

The effect of classical music during clinical practice on dental students' stress and anxiety during the COVID-19 pandemic

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ABSTRACT

Aims: This study aimed to evaluate the effect of classical music exposure during clinical practice on perceived stress and coronavirus-related anxiety levels among dental students during the transition back to face-to-face education in the COVID-19 pandemic period.

Methods: This prospective single-group clinical study with repeated measures included 46 systemically healthy dental students. Data were collected through face-to-face questionnaires at four different time points: baseline (T1), after patient care in the clinic (T2), before listening to music (T3), and after listening to music (T4). The questionnaire consisted of sociodemographic data, the Perceived Stress Scale-14 (PSS-14), and the Coronavirus Anxiety Scale (CAS). Data were analyzed using paired t-tests or Wilcoxon signed-rank tests, as appropriate.

Results: Mean PSS-14 scores obtained before listening to music (T1, T2, and T3) were similar, whereas a significant decrease was observed after listening to music (T4). No statistically significant differences were found between T1 and T2 or T3 in terms of PSS-14 and CAS scores. However, PSS-14 and CAS scores at T4 were significantly lower compared with T1, T2, and T3 ($p=0.004$, $p=0.001$, $p<0.001$, $p=0.002$, $p=0.007$, and $p<0.001$, respectively).

Conclusion: Listening to classical music during clinical practice was associated with significantly lower perceived stress and coronavirus-related anxiety scores among dental students.

Keywords: Anxiety, COVID-19, dental students, music, stress

INTRODUCTION

The COVID-19 pandemic profoundly disrupted daily routines, behavioral patterns, lifestyle habits, and mental health worldwide.¹ Numerous studies have documented increased levels of depression, anxiety, and stress during different phases of the pandemic.²

Dental education is inherently demanding and has been associated with elevated stress levels among dental students.³ The combination of the COVID-19 pandemic with the already challenging nature of dental education further exacerbated psychological distress among students and healthcare professionals. Aerosol-generating procedures, which are common in dental practice, increased concerns regarding infection risk and contributed to heightened anxiety among dental students. In Türkiye, studies have shown that dentists experienced increased stress levels during the pandemic, particularly related to their clinical working environment and perceived contamination risk.⁴

Anxiety represents another key psychosocial factor influencing mental health and is often characterized by an exaggerated

fear response to perceived threats. To fully understand the psychological impact of the pandemic, emotional states such as stress, fear, and anxiety must be closely examined.⁵ Excessive stress has been shown to impair cognitive functions, including memory retention and recall, processes closely associated with hippocampal activity. Consequently, increased stress levels among dental students may negatively affect concentration, learning efficiency, and clinical performance. The learning environment itself plays a crucial role in students' academic engagement and performance.³

Given the need to identify practical and non-pharmacological strategies that may help mitigate psychological distress in clinical education settings, particularly during periods of heightened stress, alternative supportive interventions warrant further investigation. Therefore, the hypothesis of this study was that exposure to classical music during clinical practice would reduce perceived stress and coronavirus-related anxiety levels among senior dental students during the COVID-19 pandemic.

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METHODS

The study was approved by the Ankara University Faculty of Dentistry Clinical Researches Ethics Committee (Date: 17.11.2021, Decision No: 17/03), in accordance with the Declaration of Helsinki. A total of 46 fifth-year dental students (24 female, 22 male), aged 20 years and older, were included in the study. All participants were systemically healthy, drug-free, and required to perform clinical practice in the Department of Periodontology as part of their undergraduate education at Ankara University.

This study was designed as a prospective, single-group clinical study with repeated measures, aiming to assess the effect of classical music exposure during clinical practice on perceived stress and coronavirus-related anxiety levels among dental students.

As all participants were final-year students with established clinical exposure, the potential stress associated with performing dental procedures on a patient for the first time was minimized.

Data Collection

The study was conducted in late November and December 2021. Ethical approval was obtained on November 17, 2021, and the study commenced shortly thereafter following participant briefing and a brief acclimatization period. During the initial two days, students were given time to acclimate to the setting, received detailed information regarding the study, and provided their informed consent. They were instructed to respond to every item in the questionnaire, ensuring that only one answer was selected per question. The students filled in the questionnaire form used in the study without any intervention by the researcher.

