ORIGINAL ARTICLE
DOI: 10.5152/EssentDent.2026.25040

The Effect of Clinical Education on Dental Students' Stress and Anxiety Levels

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Cite this article as: Eken Ş, Ayyıldız BG, Çetiner FD, Sever A, Çörekçi AU. The effect of clinical education on dental students' stress and anxiety levels. *Essent Dent.* 2026, 5, 0040, doi: 10.5152/EssentDent.2026.25040.

Abstract

Background: This study aimed to evaluate the levels of stress and anxiety experienced by fourth- and final-year dental undergraduate students during their clinical training years.

Methods: This cross-sectional study included 110 students, including 60 in their fourth-year and 50 in their final-year, between 2022 and 2023. Demographic characteristics were collected from all participants. The State-Trait Anxiety Inventory and the Pagana Clinical Stress Questionnaire were administered at three points: the beginning (T0) and the end (T1) of the fourth-year of clinical training and the beginning (T0) of the final-year of clinical training.

Results: The threat subscale scores of the Pagana Clinical Stress Questionnaire were significantly higher at the beginning of the final-year (T0) (12.44 ± 5.39) compared to the end of the fourth-year (T1) (10.47 ± 5.00) ($P = .049$). Additionally, State Anxiety Inventory-1 scores showed a statistically significant increase from the beginning (T0) (39.23 ± 5.39) to the end (T1) (41.48 ± 5.07) of the fourth-year ($P = .030$).

Conclusion: The findings indicated that dental students experience mild to moderate levels of stress and anxiety during clinical training, with notable increases during key transitional periods. The findings, along with previous studies conducted on the Turkish population, underline the need for targeted stress management interventions and supportive educational strategies within dental curricula to foster psychological well-being and academic confidence among students. Implementing such strategies could foster a more supportive learning environment, improve student well-being, and ultimately enhance clinical performance and professional development.

Keywords Anxiety, clinical training, dental education, dental students, stress

What is already known on this topic?

- *Dental students often experience stress and anxiety during clinical training, particularly during transitional periods such as entering new academic years.*

What this study adds on this topic?

- *This study identifies a statistically significant increase in both clinical stress and state anxiety during key transition points, especially from the end of the fourth-year to the beginning of the final-year, highlighting specific periods of vulnerability.*
- *The findings support the need to incorporate structured stress management and psychological support strategies into dental curricula to enhance students' mental well-being and clinical performance.*

INTRODUCTION

Anxiety is defined as a state of worry, nervousness, or unease regarding uncertain outcomes, whereas stress refers to difficulties and distress that affect personal and professional life. High levels of stress have been correlated with depression, whereas moderate to low levels are associated with anxiety.[1]

Studies conducted across various countries consistently reveal that dental students frequently experience depression, anxiety, and stress throughout their education,

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Received: March 14, 2025
Revision Requested: April 25, 2025
Last Revision Received: June 3, 2025
Accepted: October 13, 2025
Publication Date: August 10, 2026

regardless of the curriculum.[2] Research on the causes of stress among dental students has indicated that stress is influenced by various factors, including workload, academic pressures, clinical demands, dealing with anxious patients, managing complex treatments, conflicts with patients, time pressure, interpersonal conflicts, and critical feedback from instructors.[3] The dental education program includes a mandatory curriculum that progresses from preclinical to clinical training.[4,5] Dental students must develop a range of competencies, including academic knowledge, clinical skills, and interpersonal skills, to meet the professional requirements after graduation.[3]

Clinical training is a crucial component of dental education, providing numerous learning opportunities.[4] During clinical training, students must complete theoretical and practical education, including examinations and clinical requirements for graduation. Additionally, students are required to find patients, assume responsibility for their care, and manage permanent dental procedures.[2,6] Throughout their clinical training, students interact directly with patients who often experience pain and fear during dental examinations and treatments. These factors collectively contribute to significant levels of stress among dental students, leading to psychological issues such as anxiety, depression, and stress.[6] Early research from the 1990s and 2000s highlighted academic workload, clinical demands, and faculty expectations as key stressors in dental education, particularly during the transition to clinical training.[7,8] This period was associated with increased stress due to patient care responsibilities and performance pressure.[9] Exams, coursework load, limited vacation time, and clinic requirements were consistently reported as major sources of stress, with peak levels observed in the fourth-year.[10,11] Anxiety scores were also notably higher during the early and final years of education.[12] To improve the educational environment at the Faculty of Dentistry, it is essential to assess stress levels and identify the underlying factors contributing to stress among dental students.[13]

Although many studies have examined academic and clinical stresses in dental students, few studies have focused specifically on the stress experienced during the transition to clinical education in dentistry.[14] One study reported that the most common stress-related factors for students transitioning from the preclinical to the clinical phase were the responsibilities and demands associated with caring for real patients. Most students reported experiencing physical symptoms of stress during this period, such as tachycardia, dizziness, headache, and muscle tension.[15] Additionally, students' ethnicity and cultural differences play a significant role in determining stress levels.[16]

Research has shown that stress levels in dental students progressively increase during their clinical training years, surpassing the levels experienced during preclinical training.[15,17] Alamoush et al[17] evaluated stress levels among fourth- and fifth-year clinical undergraduate students at the University of Jordan and found that fifth-year students had higher stress scores. Although substantial research has been conducted on stress among dental students,[1,4,5,13] limited literature specifically addressing Turkish dental students. To date, stress levels and their sources among undergraduate dental students in Türkiye have been investigated throughout their education.[2,18,19] Previous studies have consistently reported that stress is higher during clinical training compared to the preclinical years, primarily due to workload, faculty and administration factors, and performance pressure.[18,19] However, differences in stress levels across clinical training years have not been adequately evaluated.

Moreover, dental education in Türkiye is shaped by unique academic and cultural expectations, including a highly competitive entrance system, rigid curricular structure, and close student–instructor dynamics. These factors may influence how Turkish students perceive and cope with clinical responsibilities and stress, underscoring the need for localized research to inform supportive educational strategies.[18]

This study aimed to assess the levels of stress and anxiety experienced by fourth- and final-year dental undergraduate students during their clinical training, focusing specifically on a cohort from the Turkish population. The null hypothesis posited that the stress and anxiety levels of undergraduate dental students would increase as they progressed in their clinical training years.

MATERIALS AND METHODS

Study Design

This study was approved by the İzmir Demokrasi University Non-invasive Clinical Research Ethics Committee on 26.04.2023 with decision number 2023/05-01 and was conducted in accordance with the revised principles of the Helsinki Declaration (2013). Before participation, all students received both written and verbal information about the purpose of the study, their rights as participants, and the voluntary nature of participation. Written informed consent was obtained from all participants. The study ensured full anonymity and confidentiality of participant data, with no identifiable information being collected or stored.

