procedures

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Dental anxiety is an emotional reaction that most often prevents patients to receive appropriate dental treatment.¹ Visit to the dental clinic is said to be a common reason of anxiety by Agras et al.² Multiple factors resulting in dental anxiety are unpleasant experiences of family members and friends, coping capacity of an individual, vulnerable position of lying back in a dental chair, scraping and vibration sounds of high

frequency scaler unit, and so on.³

Dental treatment of such anxious and fearful patients is the most stressful and time-consuming affair as it lacks patient's cooperation which ultimately leads to an unpleasant experience for both the patient as well as for the dentist.⁴ To carry out an appropriate and successful dental treatment, timely recognition and suppression of dental anxiety is inevitable. Various psychotherapeutic and pharmacological

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strategies like acupuncture, hypnosis, and sedation have been tried out to minimize dental anxiety with limited success.⁵⁻⁸

Music intervention as an alternative therapy has been proven effective in the management of several medical conditions including depression^{9,10} schizophrenia,^{11,12} and Parkinson's disease (PD).¹³ Music therapy is said to bring down anxiety and pain through deep relaxation and distraction that in turn reduces the activity of the neuroendocrine and sympathetic nervous systems (SNS).¹

It is a well-known fact that listening to music can lower the anxiety in patients undergoing medical procedures. However, studies on effectiveness of music therapy as an anxiolytic intervention in highly anxious patients rendering dental care are still inconclusive.¹⁴

The primary objective of the present study was to compare the dental anxiety levels with and without pre-recorded passive music intervention in subjects with moderate to high anxiety undergoing full-mouth ultrasonic scaling procedure. The secondary objective was to compare dental experience of the subjects with and without pre-recorded passive music intervention at the end of the dental procedure with the help of Visual Analogue Scale (VAS).

Methods

Study setting: A single-centred, single-blind, parallel group, randomised controlled trial (RCT) was done in accordance with the Consolidated Standards of Reporting Trials

(CONSORT) guidelines.

Study population: Subjects seeking dental care for the first time referring to the Department of Periodontology in Yenepoya Dental College, Yenepoya University, Deralakatte, Mangalore, India from October to December 2019 were assessed for dental anxiety level using Modified Dental Anxiety Scale (MDAS)¹⁵ (Table 1). A total of eighty subjects who scored MDAS of 13 to 25 (moderate to high anxiety level) were selected for the proposed study. The MDAS is a validated questionnaire consisting of 5 items with 5-point Likert scale responses for every question. The responses are scored from 1 to 5. Total score ranges from a minimum of 5 to a maximum of 25.

Selection criteria: Written informed consent was received from all the subjects at the beginning of the study. Subjects were enrolled on the basis of these inclusion criteria: A) subjects with good systemic health, B) subjects referring first time for the dental treatment, C) subjects requiring full-mouth ultrasonic scaling procedure in a single appointment, and D) subjects with minimum of 20 permanent teeth. Exclusion criteria included: A) subjects with definite contraindications for the use of ultrasonic device, B) subjects with mental disability, pregnancy, or systemic diseases, C) subjects with impaired hearing, D) subjects requiring multiple appointments for ultrasonic scaling procedure, E) subjects on medication such as steroids, anxiolytics, or antidepressants, and F) subjects with melophobia (fear of music).

Table 1. Pre-treatment questionnaire based on Modified Dental Anxiety Scale (MDAS)¹⁵

Pre-treatment questionnaire									
1- If you were going to your dentist for treatment tomorrow, how would you feel?									
a. Not anxious	<input type="checkbox"/>	b. Slightly anxious	<input type="checkbox"/>	c. Fairly anxious	<input type="checkbox"/>	d. Very anxious	<input type="checkbox"/>	e. Extremely anxious	<input type="checkbox"/>
2- If you were sitting in the waiting room (waiting for treatment), how would you feel?									
a. Not anxious	<input type="checkbox"/>	b. Slightly anxious	<input type="checkbox"/>	c. Fairly anxious	<input type="checkbox"/>	d. Very anxious	<input type="checkbox"/>	e. Extremely anxious	<input type="checkbox"/>
3- If you were about to have a tooth drilled, how would you feel?									
a. Not anxious	<input type="checkbox"/>	b. Slightly anxious	<input type="checkbox"/>	c. Fairly anxious	<input type="checkbox"/>	d. Very anxious	<input type="checkbox"/>	e. Extremely anxious	<input type="checkbox"/>
4- If you were about to have your teeth scaled and polished, how would you feel?									
a. Not anxious	<input type="checkbox"/>	b. Slightly anxious	<input type="checkbox"/>	c. Fairly anxious	<input type="checkbox"/>	d. Very anxious	<input type="checkbox"/>	e. Extremely anxious	<input type="checkbox"/>
5- If you were about to have a local anaesthetic injection in your gum, above an upper back tooth, how would you feel?									
a. Not anxious	<input type="checkbox"/>	b. Slightly anxious	<input type="checkbox"/>	c. Fairly anxious	<input type="checkbox"/>	d. Very anxious	<input type="checkbox"/>	e. Extremely anxious	<input type="checkbox"/>

Ethical clearance: Prior to the conduct of the study, the clinical protocol and informed consent form was reviewed and approved by the Institutional Ethical Committee (YUEC/2019/033).

