# Assessment of Time-Dependent Changes in Anxiety Levels of Third-Year Students at Ege University, Faculty of Dentistry

## *Ege Üniversitesi Diş Hekimliği Fakültesi Üçüncü Sınıf Öğrencilerinin Anksiyete Düzeylerindeki Zamana Bağlı Değişimlerin Değerlendirilmesi*

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### ABSTRACT

*INTRODUCTION: This study aimed to assess time-dependent changes in anxiety levels of third-year students.*

*MATERIAL AND METHODS: This study was conducted at a single center. Third-year students who completed preclinical training and began clinics for the first time in fall semester of the 2023-2024 academic year participated in the study. The State and Trait Anxiety Inventory (STAI I and II) was used to assess anxiety levels. A self-assessment questionnaire including questions about students' age, gender, perceived adequacy of preclinical education, and specific clinical training areas they found challenging was distributed to the students. Data were obtained at the beginning (T0) and end (T1) of clinical training. Statistical significance was set at $p < 0.05$.*

*RESULTS: A total of 141 students participated in this study (60 males, 81 females; mean age 23.67). STAI I and II scores at T0 were significantly higher than at T1 (pSTAI-I < 0.001, pSTAI-II < 0.001). However, at both T0 and T1, there was no statistically significant difference between the practice clinic and STAI I/II scores ($p > 0.05$).*

*CONCLUSION: The findings indicated that students' anxiety levels decreased after clinical education. These results may offer insights for reducing student anxiety and improving the educational experience in dental programs.*

**Keywords:** *Education, Clinical, Student, Anxiety, Scale*

### ÖZ

*GİRİŞ: Çalışmada diş hekimliği 3. sınıf öğrencilerinin klinik eğitim başlangıcındaki kaygı düzeyinin ölçülmesi ve bu kaygının zamana göre değişiminin incelenmesi amaçlanmıştır.*

*YÖNTEM ve GEREÇLER: Bu kesitsel çalışma, tek merkezli olarak yürütülmüştür. Çalışmaya, 2023-2024 Eğitim-Öğretim Güz Yarıyılı itibarıyla preklinik eğitimini tamamlayıp ilk defa klinik eğitimlere başlayacak olan 3. Sınıf öğrencileri katılmıştır. Kaygı düzeyinin değerlendirilmesinde, Durumluk ve Sürekli Kaygı Ölçekleri (STAI I ve STAI II) kullanılmıştır. Öğrencilere yaş ve cinsiyet bilgilerini içeren, preklinik eğitimin yeterliliği, zorlandıkları ve yeterli hissettikleri klinik eğitimlere yönelik bir öz değerlendirme anketi uygulanmıştır. Veriler, klinik eğitim başlangıcı (T0) ile klinik eğitim tamamlandıktan sonra (T1) olmak üzere iki kez toplanmıştır. İstatistiksel anlamlılık $p < 0,05$ olarak belirlenmiştir.*

*BULGULAR: Çalışmaya toplam 141 öğrenci katılmıştır (60 erkek, 81 kadın; yaş ortalaması 23,67). T0'da alınan STAI I ve STAI II değerleri, T1'e göre daha yüksek bulunmuştur (pSTAI-I < 0,0001, pSTAI-II < 0,0001). Eğitime başlanılan uygulama kliniği incelendiğinde ise, T0 ve T1'deki STAI ve II değerleri ile uygulama kliniği arasında istatistiksel olarak anlamlı bir ilişkiye rastlanmamıştır ($p > 0.05$).*

*SONUÇ: Çalışma ile klinik eğitim sonrası öğrencilerin kaygı düzeylerinin azaldığı görülmüştür. Elde edilen bulgular, diş hekimliği eğitiminde öğrencilerin kaygı düzeylerinin azaltılması ve eğitim sürecinin iyileştirilmesi için yol gösterici olabilir.*

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## INTRODUCTION

The curriculum for dental schools is a comprehensive educational framework that combines theoretical knowledge, laboratory work, and clinical practice. In clinical settings, students perform various oral and dental procedures under the supervision of specialists. However, as a part of their training, most treatment steps are required to be carried out by the students themselves.[1] This may cause anxiety, especially for third-year dental students who will encounter the patient for the first time and have not performed any dental treatment before. These students do not have real patient experience professionally, except for demonstrating proficiency in the exams conducted within the scope of simulation studies.