Participants

This cross-sectional study was conducted among fourth- and final-year clinical training students at İzmir Demokrasi University Faculty of Dentistry, a public institution in Türkiye, during the academic year from September 2022 to June 2023. Data collection was carried out at two critical points during the clinical training period. The initial phase commenced in September 2022, coinciding with the participants' first interactions with patients. The final phase of data collection occurred in June 2023, when participants were

now interacting with patients across clinical settings. These time points were chosen to reflect the progression of students' clinical responsibilities and to capture possible changes in stress and anxiety levels throughout the academic year. The study included dental students aged 18 years or older, who had no communication difficulties and voluntarily participated in the questionnaires. A total of 110 students participated, including 60 out of 76 fourth-year clinical training students (78.94%) and 50 out of 52 final-year clinical training students (96.15%) enrolled in the faculty.

Study Groups

Fourth-year students completed the questionnaires on the first day of clinical training at the beginning (fourth-year [T0]) and on the last day of clinical training at the end (fourth-year [T1]). Final-year students completed the questionnaires only on the first day of clinical training at the beginning (final-year [T0]). All data were collected anonymously.

Data Collection Methods

This study used three main instruments for data collection: Demographic Information Form (DIF),[2] Pagana Clinical Stress Questionnaire (PCSQ)[20] to assess stress levels, and State–Trait Anxiety Inventory (STAI)[21] to assess anxiety levels. These forms collectively included 71 questions (Supplementary Material).

Demographic Information Form

The DIF was designed to collect demographic data from the students, including variables such as age, gender, years of study, chronic medical conditions, medication intake, place of residence, and birthplace.[2] According to 2021 Turkish Statistical Institute data,[22] annual family income was categorized as low (less than 37 400 TL), moderate (between 37 400 and 49 297 TL), or high (above 49 297 TL). Other demographic variables collected included the number of siblings, voluntary choice of dentistry as a career, and scholarship status.[17]

Pagana Clinical Stress Questionnaire

The PCSQ, developed by Pagana[23] in 1989, is a Likert-type scale of open-ended questionnaires designed to assess stress levels that may arise during clinical experiences. The PCSQ includes four scales that measure emotional states related to threat, challenge, harm, and benefit. The threat scale consists of six subscales: upset, worried, anxious, overwhelmed, apprehensive, and fearful. The challenge scale includes seven subscales: stimulated, exhilarated, hopeful, pleased, eager, excited, and happy. The harm scale includes subscales such as angry, sad, guilty, disgusted, and disappointed, whereas the benefit scale includes two subscales: relieved and confident. Participants are required to rate each subscale on a 5-point Likert scale (0 = not at all, 1 = slightly, 2 = moderately, 3 = very, and 4 = extremely). The total score for each scale ranges from 0 to 80, with higher scores indicating higher levels of stress.[23]

State-Trait Anxiety Inventory

The STAI developed by Spielberger et al[21] in 1970 is a widely used self-reported questionnaire for assessing anxiety levels. The Turkish version of STAI was validated and tested for reliability by Öner and Le Comte[24] in 1985. The STAI consists of 2 scales: the STAI-1, which measures state anxiety (the participant's current emotional state in a specific situation), and the STAI-2, which measures trait anxiety (the participant's general emotional condition, regardless of the situation). The STAI-1 requires participants to select from the following options: 1 = not at all, 2 = somewhat, 3 = moderately so, and 4 = very much so, reflecting the severity of their feelings, thoughts, and actions. The STAI-2 requires participants to indicate the frequency of their expressed feelings, thoughts, and behaviors using the following options: 1 = rarely, 2 = sometimes, 3 = often, or 4 = almost always. Both scales contain direct and reverse expressions, with reverse expressions indicating positive emotions and direct expressions indicating negative emotions. For reverse expressions, the scoring is reversed (e.g., 1 becomes 4, and 4 becomes 1). For example, the statement "I feel uneasy" is a direct expression, whereas "I feel calm" is a reverse expression. A score of 4 for "I feel uneasy" and a score of 1 for "I feel calm" would indicate a high level of anxiety. In the STAI-1, items 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20 are reverse expressions. In the STAI-2, items 1, 6, 7, 10, 13, 16, and 19 are reverse expressions.[21]

Scoring was performed manually by subtracting the total score of reverse expressions from the total score of direct expressions, with a constant value (50 for the STAI-1 and 35 for the STAI-2) added to obtain the final score. Anxiety levels were categorized as follows:[25] 20-40 = low anxiety, 41-60 = moderate anxiety, and 61-80 = high anxiety.

Statistical Methods

The assumption of normality was assessed using the Shapiro–Wilk test. Descriptive statistics, including the number, percentage, mean, standard deviation, and minimum and maximum values, were calculated. The reliability of the PCSQ and STAI questionnaires was evaluated using Cronbach's α coefficients. For comparisons between two independent groups with normally distributed data, the independent sample *t*-test and One-Way ANOVA were used; the Mann–Whitney *U*-test was used when the normality assumption was not met. The dependent sample *t*-test was used to compare two normally distributed dependent groups, whereas the Wilcoxon Signed-Rank test was used when the assumption was not met. The Pearson correlation coefficient was used to evaluate correlations between continuous variables with normal distribution, and the Spearman correlation coefficient was used for non-normally distributed data. All statistical analyses were conducted using the SPSS Statistics for Windows, Version 23.0 software (IBM Corp., Armonk, New York).

RESULTS

The study sample consisted of 110 undergraduate dental students, with 60 fourth-year students and 50 final-year students enrolled at İzmir Demokrasi University Faculty of Dentistry during the 2022-2023 academic year. The detailed results obtained from data analysis are presented below.

Demographic Data

The mean age of fourth-year students (24 females, 36 males) was 22 ± 1.3 years, whereas the mean age of final-year students (27 females, 23 males) was 23 ± 0.8 years. Additionally, the majority of fourth-year students (58.3%) and final-year students (76%) indicated that "yes" as a voluntary choice of dentistry as a career (Figure 1 and Table 1). A comparison of demographic data with questionnaire scores revealed that STAI-2 scores were higher in single children than in those with three siblings in the fourth year ($P = .04$; Table 1). In the final year, female students had higher PCSQ scores than male students, whereas STAI-1 scores were higher among students with chronic medical conditions and those taking medications ($P = .03$ and $P = .04$; Table 1).

Stress and Anxiety Level Findings by Classes

Şendir and Acaroğlu[20] conducted a study in 2008 to assess the validity and reliability of the PCSQ in Türkiye, reporting a mean Cronbach's α coefficient of 0.70 (0.66-0.72). In this study, the mean Cronbach's α coefficients were 0.82, 0.75, and 0.80 at fourth-year (T0) and (T1) clinical training, and final-year (T0) clinical training, respectively.

The Cronbach's α coefficients for the STAI-1 ranged from 0.94 to 0.96, whereas those for the STAI-2 ranged from 0.83-0.87.[24] In this study, the mean values of Cronbach's α coefficients for the STAI-1 were 0.46, 0.42, and 0.61 at fourth-year (T0) and (T1) clinical training, and final-year (T0) clinical training, respectively, whereas the coefficients for the STAI-2 were 0.79, 0.63, and 0.63, respectively.