The timeline of the questionnaires is shown in [Figure](#). First, they were asked to complete a questionnaire including socio-demographic data, Perceived Stress Scale-14 (PSS-14), and Coronavirus Anxiety Scale (CAS) before patient admission (T1). The students were asked to complete the same questionnaire at the end of the day after working for 2 days (T2) and in the morning on the 5th day of their study before seeing patients (T3). Students were instructed to listen to the music during clinical practice hours using their personal mobile phones and disposable headphones. In this study, Beethoven's Moonlight Sonata (1 hour 2 minutes), Mozart's Serenata Notturna KV239 (12.50 minutes), and Pachelbel's Canon in D major (6.16 minutes) were used.⁶⁻⁸ It was shared with the students via WhatsApp (Meta, Inc., ABD), and they were allowed to listen to this music on their phones for 1 week (approximately 2 hours per day) during the study period. The same questionnaire was refilled at the end of the week in which music was played (T4).

It was ensured that there were no exams during the period included in the study and no student was absent during the study. PSS-14 and CAS scores at T1, T2, T3, and T4 were calculated and comparisons were made at T time intervals (T1-T4).



Figure. Timeline of the study

Clinical Procedures

During the study period, all students performed non-surgical periodontal treatments as part of their routine undergraduate clinical training in the department of periodontology. These procedures included periodontal examination, oral hygiene instruction and motivation, and supragingival and subgingival scaling and root planing under faculty supervision. No surgical periodontal procedures were performed during the study. Although the clinical procedures were standardized at the procedural level, patient-level standardization was not feasible due to the real-life educational setting. However, all students treated patients within the same clinical unit, followed identical institutional protocols, and were supervised by the same academic staff during the same academic period.

Questionnaire Form

The questionnaire included three sections: socio-demographic information, PSS-14, CAS and presented in the supplementary material.^{9,10} The initial section of the questionnaire gathered socio-demographic data, including the participant's name, gender, age, self-reported medical background, and current medication use. The PSS-14, consisting of 14 items, was utilized to assess individuals' perception of stress in various life situations.^{9,11} Respondents evaluated each statement using a 5-point Likert scale, ranging from "never (0)" to "very often (4)," reflecting their experiences over the previous month. The 7 items with positive statements (Questions 4,5,6,7,9,10 and 13) were reverse scored. Scores on the PSS-14 range from 0 to 56, with higher total scores reflecting greater levels of perceived stress among participants. The Turkish version of the 14-item PSS-14 has undergone validation and reliability testing. According to the scale, a score between 11 and 26 denotes low perceived stress, scores from 27 to 41 suggest moderate stress levels, and scores ranging from 42 to 56 indicate a high degree of perceived stress.¹¹

The CAS, developed by Lee¹⁰ in 2020, was designed to detect potential cases of dysfunctional anxiety specifically related to the COVID-19 pandemic. Its Turkish adaptation, including assessments of validity and reliability, was conducted by Biçer et al.¹² The scale comprises five items and follows a unidimensional Likert-type format, with each item rated on a scale from 1 to 5. Total scores range from a minimum of 5 to a maximum of 25, with scores of 9 or higher indicating a clinically significant level of anxiety.

Blinding

Due to the nature of the intervention (music exposure during clinical practice), participant blinding was not feasible,

as students were aware of listening to music. In addition, investigator blinding was not applicable, as the study relied on self-reported questionnaires. Therefore, no blinding procedures were implemented.

Statistical Analysis

In this study, G*power analysis (Heinrich-Heine-Universität Düsseldorf, Almany) was conducted to determine the appropriate sample size for comparing repeated measures within the same group. The effect size was set at 0.50, with an alpha level of 0.05 and a power (1-β) of 0.90. Based on these parameters, the required sample size was calculated to be 44 participants. To account for potential data loss or incomplete responses, the sample was increased by 10%, resulting in a total of 46 participants being included in the study.