Anxiety in clinical settings is often caused by negative experiences, errors, and malpractice that stem from a lack of proficiency in necessary procedures.[2] Additionally, managing patients who have a fear of dental treatment or experience white coat syndrome can heighten feelings of anxiety in inexperienced dental students at the start of their careers. This is particularly challenging because these patients may be uncooperative or resistant to treatment.[4]

The State-Trait Anxiety Inventory (STAI I and STAI II) developed by Spielberger et al.[5] is a widely used tool for measuring anxiety. These scales assess the level of anxiety that individuals experience in a specific moment and situation (STAI I) or regardless of their circumstances (STAI II). The Turkish translation, along with the validity and reliability studies of the scales, was conducted by Öner et al.[6] in 1985.

The objective of this study was to determine the anxiety levels of third-year dental students who were about to begin their clinical education for the first time. For this purpose, STAI I and II scales, as well as a self-assessment questionnaire, were administered to the students at both the beginning and the end of their clinical education. The study aimed to examine changes in the students' anxiety levels over this period. The null hypothesis (H0) posited that "there is no difference between the anxiety levels of third-year dental students who are starting clinical education for the first time at the beginning of the clinical education period and their anxiety levels at the end of the clinical education." Conversely, the alternative hypothesis (H1) stated that "anxiety levels among third-year dental students at the onset of clinical education are elevated compared to their anxiety levels after completing the clinical education period."

## MATERIAL AND METHOD

### *Recruitment of Participants*

The study was conducted after ethical approval of the university ethics committee (Decision No: 2354, 2024). Students were informed about the study details and informed consent was obtained from all students who agreed to participate in this study.

The sample size of the study was carried out by accepting 187 third-year students of the faculty of dentistry as the universe, with a 5% acceptable error and a 95% confidence level, and it was determined that at least 126 of these students should answer the STAI scales and questionnaires.

This cross-sectional study was conducted at a single-center dental school hospital in our country. One hundred forty-one third-year dental students participated in the study. These students had completed their preclinical education during the fall semester of the 2023-2024 academic year and were beginning their clinical education for the first time. The participation rate was 75.4%. Participation in the study was voluntary, and the students were informed that they were not required to provide their name, surname, or faculty number. The participants were asked to complete the State-Trait Anxiety Inventory (STAI I and STAI II) scales as part of the study. Additionally, they filled out a self-assessment questionnaire as a pre-test and post-test.

### *Data Collection*

Data was collected at two distinct time periods: at the beginning of clinical training (T0) and after the completion of clinical training (T1). The research team administered the State-Trait Anxiety Inventory (STAI I and II) scales and a self-assessment questionnaire to the students in the department where their training was conducted. The STAI I and II scales were evaluated using a 4-point Likert-type scale, where responses ranged from 1 to 4. The data were analyzed using a set of 20 questions, for which responses were tallied and subsequently categorized as follows: (1) Not at all, (2) A little, (3) Somewhat, (4) Very much so for STAI I, and (1) Almost never, (2) Sometimes, (3) Very often and (4) Almost always for STAI II. The responses to the questions in the scale were scored according to direct or inverted statements. The scores, which increase in direct proportion to anxiety, are theoretically calculated over a minimum of 20 and a maximum of 80. In our study, a score between 20 and 40 was designated as 'low anxiety', a score between 41 and 60 as 'moderate anxiety' and a score between 61 and 80 as 'high anxiety'.