The mean values of STAI-1 at fourth-year (T0) and (T1) clinical training, and final-year (T0) clinical training, were 39.23, 41.48, and 40.42, respectively. Similarly, the mean values of STAI-2 were 45.20, 46.25, and 46.60, respectively (Figure 2 and Tables 2-4). For the PCSQ, the mean values at fourth-year (T0) and fourth-year (T1) clinical training, and final-year (T0) clinical training, were 34.04, 35.05, and 36.54, respectively (Figure 3 and Tables 2-4).

No statistically significant differences were found in total STAI-1, STAI-2, and PCSQ scores, including subscales, between fourth-year (T0) and final-year (T0) clinical training periods ($P > .05$; Table 2). However, when comparing STAI-1, STAI-2, and PCSQ and its subscales between the total scores fourth-year (T1) clinical training and final-year (T0) clinical training, a statistically significant difference was found only in the total scores of the threat subscale of PCSQ ($P = .04$; Table 3). No statistically significant differences were detected in the total scores of STAI-1, STAI-2, PCSQ, or the challenge, harm, and benefit subscales of the PCSQ between the two periods ($P > .05$; Table 3). Notably, the total scores of final-year (T0) clinical training students were higher than those of fourth-year (T1) clinical training students (Table 3).

Further analysis of descriptive statistics regarding students' total values of STAI-1, STAI-2, and PCSQ and its subscales between fourth-year (T0) and fourth-year (T1) clinical training revealed a statistically significant difference in total values of STAI-1 between the two periods ($P = .03$; Table 4). Specifically, the total values of fourth-year (T1) clinical training students were higher than those of fourth-year (T0) clinical training students. However, no statistically significant differences were observed in the total values of STAI-2, PCSQ, and its subscales between the two periods ($P > .05$; Table 4).

Correlations Between the Stress and Anxiety Questionnaires

In the evaluation of the relationships among the questionnaires used in the study during the fourth-year, a statistically significant, positive, and moderate correlation was observed between the threat subscale of PCSQ and STAI-2, with a correlation coefficient of 0.33 ($P = .009$; Table 5).

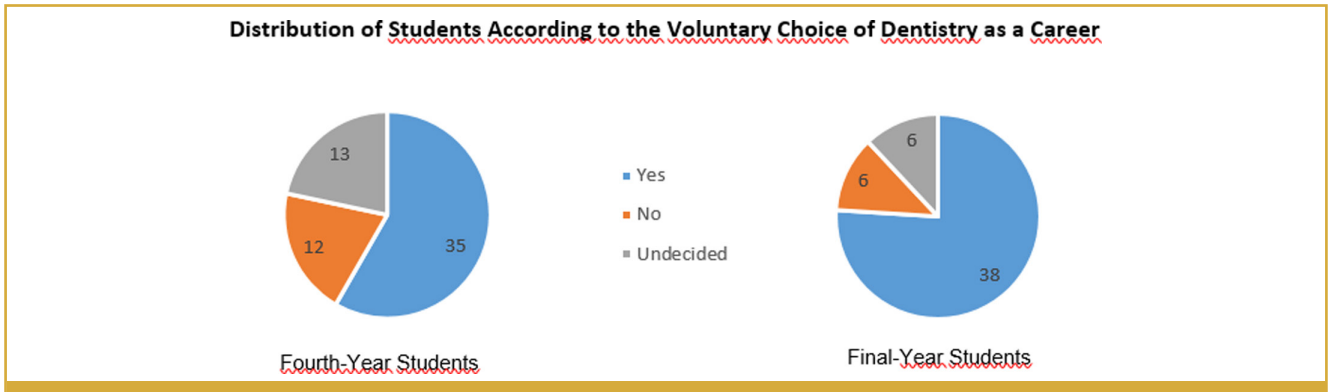


Figure 1. Distribution of the voluntary choice of dentistry as a career among fourth- and final-year students.

Table 1. Comparison Between Demographic Variables and Questionnaires

		Fourth-Year Students					Final-Year Students				
		n	%	STAI-1	STAI-2	PCSQ	n	%	STAI-1	STAI-2	PCSQ
Gender	Male	36	60.0	**0.05	**0.14	**0.79	27	54.0	**0.09	**0.17	*0.03
	Female	24	40.0				23	46.0			
Place of residence	Dorm	18	30.5	0.29	0.72	0.75	10	20.0	0.75	0.16	0.18
	Home alone	8	13.6				4	8.0			
	Home with a friend	19	32.2				25	50.0			
	Home with family	14	23.7				11	22.0			
Birthplace	Province	42	71.2	0.55	0.26	0.82	36	72.0	0.75	0.27	0.89
	District	15	25.4				11	22.0			
	Village-Town	2	3.4				3	6.0			
Chronic medical conditions	Present	4	6.7	**0.55	**0.38	**0.38	2	4.0	*0.04	**0.45	**0.95
	Not present	56	93.3				48	96.0			
Medication intake	Present	3	5.0	**0.86	**0.22	**0.58	5	10.2	*0.006	**0.96	**0.189
	Not present	57	95.0				44	89.8			
Annual family income	Low level	8	13.8	0.29	0.72	0.74	2	4.1	0.09	0.72	0.79
	Moderate level	46	79.3				44	89.8			
	High level	4	6.9				3	6.1			
Number of siblings	Only child	11	18.6	0.62	*0.04	0.47	5	10.0	0.89	0.78	0.61
	Two	21	35.6				21	42.0			
	Three	13	22.0				13	26.0			
	Four and more	14	23.7				11	22.0			
Voluntary choice of dentistry as a career	Yes	35	58.3	0.27	0.26	0.05	38	76.0	0.65	0.45	0.13
	No	12	20.0				6	12.0			
	Undecided	13	21.7				6	12.0			
Scholarship status	Yes	26	44.1	**0.98	**0.23	**0.36	22	44.0	**0.49	**0.84	**0.30
	No	33	55.9				28	56.0			

%, percentage for the year; PCSQ, Pagana Clinical Stress Questionnaire; STAI-1, State Anxiety Inventory; STAI-2, Trait Anxiety Inventory.
*$P < .05$.
**Independent sample *t*-test, one-way ANOVA test.

Additionally, statistically significant, positive-negative, and low-level correlations were identified between the challenge subscale of PCSQ and STAI-1, with correlation coefficients of 0.28 ($P = .03$; Table 5). A statistically significant, positive, and low-level relationship was found between the PCSQ and the STAI-1, with a correlation coefficient of 0.25 ($P = .04$; Table 5). Furthermore, a statistically significant, positive, and moderate relationship was observed between the PCSQ and STAI-2, with a correlation coefficient of 0.39 ($P = .007$; Table 5).