The data collected in this research were analyzed using SPSS version 22 (SPSS Inc., IL, USA). To assess the normality of distribution, the Kolmogorov-Smirnov test was applied. For comparisons between two independent groups, the Mann-Whitney U test was employed when the data did not follow a normal distribution, while the independent samples t-test was used for data that met the assumption of normality. Wilcoxon signed-rank test was used for non-normally distributed data, and a paired T test was used for normally distributed data. Spearman-correlation analysis was used for the relationship between variables. Descriptive statistics were presented as mean±standard deviation. The results were interpreted within a 95% confidence interval, and a p-value of 0.05 was established as the threshold for statistical significance. Parametric or non-parametric tests were selected based on the results of normality analysis.

RESULTS

A total of 46 students were included in the study, of whom 52.2% were female (n=24) and 47.8% were male (n=22). The participants' ages ranged from 21 to 34 years, with a mean age of 24.33±2.49 years.

The mean PSS-14 scores were 30.00±7.20 at T1, 31.11±6.95 at T2, and 31.59±7.59 at T3. Following exposure to classical music, the mean PSS-14 score decreased to 24.83±10.26 at T4 (Table 1). No statistically significant differences were observed among T1, T2, and T3 PSS-14 scores. In contrast, PSS-14 scores at T4 were significantly lower compared with T1, T2, and T3 (p=0.004, p=0.001, and p<0.001, respectively) (Table 2).

Table 1. Evaluation of PSS-14 scores at different time points		
	n	Mean±SD
T1-PSS-14 score	46	30.00±7.20
T2-PSS-14 score	46	31.11±6.95
T3-PSS-14 score	46	31.59±7.59
T4-PSS-14 score	46	24.83±10.26
PSS-14: Perceived Stress Scale-14; SD: Standard deviation, T1: Baseline, T2: After patient care, T3: Before music exposure, T4: After music exposure		

The mean CAS scores were 6.48±2.40 at T1, 6.28±2.44 at T2, and 6.41±2.65 at T3, showing similar values before music exposure. After listening to music, the mean CAS

Table 2. Comparison of PSS-14 scores using paired T test			
	n	t	p
T1 vs T2	46	-1.381	0.174
T1 vs T3	46	-1.639	0.108
T1 vs T4	46	3.012	0.004*
T2 vs T3	46	-0.6	0.552
T2 vs T4	46	0.552	0.001*
T3 vs T4	46	4.058	0.0001*
Statistical analysis: Paired T test was used for pairwise comparisons, *p<0.05 was considered statistically significant, PSS-14: Perceived Stress Scale-14, T1: Baseline, T2: After patient care, T3: Before music exposure, T4: After music exposure			

score decreased to 5.43±1.34 at T4 (Table 3). No significant differences were observed among CAS scores at T1, T2, and T3. However, CAS scores at T4 were significantly lower than those at T1, T2, and T3 (p=0.002, p=0.007, and p=0.003, respectively) (Table 4).

Table 3. Descriptive statistics of CAS scores at different time points		
	n	Mean±SD
T1-CAS score	46	6.48±2.40
T2-CAS score	46	6.28±2.44
T3-CAS score	46	6.41±2.65
T4-CAS score	46	5.43±1.34
CAS: Coronavirus Anxiety Scale, SD: Standard deviation, T1: Baseline, T2: After patient care, T3: Before music exposure, T4: After music exposure		

Table 4. Comparison of CAS scores between time points			
	n	Z	p
T1 vs T2	46	-1.044	0.296
T1 vs T3	46	-0.287	0.774
T1 vs T4	46	-3.112	*0.002
T2 vs T3	46	-0.0373	0.709
T2 vs T4	46	-2.694	*0.007
T3 vs T4	46	-3.013	*0.003
CAS: Coronavirus Anxiety Scale, T1: Baseline, T2: After patient care, T3: Before music exposure, T4: After music exposure, *p<0.05 was considered statistically significant			

When PSS-14 and CAS scores were evaluated according to gender, no statistically significant differences were observed at any time point (Table 5, 6).