The students completed a self-assessment questionnaire consisting of two-choice and numerical rating questions. This questionnaire was administered at two points: T0 (pre-test) and T1 (post-test) to analyze the results. It began with brief text response questions about age and gender, followed by multiple-choice questions regarding the clinical education group that the students started with and the order of their clinical placements. At T0, the questionnaire asked students about the clinical practices in which they felt competent, as well as those they anticipated having difficulties with. Additionally,

students were asked whether they had any preclinical courses that they had failed during the preclinical period and had to take make-up. In T1, these questions were revised to include the clinical practices in which the students felt competent or had difficulty after completing their entire clinical education. Both in T0 and T1, the numerical rating (0-10) questions were also asked students to measure the level of anxiety depending on the various clinics as 0: no anxiety, 1-3 was categorized as 'low anxiety', 4-6 as 'moderate anxiety' and 7-10 as 'high anxiety'. The questions in the self-assessment questionnaire are presented in Table 1.

**Table 1.** (a) T0 and (b) T1 self-assessment questionnaire questions

| **T0** |
|---|
| Clinical trainee group |
| Sequence of clinical training |
| Gender |
| Age |
| Was dentistry your first choice of profession? |
| To what extent do you feel prepared for clinical practice? |
| To what extent do you think the dental education you received has prepared you for clinical practice? |
| Which professional procedure do you find the most challenging? |
| During your preclinical education, did you have to attend make-up training for any course or repeat a year? If yes, does starting the clinical practice related to that course make you feel anxious? |
| In which clinical procedure do you feel most competent? |
| During which professional procedure do you think you are more likely to make errors or encounter complications? |
| Can you rate the level of anxiety caused by completing preclinical education and starting clinical training on a scale from 0 to 10? |
| Can you rate the level of anxiety caused by performing professional procedures on patients during endodontics clinical training on a scale from 0 to 10? |
| Can you rate the level of anxiety caused by performing professional procedures on patients during restorative dentistry clinical training on a scale from 0 to 10? |
| Can you rate the level of anxiety caused by performing professional procedures on patients during periodontology clinical training on a scale from 0 to 10? |
| Can you rate the level of anxiety caused by performing professional procedures on patients during pediatric dentistry clinical training on a scale from 0 to 10? |
| Can you rate the level of anxiety caused by starting orthodontics clinical training on a scale from 0 to 10? |
| Can you rate the level of anxiety caused by starting oral and maxillofacial radiology clinical training on a scale from 0 to 10? |
| Can you rate the level of anxiety caused by starting prosthodontics clinical training on a scale from 0 to 10? |
| Can you rate the level of anxiety caused by starting oral and maxillofacial surgery clinical training on a scale from 0 to 10? |
| Would you describe yourself as an anxious person? If yes, can you rate your anxiety level on a scale from 0 to 10? |
| Apart from the educational process, are there currently any situations that cause you anxiety? If yes, can you rate your anxiety level on a scale from 0 to 10? |
| **T1** |
| Clinical trainee group |
| Sequence of clinical training |
| Gender |
| Age |
| After completing your clinical training, which professional procedure did you find the most challenging? |
| After completing your clinical training, in which clinical procedure did you feel most competent? |
| After completing your clinical training, during which professional procedure did you make the most errors or experience complications? |
| Can you rate your anxiety level after endodontics clinical training on a scale from 0 to 10? |
| Can you rate your anxiety level after restorative dentistry clinical training on a scale from 0 to 10? |
| Can you rate your anxiety level after periodontology clinical training on a scale from 0 to 10? |
| Can you rate your anxiety level after pediatric dentistry clinical training on a scale from 0 to 10? |
| Can you rate your anxiety level after orthodontics clinical training on a scale from 0 to 10? |
| Can you rate your anxiety level after oral and maxillofacial radiology clinical training on a scale from 0 to 10? |
| Can you rate your anxiety level after prosthodontics clinical training on a scale from 0 to 10? |
| Can you rate your anxiety level after oral and maxillofacial surgery clinical training on a scale from 0 to 10? |

*Statistical Analysis*

Statistical analyses were conducted using the SPSS software program (version 29.0.2.0; IBM Corporation, New York, USA). The frequency (%) of responses to the questionnaires was calculated using the chi-square test. Data were summarized with percentages, means, standard deviations, medians, minimum and maximum values. To assess data distribution, a Kolmogorov-Smirnov test was performed since the sample size exceeded 50 participants, revealing that the data did not follow a normal distribution. As a result, nonparametric statistical analyses were employed at a 95% confidence level to evaluate the data.