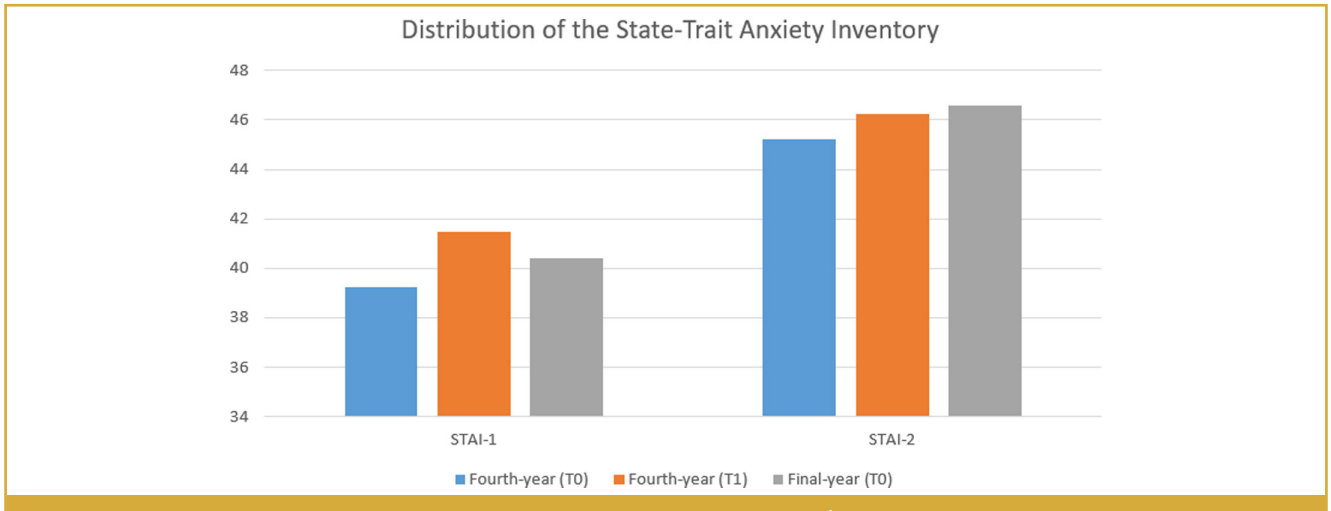


Figure 2. Distribution of State–Trait Anxiety Inventory scores across years/periods.

Table 2. Distribution and Comparison of Results for Fourth Year (T0) and Final Year (T0)

	Years	Min.	Max.	Mean ± SD	*P*
STAI-1	Fourth-year (T0)	30.00	53.00	39.23 ± 5.39	.25
	Final-year (T0)	30.00	53.00	40.42 ± 5.49	
STAI-2	Fourth-year (T0)	30.00†	67.00†	45.20 ± 7.62†	.12†
	Final-year (T0)	32.00†	63.00†	46.60 ± 6.11†	
PCSQ's threat subscale	Fourth-year (T0)	0.00	22.00	11.43 ± 5.82	.35
	Final year (T0)	2.00	23.00	12.44 ± 5.39	
PCSQ's challenge subscale	Fourth-year (T0)	0.00	25.00	12.75 ± 5.49	.08
	Final-year (T0)	6.00	26.00	14.52 ± 5.22	
PCSQ's harm subscale	Fourth-year (T0)	0.00†	20.00†	6.93 ± 5.57†	.90†
	Final-year (T0)	0.00†	18.00†	6.62 ± 4.92†	
PCSQ's benefit subscale	Fourth-year (T0)	0.00†	8.00†	2.95 ± 2.24†	.97†
	Final-year (T0)	0.00†	7.00†	2.96 ± 2.00†	
Total scores of PCSQ	Fourth-year (T0)	0.00	61.00	34.07 ± 12.54	.28
	Final-year (T0)	11.00	59.00	36.54 ± 11.05	

PCSQ, Pagana Clinical Stress Questionnaire; STAI-1, State Anxiety Inventory; STAI-2, Trait Anxiety Inventory.
†Mann–Whitney *U*-test, Independent sample *t*-test.
*$P < .05$.

Table 3. Distribution and Comparison of Results for Fourth-Year (T1) and Final Year (T0)

	Years	Min.	Max.	Mean ± SD	*P*
STAI-1	Fourth-year (T1)	31.00†	52.00†	41.48 ± 5.07†	.26†
	Final-year (T0)	30.00†	53.00†	40.42 ± 5.49†	
STAI-2	Fourth-year (T1)	35.00†	58.00†	46.25 ± 5.94†	.58†
	Final-year (T0)	32.00†	63.00†	46.60 ± 6.11†	
PCSQ's threat subscale	Fourth-year (T1)	0.00	22.00	10.47 ± 5.00	.04*
	Final-year (T0)	2.00	23.00	12.44 ± 5.39	
PCSQ's challenge subscale	Fourth-year (T1)	0.00	25.00	14.15 ± 6.36	.74
	Final-year (T0)	6.00	26.00	14.52 ± 5.22	
PCSQ's harm subscale	Fourth-year (T1)	0.00†	20.00†	6.90 ± 4.88†	.76†
	Final-year (T0)	0.00†	18.00†	6.62 ± 4.92†	
PCSQ's benefit subscale	Fourth-year (T1)	0.00†	8.00†	3.53 ± 2.34†	.24†
	Final-year (T0)	0.00†	7.00†	2.96 ± 2.00†	
Total scores of PCSQ	Fourth-year (T1)	13.00	64.00	35.05 ± 10.76	.47
	Final-year (T0)	11.00	59.00	36.54 ± 11.05	

PCSQ, Pagana Clinical Stress Questionnaire; STAI-1, State Anxiety Inventory; STAI-2, Trait Anxiety Inventory.
†Mann–Whitney *U*-test, Independent sample *t*-test.
*$P < .05$.

Similarly, in the evaluation of the relationships between the questionnaires during the final-year, statistically significant, positive, and moderate correlations were found between the threat subscale of PCSQ and STAI-2, with a correlation coefficient of 0.49 ($P = .00$; Table 5). Likewise, a statistically significant, positive, and moderate relationship was observed between the challenge subscale of PCSQ and STAI-1, with a correlation coefficient of 0.30 ($P = .03$; Table 5). Furthermore, statistically significant, positive, and moderate-to-high-level correlations were observed between the PCSQ with STAI-1 and STAI-2, with correlation coefficients of 0.38 and 0.37, respectively ($P = .006$ and $P = .007$; Table 5).

For all students (fourth- and final-year), a statistically significant, positive, and low correlation was observed between gender and STAI-1, with a correlation coefficient of 0.26 ($P = .005$; Table 6). In addition, statistically significant, negative, and low-level correlations were observed between PCSQ and voluntary choice of dentistry as a career, with a correlation coefficient of −0.27 ($P = .004$; Table 6).