Table 5. Comparison of PSS-14 scores according to gender				
Gender		n	Mean±SD	p
T1-PSS-14	Male	22	31.23±8.27	0.248
	Female	24	28.88±6.02	
T2-PSS-14	Male	22	31.14±7.68	0.758
	Female	24	31.08±6.38	
T3-PSS-14	Male	22	31.86±7.98	0.817
	Female	24	31.33±7.37	
T4-PSS-14	Male	22	24.73±10.37	0.965
	Female	24	24.92±10.38	
Mann-Whitney U test, PSS-14: Perceived Stress Scale-14, SD: Standard deviation, T1: Baseline, T2: After patient care, T3: Before music exposure, T4: After music exposure				

Table 6. Evaluation of CAS scores according to gender

Gender		n	Mean±SD	p
T1-CAS score	Male	22	6.00±1.93	0.223
	Female	24	6.92±2.73	
T2-CAS score	Male	22	6.09±2.52	0.347
	Female	24	6.46±2.40	
T3-CAS score	Male	22	6.18±2.20	0.526
	Female	24	6.63±3.05	
T4-CAS score	Male	22	5.50±1.68	0.535
	Female	24	5.38±0.97	
	Male	24	24.92±10.38	

Mann-Whitney U test, CAS: Coronavirus Anxiety Scale, SD: Standard deviation, T1: Baseline, T2: After patient care, T3: Before music exposure, T4: After music exposure

DISCUSSION

Studies have evaluated the impact of music-based interventions in various patient populations. Recent studies published after the COVID-19 pandemic have further highlighted the beneficial effects of music-based interventions on psychological well-being and stress reduction in both clinical and educational settings.¹³⁻¹⁵ However, research focusing specifically on students, particularly within clinical education and authentic clinical training environments, remains relatively limited compared with studies conducted in general university settings.¹⁶ Music has been reported as one of the most frequently used stress-coping strategies among university students during the COVID-19 pandemic.¹⁵ Considering the increased psychological burden experienced during this time, the present study contributes to the literature by evaluating the effect of classical music exposure during routine clinical dental practice under pandemic conditions. Beyond the pandemic context, these findings may also be relevant to other periods characterized by heightened stress and systemic disruption in clinical education, such as curriculum transitions, heavy clinical workload, or institutional crises. This study therefore provides additional evidence regarding the potential role of classical music as a stress management strategy among dental students actively providing patient care during the COVID-19 pandemic.

Elevated anxiety and psychological distress experienced during the COVID-19 pandemic may negatively influence students' perception of self-efficacy and academic functioning.¹⁷ In the present study, final-year dental students with established clinical experience demonstrated moderate levels of perceived stress prior to the intervention, which is consistent with previous reports indicating increased stress levels among dental students during the COVID-19 pandemic.² Anxiety levels observed in the current study were relatively low, a finding that aligns with several earlier investigations.^{18,19} These findings suggest that while dental students experienced considerable stress during the pandemic, anxiety levels may vary depending on individual and contextual factors, including clinical workload and prior clinical exposure.

Music has been widely investigated as a non-pharmacological approach for stress and anxiety reduction.³ Previous studies

comparing different music genres suggest that soft and slow-paced music, particularly classical music, is more effective in alleviating negative emotional states than fast-paced or loud music genres.^{6,20} Despite growing evidence supporting the stress-reducing effects of music, data regarding its application during clinical dental education, especially in real clinical settings involving patient care during pandemic conditions. In this context, music has been recognized as a popular and accessible method for stress reduction among dental students.⁶ Previous studies involving university students have demonstrated that listening to music for relaxation purposes can reduce subjective stress levels and physiological stress markers.²¹ In Türkiye, Kolbaşı et al.²² reported a significant decrease in anxiety levels among university students following music-based interventions. In the present study, stress and anxiety were assessed using validated self-report questionnaires, namely the PSS-14 and CAS, which are commonly used tools in behavioral and educational research, without the inclusion of laboratory-based measurements. Nevertheless, the observed reduction in perceived stress and coronavirus-related anxiety following classical music exposure is consistent with previous research supporting the effectiveness of music in managing psychological distress across diverse populations and methodologies.^{23,24}

Several studies have reported that background music contributes to more positive emotional states during learning activities and reduces stress associated with academic tasks.³ The use of background music has also been shown to reduce stress and enhance learning in preclinical dental laboratory settings. Additionally, research conducted among dental students in Iran demonstrated that background music could reduce anxiety and depression.²⁵ However, contradictory findings have also been reported. Algailani et al.²⁶ found that music did not significantly reduce perceived stress levels or improve academic performance among dental students in a preclinical laboratory setting.²⁶ Similarly, recent systematic reviews have suggested that background music may negatively affect performance in cognitively demanding tasks compared with silence.²⁷ These discrepancies highlight the importance of contextual factors, indicating that the effects of music may depend on the learning environment, the type of music, and individual preferences. From an educational perspective, this suggests that music-based interventions may be particularly beneficial in high-stress clinical settings, where cognitive and emotional demands are increased, rather than in low-stress or preclinical environments.