The Wilcoxon Signed Rank test was used to compare the State-Trait Anxiety Inventory STAI scores (STAI I and STAI II) at time points T0 and T1, as well as to assess numerical rating questions measuring the anxiety levels associated with the training clinics. To compare anxiety levels by gender, the Mann-Whitney U test was applied. Additionally, Spearman correlation analysis was used to examine the relationship between the professional practices that students found most challenging at T0 and T1 and the complications they anticipated or experienced. It also analyzed the relationship between the courses students needed to repeat during the preclinical period and their anxiety levels related to the clinics.

## RESULTS

A total of 141 students participated in our study, including 60 males and 81 females, with an average age of 23.67 years. Among them, 58.9% (n = 83) identified themselves as anxious. When analyzing general anxiety levels, we found that 31.2% (n = 44) reported 'moderate anxiety' and 27.7% (n = 39) reported 'high anxiety' on a scale ranging from 0 to 10. Additionally, 90 students (63.8%) indicated that their concerns extended beyond the educational process. An analysis of anxiety levels related to these concerns revealed that 38 students (27%) experienced 'moderate anxiety,' while 46 students (32.6%) reported 'high anxiety.' Results from the first and second parts of the STAI indicated that at baseline (T0), 67% of the students exhibited 'state anxiety' while 77% demonstrated 'trait anxiety.' By the following assessment (T1), the rates of 'moderate anxiety' measured by the STAI I and STAI II scales were 57% and 60%, respectively (see Table 2). A statistically significant difference was observed between T0 and T1 measurements for both STAI I and II ($p < 0.001$). Further analysis of gender and anxiety levels showed that STAI II scores at T0 and T1 were higher in females than in males, with this difference being statistically significant ($p < 0.001$ at T0 and $p = 0.001$ at T1) (see Table 3). However, no statistically significant differences were found between the practice clinic and the values of STAI I and STAI II at T0 and T1 ($p > 0.05$).

**Table 2.** Distribution of STAI-I and STAI-II scores at T0 and T1

| | Mean | SD | Median | Min. | Max. | p |
|---|---|---|---|---|---|---|
| T0-STAI I | 40,39 | 5,42 | 40 | 23 | 60 | < 0.001 |
| T1-STAI I | 42,76 | 6 | 42 | 28 | 61 | |
| T0-STAI II | 45,42 | 5,47 | 46 | 33 | 60 | < 0.001 |
| T1-STAI II | 44,03 | 5,51 | 43 | 32 | 61 | |

Abbreviations: T0: before clinical training; T1: after clinical training; Mean: mean; SD: standard deviation; min: minimum; max: maximum

**Table 3.** Distribution of STAI-I and STAI-II scores by gender and time

| | Male | | Female | | |
|---|---|---|---|---|---|
| | (Median; min–max) | Mean ± SD | (Median; min–max) | Mean ± SD | *P** |
| T0-STAI I | 41 (25-60) | 41,25 ±5,626 | 40,50 (28-51) | 40,40 ± 5,032 | 0,017 |
| T1-STAI I | 43 (33-60) | 43,90 ± 6,083 | 41 (30 – 61) | 42,35 ± 6,597 | 0,085 |
| T0-STAI II | 43,50 (33-54) | 43,40 ±4,833 | 48 (37-60) | 47,88 ± 5,534 | <0,001 |
| T1-STAI II | 41 (32-53) | 42,17 ± 4,752 | 44,50 (36-61) | 45,65 ±6,002 | 0,001 |

[*] Mann–Whitney U test
Abbreviations: T0: before clinical training; T1: after clinical training; SD: standard deviation; min: minimum; max: maximum

When asked about the adequacy of pre-clinical education in preparing them for clinical practice, 5% (n = 7) of the students stated it was 'not at all' adequate, while 62.4% (n = 88) felt it was 'somewhat' adequate. Regarding their feelings of readiness for clinical practice, 30.5% (n = 43) indicated they were partially ready,

35.5% (n = 50) felt ready, and 32.6% (n = 46) were undecided. An analysis of the anxiety experienced during the initiation of clinical education revealed that 43.3% (n = 61) of students reported moderate anxiety, while 36.9% (n = 52) reported high anxiety. Nearly 48.9% indicated that the most challenging professional practice at T0 was root canal treatment, followed by tooth preparation and impression taking (27.7%), and tooth extraction and anesthesia (14.9%). In terms of competence, 46.1% (n = 65) of students felt most competent in tooth filling, and 28.4% (n = 40) reported feeling competent in scaling. No statistically significant differences were found when comparing these results to T1 ($p > 0.05$).