DISCUSSION

This cross-sectional study investigated the levels of stress and anxiety among fourth- and final-year dental undergraduate students in Türkiye during their clinical training, within a cohort from the Turkish population. This study is the first to evaluate the stress and anxiety levels of Turkish dental students and how these levels vary across different years and periods of clinical training. The findings revealed that the

Table 4. Distribution and Comparison of Results for Fourth-Year (T0) and Fourth-Year (T1)

	Fourth-Year	Min.	Max.	Mean ± SD	*P*
STAI-1	T0	30.00†	53.00†	39.23 ± 5.39†	.03*
	T1	31.00†	52.00†	41.48 ± 5.07†	
STAI-2	T0	30.00†	67.00†	45.20 ± 7.62†	.34†
	T1	35.00†	58.00†	46.25 ± 5.94†	
PCSQ's threat subscale	T0	0.00	22.00	11.43 ± 5.82	.38
	T1	0.00	22.00	10.47 ± 5.00	
PCSQ's challenge subscale	T0	0.00	25.00	12.75 ± 5.49	.15
	T1	0.00	25.00	14.15 ± 6.36	
PCSQ's harm subscale	T0	0.00†	20.00†	6.93 ± 5.57†	.97†
	T1	0.00†	20.00†	6.90 ± 4.88†	
PCSQ's benefit subscale	T0	0.00†	8.00†	2.95 ± 2.24†	.16†
	T1	0.00†	8.00†	3.53 ± 2.34†	
Total scores of PCSQ	T0	0.00	61.00	34.07 ± 12.54	.63
	T1	13.00	64.00	35.05 ± 10.76	

PCSQ, Pagana Clinical Stress Questionnaire; STAI-1, State Anxiety Inventory; STAI-2, Trait Anxiety Inventory.
†Wilcoxon signed-rank test, Dependent sample *t*-test.
**P* < .05.

threat subscale of the PCSQ was significantly higher in final-year (T0) compared to the fourth-year (T1) in clinical training. Anxiety and stress levels were similar between fourth-year (T0) and final-year (T0) students, while the STAI-1 score was higher in fourth-year students during clinical training at T1 compared to T0. Thus, the hypothesis that stress and anxiety levels would increase as students progressed in their clinical training was rejected. Most students reported low to moderate levels of stress and anxiety, a finding that contrasts with previous studies, which commonly reported high levels of psychological distress during clinical training.[26,27]

According to the guidelines set by the Council of Higher Education in Türkiye, the undergraduate dental curriculum consists of clinical training during the third, fourth, and final years of the five-year program, with the third year primarily focusing on clinical observation. The dental curriculum combines theoretical education and practical clinical training, during which students frequently encounter stressful situations.[4] Despite this, there is a limited body of literature addressing the stress levels of dental students.[5] To the authors' knowledge, there are only three studies on the stress and the psychological distress levels of dental students in Türkiye.[2,18,19]

Cultural and educational contexts significantly influence how dental students perceive and experience stress and anxiety.[16,27] Cross-national studies have shown notable differences in stress levels, often shaped by factors such as institutional structures, academic pressures, and broader environmental conditions.[27] For instance, students in Ireland and England reported high stress linked to study obligations and clinical responsibilities,[6] whereas those in Poland and Brazil experienced increased anxiety upon progressing to the clinical

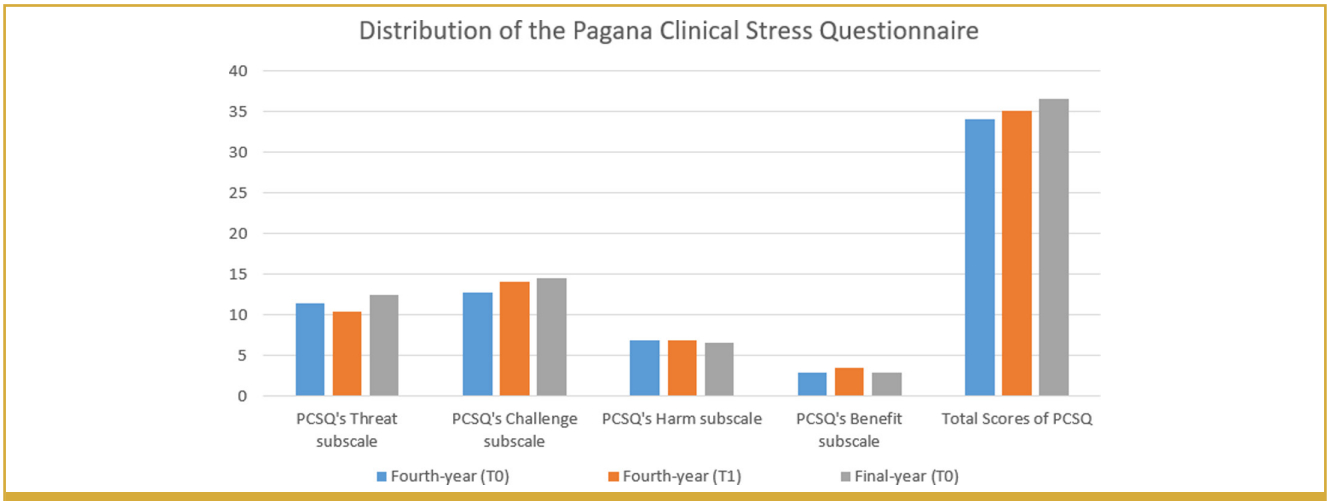


Figure 3. Distribution of the Pagana Clinical Stress Questionnaire scores across years/periods.

Table 5. Correlations Between the Questionnaires for Fourth-Year (T0) and Final Year (T0)

		Fourth-Year (T0)					Final-Year (T0)				
		STAI-2	PCSQ's Threat Subscale	PCSQ's Challenge Subscale	PCSQ's Harm Subscale	PCSQ's Benefit Subscale	PCSQ	STAI-2	PCSQ's Threat Subscale	PCSQ's Challenge Subscale	PCSQ's Harm Subscale	PCSQ's Benefit Subscale	PCSQ
STAI-1	*r*	0.09	−0.05	0.28	0.04	0.40	0.25	0.17	0.17	0.30	0.15	0.14	0.38
	P	.501	.66	.03*	.71	.001*	.04*	.23	.23	.03*	.28	.32	.006*
STAI-2	*r*	1.000	0.33	0.19	0.12	0.17	0.39	1.00	0.49	0.11	0.14	0.04	0.37
	P		.009*	.12	.34	.19	.002*		.00*	.41	.30	.74	.007*
PCSQ's threat subscale	*r*		1.00	−0.15⁂	0.70	−0.21	0.65⁂		1.00	0.02⁂	0.64	−0.007	0.78⁂
	P			.22	.00*	.10	.00*			.89	.00*	.96	.00*
PCSQ's challenge subscale	*r*			1.00	−0.22	0.73	0.56⁂			1.00	−0.15	0.66	0.53⁂
	P				.08	.00*	.00*				.28	.00*	.00*
PCSQ's harm subscale	*r*				1.00	−0.21	0.55				1.00	−0.15	0.64
	P					.10	.00*					.29	.00*
PCSQ's benefit subscale	*r*					1.00	0.45					1.00	0.36
	P						.00*						.009*

PCSQ, Pagana Clinical Stress Questionnaire; STAI-1, State Anxiety Inventory; STAI-2, Trait Anxiety Inventory.
⁂Pearson correlations, Spearman correlations.
*$P < .05$.