Study parameters

- Self-reported Dental Anxiety Scale (DAS) using MDAS (Table 1)
- Physiological evaluation of dental anxiety by measurement of pulse rate (PR), systolic blood pressure (SBP), and diastolic blood pressure (DBP)

Study procedure: Total of eighty healthy subjects were randomly assigned into two groups using computer-generated random numbers: Group I (control group) - subjects undergoing ultrasonic scaling procedure without pre-recorded passive music intervention and group II (study group) - subjects undergoing ultrasonic scaling procedure with pre-recorded passive music intervention

All subjects in both groups underwent full-mouth ultrasonic scaling using Piezoelectric Ultrasonic Scalers (Satelec P5 Booster Scaler). Subjects in the study group were listening to pre-recorded instrumental music passively using earphone throughout the ultrasonic scaling procedure for a minimum of 45-minute duration. Subjects in the control group were undergoing the same procedure without any kind of music intervention. Physiological parameters like PR and blood pressure (BP) were recorded twice (before and at the end of the ultrasonic scaling procedure) for all the subjects in both groups.

At the end of the treatment session, subjects of both groups were asked to report their level of dental anxiety experienced during the procedure using VAS¹⁶ from 0 to 10 cm. The ends were marked as “relaxed” and “extremely anxious”.

Data analysis was performed using SPSS software (version 22, IBM Corporation, Armonk, NY, USA). Descriptive analysis was performed for all the study parameters regarding mean \pm standard deviation (SD) for group I and group II.

Repeated measures analysis of variance (ANOVA) was used to test the significant mean difference between pre- and post-measurements of all clinical parameters among group I and group II. Independent samples t-test was applied to analyze VAS inter-group significance. The level of significance was maintained at < 0.05 .

Results

A total of 80 subjects ($n = 80$) in a range of 18-60 years (38.30 ± 9.82 years) were recruited in the present study. Gender-wise sample comprised 23 women and 17 men in control group and 25 women and 15 men in study group. Distribution of study subjects in different parameters (Table 2) used descriptive statistics to calculate mean and SD for parameters like PR (pre and post) and SBP and DBP (pre and post) in the study and control groups.

Table 2. Distribution of study subjects in different parameters

Parameters	Groups	Mean \pm SD
PR (pre) (bpm)	Control	85.69 \pm 10.30
	Study	80.32 \pm 9.56
PR (post) (bpm)	Control	81.89 \pm 10.77
	Study	74.50 \pm 5.25
SBP (pre) (mmHg)	Control	124.79 \pm 10.19
	Study	115.65 \pm 12.56
SBP (post) (mmHg)	Control	126.33 \pm 9.02
	Study	112.67 \pm 9.95
DBP (pre) (mmHg)	Control	80.71 \pm 4.62
	Study	75.02 \pm 9.99
DBP (post) (mmHg)	Control	79.71 \pm 6.05
	Study	73.75 \pm 9.38

PR: Pulse rate; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; SD: Standard deviation; bpm: Beats per minute
Control group: Without music intervention; Study group: With music intervention

ANOVA results for within group's variance (Table 3) showed that our data violated the assumption of sphericity and we found that there was a statistically significant difference between mean scores among pre- and post-test across the groups (Table 4).

Inter-group comparison of VAS showed a significant difference in VAS among study and control groups ($P < 0.05$).

Table 3. Analysis of variance (ANOVA) results for within group's variance

Groups	Factor		F	P
Control and study	PR	Variance assumed	15.266	< 0.001*
Control and study	SBP (pre), DBP (pre)	Variance assumed	10.848	0.001*
Control and study	SBP (post), DBP (post)	Variance assumed	15.292	< 0.001*

PR: Pulse rate; SBP: Systolic blood pressure; DBP: Diastolic blood pressure

Control group: Without music intervention; Study group: With music intervention

*P < 0.05 considered as significant

Post-therapy VAS score was significantly lower in the study group with a mean \pm SD of 2.65 ± 0.37 compared to the control group with a mean \pm SD of 4.92 ± 2.14 .

PR: The mean score of PR (pre) in control group was 85.69 ± 10.30 and PR (post) was 81.89 ± 10.77 and the mean score of PR (pre) in study group was 80.32 ± 9.59 and PR (post) was 74.50 ± 5.25 (Table 1).

ANOVA results for inter-group's variance showed that the mean values of PR (pre and post) were statistically significant for study and control groups. There was a statistically significant difference noted between study and control groups (Table 4).