At T0, students reported the procedures that they thought they were most likely to experience complications as follows: root canal treatment (55.3%), anesthesia (36.9%), tooth extraction (7.1%) and tooth preparation (0.7%). At T0, no correlation was observed between the professional practices that students reported to be the most difficult and the practice that they thought they would experience the most complications ($p = 0.251$). Furthermore, there was no significant correlation between the practice they had the most difficulty with at T0 and the practice they had the most complications with at T1 ($p = 0.652$). On the other hand, it was determined that root canal treatment (42.6%) and tooth filling (11.3%) were the applications that students encountered the most complications at T1. A statistically significant correlation was found between the professional practices where students faced the most challenges during the clinical education process at T1 and the practices in which they experienced complications ($p < 0.001$). While root canal treatment had the highest incidence of complications, there was no statistically significant correlation between the practices that students anticipated would lead to complications at T0 and those in which they actually experienced complications at T1 ($p = 0.379$).

The anxiety levels of the students at T0 and T1 according to the training clinics are summarized in Table 4. It was observed that the initiation of patient treatment in the Endodontics clinic caused 'high anxiety' in 72.3% of the students. Oral and Maxillofacial Surgery ranked second with a high anxiety level of 41.8%. For Clinics of Restorative Dentistry and Prosthodontics, students reported 'moderate anxiety' (48.2% and 39.7%, respectively). Similarly, for clinic of Endodontics, students reported the highest level of anxiety at T1 after clinical training (45.4%); however, compared to T0, the level of anxiety decreased at T1, and this difference was statistically significant ($p < 0.001$). Similarly, in Restorative Dentistry ($p = 0.03$) and Oral and Maxillofacial Surgery ($p = 0.004$) clinical trainings, the anxiety levels reported by the students were statistically significantly lower at T1.

The evaluation of students' anxiety levels during each clinical training at T0 revealed that there was a correlation only in the Oral and Maxillofacial Surgery training ($p = 0.013$). Additionally, a statistically significant correlation was identified between students' anxiety levels related to the specific clinic and the courses they took during their preclinical education, but this was only evident in Pediatric Dentistry ($p = 0.024$). Furthermore, at T1, a significant relationship was found between students' anxiety levels and the complications they encountered in Restorative Dentistry ($p = 0.023$) and Oral and Maxillofacial Surgery ($p = 0.025$) clinical education.

## DISCUSSION

The objective of this study was to assess both state and trait anxiety levels in third-year dental students as they transition from preclinical to clinical education, where they will diagnose and treat patients for the first time.

In this study, we examined the STAI I and II anxiety levels of these students at the beginning of the clinical education period and again after completing the clinical education. We found a statistically significant difference between the STAI I and STAI II anxiety scores at time point T0 (the beginning) and T1 (after clinical training). Based on these findings, we rejected our null hypothesis (H0) and accepted the alternative hypothesis (H1).

A subsequent analysis revealed a statistically significant variation in the STAI I and II anxiety levels of the students at the commencement of clinical education and following its culmination. This variation was found to be contingent on gender, with female students exhibiting elevated anxiety levels in comparison to their male counterparts. A review of previous studies revealed that anxiety levels did not differ according to gender.[7,8] However, consistent with the findings of this study, previous research has indicated that women exhibited statistically significantly higher levels of anxiety compared to men in studies conducted with intern students from the Faculty of Medicine and from the Faculty of Dentistry.[9] The discrepancy in these findings is hypothesized to be attributable to the subjective nature of anxiety as a research construct. Unlike other faculties, it is known that students may be stressed and anxious in the early stages of clinical education, where the first patient experience takes place, because education in dental faculties includes theoretical and practical/applications.[2,10] It has been reported in the literature that a good preclinical education is one of the factors that increase students' self-confidence at this point.[11-13] Although simulation training has been demonstrated to enhance student self-confidence in the literature, [14-16] it covers the basis of clinical practices such as making diagnostic-treatment decisions on the patient and planning the treatment process to a limited