Table 6. Correlations Between Demographic Variables and Questionnaires for All Students

		STAI-1	STAI-2	PCSQ
Gender	*r*	0.26**	−0.01	0.11
	P	.005†	.87	.26
Place of residence	*r*	−0.08	−0.04	−0.14
	P	.4	.62	.13
Birthplace	*r*	−0.02	−0.15	−0.04
	P	.84	.11	.64
Chronic medical conditions	*r*	−0.07	−0.11	0.07
	P	.45	.24	.46
Medication intake	*r*	−0.19*	−0.07	−0.05
	P	.04	.45	.56
Annual family income	*r*	0.19*	−0.08	−0.08
	P	.04	.37	.42
Number of siblings	*r*	−0.01	−0.21*	−0.02
	P	.86	.02	.82
Voluntary choice of dentistry	*r*	−0.12	−0.02	−0.27**
	P	.19	.84	.004†
Scholarship status	*r*	−0.04	0.1	0.13
	P	.62	.3	.16

PCSQ, Pagana Clinical Stress Questionnaire; STAI-1, State Anxiety Inventory; STAI-2, Trait Anxiety Inventory.
†$P < .05$, Pearson correlations.
*Correlation is significant at the 0.05 level.
**Correlation is significant at the 0.01 level.

phase.[5,15] In contrast, students in countries such as India and Nigeria faced chronic stress driven by both academic pressure and socioeconomic concerns, including future employment prospects.[4,16] A multi-country study further highlighted that workload-related stress varied widely, with the highest levels reported in Egypt and the lowest in Jordan.[27] In the Turkish context, stress may be intensified by the highly competitive university entrance system, elevated societal expectations, and hierarchical dynamics between students and faculty, particularly during the transition into clinical practice. These observations emphasize the need to interpret dental student stress within specific cultural and institutional frameworks, as stressors and coping strategies differ widely across countries.

Numerous assessment tools have been used in the literature to evaluate stress and psychological well-being among dental students. These include the Dental Environment Stress Questionnaire and its modified clinical version,[18] the Perceived Stress Scale,[2] the General Self-Efficacy Scale,[2] the Brief Coping Scale,[2] the Maslach Burnout Inventory (MBI),[28] the Psychosocial Stress Inventory,[28] the Psychological General Well-Being, and[18] the Depression, Anxiety and Stress Scale (DASS-21).[29] In addition, instruments such as the Beck Depression Inventory,[19] the MBI,[28] the STAI,[19] the Moss and McManus Clinical Anxiety Questionnaire,[30] 12 question the General Health Questionnaire-12 (GHQ-12), and [30] the Zung Self-Rating Anxiety Scale[30] have been employed to assess psychological health in this population. Among these, the STAI has achieved widespread acceptance for evaluating anxiety in both clinical and research contexts. [31] Although

the PCSQ has previously been used in nursing populations to measure clinical stress,[32] its application in dental education remains limited. For this reason, the current study utilized both the PCSQ and STAI to assess stress and anxiety levels in undergraduate dental students.

Gender-based differences in stress and anxiety levels among dental students have been reported inconsistently in the literature. While several studies have observed that female students tend to experience higher levels of stress and anxiety,[2,3,18,27]others have found no significant gender-based differences or even contrary results.[19,33] The higher levels of stress and anxiety in female students have been associated with emotional sensitivity, greater willingness to express distress, and the additional pressure to succeed in a male-dominated professional environment.[34] Additional factors linked to increased stress include low academic performance, reduced emotional intelligence, cultural background, and motivations for choosing dentistry.[2,3,27] Conversely, one study has found no meaningful impact of variables such as marital status or financial condition.[35] In the present study, female students reported significantly higher levels of state anxiety compared to males. Moreover, students who chose dentistry voluntarily exhibited lower levels of stress, while final-year students with chronic medical conditions or those taking medications showed higher state anxiety.

Several studies have highlighted the psychological challenges students face during the transition to clinical training, particularly when working with complex clinical procedures and real patients.[14],[15] Another study reported that stress levels remain moderate and relatively stable across academic years.[36] In the Türkiye context, findings have been mixed—some studies report moderate and high levels of stress among clinical students and higher stress in final-year students,[2,18] while one study reported that stress decreases with increasing clinical competence.[19] According to the present study, the threat subscale—one of the four subscales constituting the stress level—was higher in the final-year (T0) than in the fourth-year (T1) of clinical training. This may reflect final-year students' concerns about graduation, restricted job opportunities, and the pressure and challenges of the dental specialty exam. Increased clinical responsibility and reduced supervision likely contribute to heightened perceptions of threat and psychological strain during this period.

According to the DASS-21 questionnaire in 2018, which includes 21 questions, 63.0% of dental students reported feeling anxiety at a moderate level or higher.[29] Another study found an even higher anxiety prevalence, with 66.8% of participants affected.[35] The anxiety level of dental students in objective structured clinical examinations conducted abroad using the STAI questionnaire was found to be higher for STAI-1 than for STAI-2.[33] Similarly, tools like the Moss and McManus Clinical Anxiety Questionnaire, the GHQ-12, and Zung Self-Rating Anxiety Scale have indicated elevated anxiety levels, especially among fourth-year students concerned about diagnostic errors.[30] In contrast, one study found that 96.3% of students experienced only mild to moderate anxiety.[37] Gerreth et al[5] reported mean STAI-1 and STAI-2 scores of 40.55 and 41.75, respectively. While Peker et al[19] found no observed significant differences based on educational year, another study suggests anxiety may decline with greater clinical experience.[38] Although most studies reported moderate to high anxiety levels,[17,30] the present study found mild to moderate anxiety levels. The difference may be due to the use of different questionnaires. Notably, STAI-1 scores were higher in fourth-year students at T1 than at T0. Additionally, stress scores were positively correlated with both STAI-1 and STAI-2 in both the fourth- and final- years. The threat subscale correlated with trait anxiety, while the challenge subscale correlated with state anxiety. These findings suggest that the increase in anxiety among fourth-year students at T1 may be linked to final examinations following clinical internships and the associated fear of academic failure.

Clinical training and dental examinations in dentistry are well-documented sources of student stress, particularly in specialties requiring invasive procedures and intensive patient interaction, such as endodontics, oral surgery, and prosthodontics.[17,39,40] Higher stress levels have been reported in endodontics and pedodontics,[41,42] leading to recommendations that students begin with departments like preventive dentistry or periodontology.[41,42] Although this study did not analyze stress by clinical departments, variables such as case complexity, patient workload, and clinical autonomy likely contribute to stress and anxiety. Future research should investigate stressors across various clinical departments to provide insights for evidence-based curriculum development.

To improve the learning environment and address elevated stress and anxiety levels among dental students, various stress management strategies have been explored, including relaxation techniques, counseling systems, time management training, and mindfulness-based interventions.[43,44] Evidence supports the effectiveness of methods such as deep breathing exercises, progressive muscle relaxation, and yogic breathing in reducing anxiety.[45,46] Integrating psychological skills training and emotional regulation strategies into the dental curriculum, alongside access to confidential counseling services, may offer proactive and sustainable support for students facing the emotional challenges of clinical education.