Table 4. Analysis of variance (ANOVA) results for inter-group's variance

Groups	Factor	F	P
Control and study	PR (pre)	18.309	< 0.001*
	PR (post)		
Control and study	SBP (pre)	15.295	< 0.001*
	SBP (post)		
Control and study	DBP (pre)	14.489	< 0.001*
	DBP (post)		

PR: Pulse rate; SBP: Systolic blood pressure; DBP: Diastolic blood pressure

Control group: Without music intervention; Study group: With music intervention

*P < 0.05 considered as significant

BP: The mean score of SBP (pre) in control group was 124.79 ± 10.19 mmHg and SBP (post) was 126.33 ± 10.19 ; DBP (pre) was 80.71 ± 4.62 mmHg and DBP (post) was 79.71 ± 6.05 mmHg. The SBP (pre) in study group was 85.69 ± 10.30 mmHg and SBP (post) was 81.89 ± 10.77 mmHg; DBP (pre) was 75.02 ± 9.99 mmHg and DBP (post) was 73.75 ± 9.38 mmHg as shown in table 1.

ANOVA results for inter-group's variance showed that the mean values of SBP (pre and post) and DBP (pre and post) were

statistically significant for control and study groups. Mean values of SBP (pre and post) and DBP (pre and post) showed statistically significant reduction in study group as compared to control group (Table 4).

Discussion

Considerable proportion of the population visiting to the dentist suffer from dental anxiety and phobia despite the technological advancement in modern dentistry.¹⁷ Most often, dental anxiety is expressed through restlessness, non-cooperation, and extreme emotional stress leading to bitter dental experience for the patients.¹⁸ Therefore, effective management of such moderate to highly anxious subjects in dental clinic must be an integral part of dental practice. Aim of the present study was to assess the effectiveness of music therapy in self-reported moderately to highly anxious subjects undergoing full-mouth ultrasonic scaling procedure. After analyzing the results obtained during our clinical study, we observed that subjective and objective parameters of anxiety were reduced in all the subjects with or without music intervention. However, a marked reduction in objective parameters of anxiety like PR and BP was observed in subjects who received passive music intervention throughout the treatment procedure than the subjects without music intervention.

This finding is in accordance with a study done by Mejia-Rubalcava et al.¹⁹ who reported marked decrease in all physiologic parameters including PR and BP for subjects receiving music therapy during dental treatment. Studies by Olszewska and Zarow,²⁰ Kim et al.,²¹ and Tran et al.²² also concluded in their research paper that music

therapy reduced dental anxiety remarkably in patients undergoing dental procedure.

Music is a well-known non-pharmacological method of relaxation, as it helps easing out dental anxiety or fear. Listening to pre-recorded music through earphones helps distract and divert patient's attention from stressful stimuli like sound of ultrasonic scaling unit thereby improving dental experience especially for the patients suffering from moderate to severe type of dental anxiety.²³ However, studies by Lahmann et al.²⁴ and Corah²⁵ could not find any significant advantage of music therapy in anxious dental patients when compared with relaxation technique. According to their finding, relaxation suppresses the anxiety-producing situation in dental procedure rather than distraction or masking effect of music as an intervention.

Subjects with dental anxiety score of 13-25 by MDAS were selected to participate in the present study. It is the most reliable, well-validated, and highly-predictive scale used for assessment of dental anxiety trait.²⁶ Cutoff point for high dental fear has been suggested at a score of 19, based on clinical relevance.¹⁵ Reason to select subjects with moderate to severe dental anxiety score was to eliminate bias and assess effectiveness of pre-recorded music application in subjects with relatively high levels of dental apprehension and fear.

Strength of our study lies in selection of subjects with only moderate to high levels of dental anxiety, which definitely allows standardizing the research protocol at the beginning of the study.

In the present study, we also evaluated post-therapy VAS scale of 1-10 as a subjective assessment tool for all the subjects of both groups to report their dental anxiety experience during the treatment period. Inter-group comparison showed that the subjects who received music intervention reported significantly lower scale than the

other group, suggestive of more relaxed dental experience with music intervention during ultrasonic scaling procedure.

The limitation that can be noted for this study was the use of single pre-recorded instrumental music of classical base for all the subjects of music group. There was no choice given to the study participants of music group to select their favourite music while undergoing ultrasonic procedure. Choice of music, hence, may further improve their dental experience which should be evaluated in future research. In the present study, participants were subjected to a non-invasive procedure like ultrasonic scaling. The effectiveness of music therapy in invasive procedures like extractions or periodontal surgery needs to be evaluated in future studies.

Conclusion

Within the limitation of this study, we conclude that music intervention is beneficial and may be used as an effective, noninvasive, and low-cost tool to improve dental experience and quality care for moderately to highly anxious dental subjects undergoing ultrasonic scaling procedures.

In future, further research is warranted to substantiate these results even in invasive dental procedures.

Conflict of Interests

Authors have no conflict of interest.

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