extent.[17] The fact that the information in the theoretical courses and what is taught in laboratory training does not cover the management of the treatment of patients may be the reason why students have difficulty in synthesizing information and do not feel fully prepared for clinical training.[18]

Root canal treatment has been identified as the procedure that students find most challenging, both at the beginning and end of their clinical training. It is also the procedure that they anticipate or encounter the most complications with. This finding indicates that root canal treatment poses significant challenges for students in terms of perception and practical application. In a previous study, many students perceive the application of root canal treatment as complex and difficult, often experiencing stress during the process. This leads to feelings of insecurity, particularly when performing the procedure on molars.[19] In addition, it is reported in the literature that the insecurity felt by students during root canal treatment is related to their undergraduate education.[20,21] Although working in the root area, which is not directly visible due to the nature of root canal treatment, is usually compared to other branches, considering the importance of students' perceptions about learning and educational experiences. It has been revealed that different educational models contribute to students' achievement of their learning goals.[22,23] Specifically, the use of case-specific discussions and problem-based teaching methods contributed to students' learning process and increased their confidence by improving their reasoning and problem-solving skills.[24,25]

In the present study, tooth filling was identified as the second highest practice associated with complications at the end of the clinical education process (T1), particularly in comparison to T0, despite students reporting low anxiety levels during the procedure. It is hypothesized that this lower anxiety is due to the preclinical courses in Restorative Dentistry beginning in the second grade, whereas the Endodontics course starts in the third grade, resulting in a longer duration of preclinical education for tooth filling. Complications during procedures were noted, including perforation while opening the cavity during root canal treatment, canal obstruction due to loss of working length during expansion, step formation, and tool breakage. Additionally, pulp exposure during tooth filling was classified as a complication to emphasize the importance of careful work by students in their preclinical education and theoretical lessons. Although tooth filling is indicated for deep caries, the depth of the carious tissue can sometimes lead to pulp exposure. In this study, data on complications were based on student reports, which may explain instances where any pulp exposure, regardless of the presence of caries, was recorded as a complication, making filling the second most commonly reported complication.

A significant portion of the students who participated in our study identified themselves as anxious, reporting that they experienced anxiety issues beyond the educational context. Their levels of trait anxiety, as measured by the STAI II scale, were predominantly above the moderate threshold (STAI II > 40). Previous literature indicates that dental students often report a highly stressful learning environment compared to their peers in other faculties,[10] with higher stress levels observed in dental students than in the general population.[2]

To address the challenge of including students with elevated STAI II scores in our study, we administered separate questionnaires focused on anxiety specifically related to clinical education. However, since the analyses included all participants without excluding those with high anxiety scores, we must consider this limitation when interpreting our results. Additionally, this study was conducted at a single center and involved only third-year dental students, which may limit the generalizability of the findings to the broader population of third-year dental students. Importantly, the administration of questionnaires was restricted to the 2023-2024 academic year, thereby excluding students who completed preclinical education in earlier years.

Despite these limitations, our findings indicate that most students displayed elevated levels of both trait and state anxiety. Implementing strategies to reduce student anxiety and enhance their self-efficacy in clinical education could potentially lead to higher perceptions of success and increased motivation to engage in their studies.[26]

## CONCLUSION

By the responsibility of patient-based treatments and management of dental problems, clinical training may induce anxiety among dental students. Pre-clinical practices have demonstrated efficacy in reducing anxiety. It would be advantageous for the student to meet with each department prior to the clinic, thereby facilitating opportunities for practice and ensuring a balance in dental training. It is hypothesized that the data obtained in this study can be used to reduce students' anxiety levels and improve the educational process in dentistry.

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