Although stress management initiatives offer clear benefits, their implementation within dental education faces several challenges. These include insufficient faculty training in psychological health support, time constraints due to dense curricula, and enduring stigma related to psychological well-being. Enhancing dental education thus requires not only curricular reform and faculty development but also the

adoption of innovative tools and teaching strategies to build clinical competence. Overcoming these barriers necessitates strong institutional commitment and interdisciplinary collaboration, particularly with mental health professionals.[47]

As of 2023, the Turkish Dental Association reported 105 dental faculties in Türkiye, with 97 actively enrolling students.[22] The increasing number of graduates has resulted in reduced clinical case availability per student and increased clinical workload, both of which are likely to exacerbate stress and anxiety levels. Additionally, the Association has expressed concerns about the declining quality of dental education, citing diminishing educational resources and opportunities on a per-student basis.[22]

This study evaluated the levels of stress and anxiety experienced by a group of dental students in the Turkish population. The findings can be used by faculty members to maintain awareness of students' stress and anxiety levels and circumstances, thereby developing strategies to improve and reduce these levels.[30] However, several limitations must be acknowledged in this study. The cross-sectional design prevents causal inferences and limits the ability to assess changes over time; thus, longitudinal studies are needed to monitor psychological changes throughout clinical education. Cronbach's alpha value between 0.40 and 0.60 is considered to indicate low reliability, between 0.60 and 0.80 acceptable reliability, and above 0.80 high reliability.[48] One important limitation of this study concerns the internal consistency of the STAI. While the STAI-2 demonstrated acceptable reliability at one measurement point (α=0.79), the STAI-1 exhibited lower internal consistency, with Cronbach's alpha values ranging from 0.42 to 0.61. Furthermore, the reliability of STAI-2 declined to 0.63 at another point. These findings suggest limited internal consistency, particularly for STAI-1, which may compromise the precision of anxiety assessment. Possible contributing factors include cultural differences in response tendencies, varying interpretations of questionnaire items, and situational fluctuations in anxiety during clinical training. To enhance measurement reliability, future studies are encouraged to consider alternative or complementary instruments. Additionally, confounding variables such as personality traits, socioeconomic status, academic performance, and coping mechanisms were not controlled, despite their potential influence on outcomes. Although demographic variables were evenly distributed across academic years, this homogeneity may have limited the detection of group differences. The study also did not explore specific sources of stress or compare stress levels across clinical departments. Lastly, as the study was conducted in a single institution with a limited sample size, the generalizability of the findings is constrained. Variability in curricula, institutional environments, and assessment practices across Turkish dental schools underscores the need for multicenter, longitudinal research to more comprehensively examine stress and anxiety levels in this population.

CONCLUSION

This study found that the majority of clinical dental students experienced mild to predominantly moderate levels of stress and anxiety. While STAI-1 scores were high among students during fourth-year clinical training, final-year students exhibited even higher levels of threat, which resulted in increased scores for STAI-1 and STAI-2. However, the interpretation of these results should be approached with caution due to concerns regarding the internal consistency of the STAI, particularly STAI-1. Future research should focus on conducting larger-scale studies to assess stress and anxiety levels using the PCSQ and STAI questionnaires. These studies should consider the impact of different clinical training systems and different populations across various dental faculties.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Artificial Intelligence Usage Statement: The authors declared that no artificial intelligence tool was used in the preparation of the manuscript.

Ethics Committee Approval: Ethical approval was taken from İzmir Demokrasi University Non-invasive Clinical Research Ethics Committee (No.: 2023/05-01; Date: 26.04.2023).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – S.E., B.G.A., F.D.C., A.U.C., A.S.; Design – S.E., B.G.A., F.D.C., A.U.C.; Supervision – B.G.A., F.D.C., A.U.C.; Resource – S.E., A.U.C., A.S.; Data Collection and/or Processing – S.E., A.S.; Analysis and/or Interpretation – S.E., B.G.A., F.D.C., A.U.C., A.S.; Literature Search – S.E., B.G.A., F.D.C., A.U.C., A.S.; Writing – S.E., B.G.A., F.D.C., A.U.C., A.S.; Critical Reviews – S.E., B.G.A., F.D.C., A.U.C., A.S.

Declaration of Interests: The authors have no conflicts of interest to declare.

Funding: The authors declared that this study has received no financial support.

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Supplementary Material

İZMİR DEMOKRASİ ÜNİVERSİTESİ

GİRİŞİMSEL OLMAYAN KLİNİK ARAŞTIRMALAR ETİK KURULU

ANKET ARAŞTIRMALARI İÇİN AYDINLATILMIŞ ONAM FORMU

LÜTFEN BU DÖKÜMANI DİKKATLİCE OKUYUNUZ

Sayın Katılımcı

Sizi İzmir Demokrasi Üniversitesi Diş Hekimliği Fakültesi Periodontoloji Anabilim Dalı'nda yürütülen "Klinik Eğitiminin Diş Hekimliği Öğrencilerinin Stres ve Anksiyete düzeylerine etkisi" başlıklı **araştırmaya** davet ediyoruz. Bu araştırmaya katılıp katılmama kararını vermeden önce, araştırmanın niçin ve nasıl yapılacağını bilmeniz gerekmektedir. Bu nedenle bu formun okunup anlaşılması büyük önem taşımaktadır. Aşağıdaki bilgileri dikkatlice okumak için zaman ayırınız. Eğer anlayamadığınız ve sizin için açık olmayan şeyler varsa, ya da daha fazla bilgi isterseniz bize sorunuz. Katılmayı kabul ettiğiniz takdirde, gerekli yerler siz ve sorumlu araştırmacı tarafından doldurup imzalanmış bu formun bir kopyası saklamanız için size verilecektir.

Araştırmaya katılmak tamamen gönüllülük esasına dayanmaktadır. Çalışmaya katılmama veya katıldıktan sonra herhangi bir anda çalışmadan çıkma hakkında sahipsiniz. Her iki durumda da bir ceza veya hakkınız olan yararların kaybı kesinlikle söz konusu olmayacaktır.

Bu çalışmadan elde edilen bilgiler tamamen araştırma amacı ile kullanılacak ve kimlik bilgileriniz kesinlikle gizli tutulacaktır.

Anket formuna adınızı ve soyadınızı yazmayınız.

Araştırmamızın amacı 4. ve 5. Sınıf Diş Hekimliği Fakültesi öğrencilerinin klinik eğitimi öncesi ve sonrasındaki stres ve anksiyete seviyelerinin ölçülmesi ve değerlendirilmesidir. Bu nedenle sorularımızın tümünü içtenlikle cevaplamanız büyük önem taşımaktadır.

Anketimiz 4 bölümden oluşmaktadır. Toplamda 71 soruluk, 6 dk zamanınızı alacak bu çalışmada açık uçlu soruları yanlarındaki boşluğa yazarak ya da diğer soruların yanlarındaki seçeneklerden size en uygununu seçerek işaretleyebilirsiniz.

Çalışma ile ilgili herhangi bir sorunuz olduğunda aşağıdaki kişi(ler) ile iletişim kurabilirsiniz.

Sorumlu Öğretim Üyesi

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Çalışmaya katılmayı kabul ediyorsanız aşağıdaki kutucuğu X ile işaretleyiniz ve devam ediniz.

Kabul ediyorum.

Anketi yanıtladığınız için teşekkür ederiz.