It has been suggested that music may alleviate stress and anxiety by stimulating psychophysiological responses mediated through the limbic system, thereby promoting relaxation and facilitating the release of endorphins and enkephalins.²⁸ In the present study, classical compositions by Mozart, Beethoven, and Pachelbel were selected based on their documented calming effects. Previous studies investigating the impact of classical music on stress and anxiety frequently utilized compositions by Mozart and Beethoven, reporting significant reductions in psychological distress.^{6,7} Studies employing relaxing classical music, including Pachelbel's

Canon in D major, have demonstrated beneficial effects on relaxation and anxiety reduction.^{8,18}

Different music genres have been shown to exert distinct effects on stress and anxiety levels. Individuals exposed to classical or self-selected relaxing music tend to report lower anxiety levels compared with those exposed to more intense music genres, such as heavy metal.²⁹ In a study comparing classical music, heavy metal music, and self-selected music following exposure to a stressor, participants who listened to classical or relaxing music exhibited greater reductions in anxiety.³⁰ These findings support the conclusion that classical music may serve as an effective intervention for reducing stress and anxiety in demanding clinical education environments. Such interventions may represent a simple, low-cost, and easily implementable strategy to support student well-being during periods of intense stress or crisis in dental education.

Limitations

The present study evaluated the short-term effects of classical music exposure; therefore, the findings reflect the immediate impact of music on stress and anxiety levels. A limitation of the study is the inability to assess long-term effects due to the shortened education period during the pandemic. Another limitation is the absence of biological stress markers, as saliva collection and laboratory analyses could not be performed due to infection control concerns. In addition, patient-level standardization was not possible, as the study was conducted in a real-life clinical education environment. However, procedural consistency was ensured by including final-year dental students who performed identical non-surgical periodontal treatments under uniform clinical protocols and academic supervision. Finally, the single-group study design and the lack of blinding inherent to behavioral interventions should be considered when interpreting the findings. Future studies incorporating longer follow-up periods, control groups, and objective physiological measurements may provide a more comprehensive understanding of the role of music in stress and anxiety management within dental education.

CONCLUSION

Following the transition from remote learning to face-to-face education during the COVID-19 pandemic, final-year dental students engaged in clinical practice were found to experience moderate levels of perceived stress and low levels of coronavirus-related anxiety. The findings of this study support the hypothesis that exposure to classical music during patient care can reduce both perceived stress and coronavirus anxiety levels among senior dental students. Although the study was conducted within a pandemic context, these findings suggest that music-based interventions may have broader relevance for dental education during periods of heightened stress, crisis, or systemic disruption. Accordingly, listening to music during clinical practice may be considered an effective and easily applicable strategy to promote psychological well-being in dental education under challenging training conditions. Given the demanding nature of dental training, supportive approaches such as stress management programs, relaxation techniques, and access to psychological counseling

may further contribute to improving students' mental well-being, particularly during periods of increased academic or clinical pressure. Incorporating simple, low-cost, and non-invasive interventions such as music into clinical education environments may help foster a more supportive and resilient learning atmosphere.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was approved by the Ankara University Faculty of Dentistry Clinical Researches Ethics Committee (Date: 17.11.2021, Decision No: 17/03)

Informed Consent

Written informed consent was obtained from all individual participants prior to their inclusion in the study. Participants were fully informed about the study's aims, procedures, potential risks and benefits, and their rights-including the right to withdraw at any time without consequence. All participants voluntarily signed a written informed consent form.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

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Author Contributions

Concept: SY, GE; Design: SY, GE; Supervision/Control: SY, GE; Data Collection and/or Processing: SY, GE; Analysis and/or Interpretation: SY, GE; Literature Review: SY, GE; Article Writing: SY; Critical Review: SY, GE.

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