FORM I

Cinsiyet: Erkek ☐ Kadın ☐
Sınıf: 4 ☐ 5 ☐
Yaşadığı Yer: Yurt ☐ Tek başına evde ☐ Arkadaş ile evde ☐ Aile ile evde ☐
Doğduğu Yer: İl ☐ İlçe ☐ Kasaba-Köy ☐
Kronik Hastalık: Var ☐ Yok ☐
Kullanılan İlaç: Var ☐ Yok ☐ Varsa ismi:
Ailenin Gelir Düzeyi: Düşük ☐ Orta ☐ Yüksek ☐
Kardeş Sayısı: Tek çocuğum ☐ İki kardeşiz ☐ Üç kardeşiz ☐ Dört ve fazlası ☐
Bölümü İsteyerek mi Seçtiniz? Evet ☐ Hayır ☐ Kararsızım ☐
Burs Alıyor musunuz? Evet ☐ Hayır ☐

FORM II

Aşağıda kişilerin kendilerine ait duygularını anlatmada kullandıkları birtakım ifadeler verilmiştir. Her ifadeyi okuyun, sonra da o anda nasıl hissettiğinizi ifadelerin sağ tarafındaki parantezlerden uygun olanını işaretlemek suretiyle belirtin. Doğru ya da yanlış cevap yoktur. Herhangi bir ifadenin üzerinde fazla zaman sarf etmeksizin anında nasıl hissettiğinizi gösteren cevabı işaretleyin.

		Hiç	**Biraz**	**Çok**	Tamamıyla
1.	Şu anda sakinim	(1)	(2)	(3)	(4)
2.	Kendimi emniyette hissediyorum	(1)	(2)	(3)	(4)
3.	Su anda sinirlerim gergin	(1)	(2)	(3)	(4)
4.	Pişmanlık duygusu içindeyim	(1)	(2)	(3)	(4)
5.	Şu anda huzur içindeyim	(1)	(2)	(3)	(4)
6.	Şu anda hiç keyfim yok	(1)	(2)	(3)	(4)
7.	Başıma geleceklerden endişe ediyorum	(1)	(2)	(3)	(4)
8.	Kendimi dinlenmiş hissediyorum	(1)	(2)	(3)	(4)
9.	Şu anda kaygılıyım	(1)	(2)	(3)	(4)
10.	Kendimi rahat hissediyorum	(1)	(2)	(3)	(4)
11.	Kendime güvenim var	(1)	(2)	(3)	(4)
12.	Şu anda asabım bozuk	(1)	(2)	(3)	(4)
13.	Çok sinirliyim	(1)	(2)	(3)	(4)
14.	Sinirlerimin çok gergin olduğunu hissediyorum	(1)	(2)	(3)	(4)
15.	Kendimi rahatlamış hissediyorum	(1)	(2)	(3)	(4)
16.	Şu anda halimden memnunum	(1)	(2)	(3)	(4)
17.	Şu anda endişeliyim	(1)	(2)	(3)	(4)
18.	Heyecandan kendimi şaşkına dönmüş hissediyorum	(1)	(2)	(3)	(4)
19.	Şu anda sevinçliyim	(1)	(2)	(3)	(4)
20.	Şu anda keyfim yerinde.	(1)	(2)	(3)	(4)

FORM III

Aşağıda kişilerin kendilerine ait duygularını anlatmada kullandıkları birtakım ifadeler verilmiştir. Her ifadeyi okuyun, sonra da o anda nasıl hissettiğinizi ifadelerin sağ tarafındaki parantezlerden uygun olanını işaretlemek suretiyle belirtin. Doğru ya da yanlış cevap yoktur. Herhangi bir ifadenin üzerinde fazla zaman sarf etmeksizin anında nasıl hissettiğinizi gösteren cevabı işaretleyin.

		Hemen hemen hiçbir zaman	**Bazen**	**Çok zaman**	Hemen her zaman
1.	Genellikle keyfim yerindedir	(1)	(2)	(3)	(4)
2.	Genellikle çabuk yorulurum	(1)	(2)	(3)	(4)
3.	Genellikle kolay ağlarım	(1)	(2)	(3)	(4)

4.	Başkaları kadar mutlu olmak isterim	(1)	(2)	(3)	(4)
5.	Çabuk karar veremediğim için fırsatları kaçırırım	(1)	(2)	(3)	(4)
6.	Kendimi dinlenmiş hissediyorum	(1)	(2)	(3)	(4)
7.	Genellikle sakin, kendine hakim ve soğukkanlıyım	(1)	(2)	(3)	(4)
8.	Güçlüklerin yenemeyeceğim kadar biriktiğini hissederim	(1)	(2)	(3)	(4)
9.	Önemsiz şeyler hakkında endişelenirim	(1)	(2)	(3)	(4)
10.	Genellikle mutluyum	(1)	(2)	(3)	(4)
11.	Her şeyi ciddiye alır ve endişelenirim	(1)	(2)	(3)	(4)
12.	Genellikle kendime güvenim yoktur	(1)	(2)	(3)	(4)
13.	Genellikle kendimi emniyette hissederim	(1)	(2)	(3)	(4)
14.	Sıkıntılı ve güç durumlarla karşılaşmaktan kaçınırım	(1)	(2)	(3)	(4)
15.	Genellikle kendimi hüzünlü hissederim	(1)	(2)	(3)	(4)
16.	Genellikle hayatımdan memnunum	(1)	(2)	(3)	(4)
17.	Olur olmaz düşünceler beni rahatsız eder	(1)	(2)	(3)	(4)
18.	Hayal kırıklıklarını öylesine ciddiye alırım ki hiç unutamam	(1)	(2)	(3)	(4)
19.	Aklı başında ve kararlı bir insanım	(1)	(2)	(3)	(4)
20.	Son zamanlarda kafama takılan konular beni tedirgin ediyor	(1)	(2)	(3)	(4)

FORM IV

Bir klinik uygulamada diş hekimliği öğrencileri aşağıda listelenmiş duyguları deneyimleyebilir. İlk klinik deneyiminizi düşününüz ve aşağıdaki duygulardan hangisini deneyimlediğinizi belirtiniz.

Lütfen her bir duygu için aşağıda verilen seçeneklerden birini işaretleyiniz.

	HİÇ	**BİRAZ**	**ORTA**	**FAZLA**	ÇOK FAZLA
1. Üzüldüm	0	1	2	3	4
2.Uyarıldım	0	1	2	3	4
3. Öfkelendim	0	1	2	3	4
4. Neşelendim	0	1	2	3	4
5. Hüzünlendim	0	1	2	3	4
6. Ümitlendim	0	1	2	3	4
7. Endişelendim	0	1	2	3	4
8. Hoşlandım	0	1	2	3	4
9. Bunaldım	0	1	2	3	4
10. Heveslendim	0	1	2	3	4
11. Suçluluk hissettim	0	1	2	3	4
12. Duygulandım	0	1	2	3	4
13. İğrendim / tiksindim	0	1	2	3	4
14. Heyecanlandım	0	1	2	3	4
15. Gözüm korktu/ sindim	0	1	2	3	4
16. Rahatladım	0	1	2	3	4
17. Hayal kırıklığına uğradım	0	1	2	3	4
18. Mutlu oldum	0	1	2	3	4
19. Korktum	0	1	2	3	4
20. Güvendim	0	1	2	3	4