

# Dentistry students after the COVID-19 outbreak—have views on distance education changed?

Hakan Yasin Gönder<sup>1</sup>, Muhammet Fidan<sup>2</sup>, Mehmet Gökberkkaan Demirel<sup>3</sup>, Mehmet Soybelli<sup>4</sup>, Sinem Alkurt<sup>1</sup>, İbrahim Burak Yüksel<sup>5</sup>

<sup>1</sup> Necmettin Erbakan University, Faculty of Dentistry, Department of Restorative Dentistry, Konya, Turkey

<sup>2</sup> Uşak University, Faculty of Dentistry, Department of Restorative Dentistry, Uşak, Turkey

<sup>3</sup> Necmettin Erbakan University, Faculty of Dentistry, Department of Prosthodontics, Konya, Turkey

<sup>4</sup> Private Practice, Konya, Turkey

<sup>5</sup> Necmettin Erbakan University, Faculty of Dentistry, Department of Oral Diagnose and Radiology, Konya, Turkey

## Abstract

**Aim:** The aim of this study is to evaluate dentistry students for changes in anxiety levels between the initial outbreak of the COVID-19 pandemic and the point where COVID restrictions were reduced to a minimum and to compare their perspectives on distance education at both points in time.

**Methodology:** The participants in this study were undergraduate students (n = 297) from the Faculty of Dentistry who volunteered to answer a questionnaire that asked them to detail the anxiety levels that they experienced during the COVID-19 period and during the months after COVID-related restrictions were lifted. The students were also asked for their opinions about the theoretical dentistry lessons delivered by distance education. The measurement values obtained were subjected to the independent sample t-test for comparisons between groups and to the one-way analysis of variance for comparisons of more than two groups. The Pearson correlation analysis was used to evaluate the relationship between anxiety levels. A value of  $p < 0.05$  was considered statistically significant.

**Results:** When asked whether technology-based education was beneficial, and whether theoretical education should be realized through distance education, men answered yes at a higher rate than women. ( $p < 0.05$ ). It was also observed that, compared to the early days of the COVID-19 pandemic, the anxiety scores of the participants were lower in the months after pandemic restrictions were reduced.

**Conclusion:** According to the findings, it was observed that male students were more inclined to use the internet, to believe that technology-based education was beneficial, to prefer distance education over face-to-face education, and to be more motivated in distance education than face-to-face education. COVID-19 has impacted face-to-face education with a sudden transition to distance education, and these results support the importance of identifying the deficiencies in this education method and developing this system.

**Keywords:** COVID-19, distance education, dental student, online education, survey

## Correspondence:

Dr. Sinem ALKURT

Necmettin Erbakan University, Faculty of Dentistry, Department of Restorative Dentistry, Konya, Turkey

E-mail: sinem.alkurt@gmail.com

Received: 19 October 2022

Accepted: 13 December 2022

## Access Online



DOI:

<https://doi.org/10.5577/intdentres.440>

**How to cite this article:** Gönder HY, Fidan M, Demirel MG, Soybelli M, Alkurt S, Yüksel İB. Dentistry students after the COVID-19 outbreak—have views on distance education changed? Int Dent Res 2022;12(Suppl.1):34-43. <https://doi.org/10.5577/intdentres.440>

## Introduction

When the COVID-19 disease caused by the novel SARS-CoV-2 coronavirus started to spread all over the world, many educational institutions urgently suspended face-to-face education and switched to distance education in order to reduce viral transmission (1). Distance education is a teaching method delivered through specific centers and depends on self-learning goals, educational content, and tools specifically designed for learners in a myriad of settings. It is a form of planned teaching in which students do not need to be physically present in a particular place to receive education; students and teachers connect synchronously or asynchronously through communication technologies and with the help of internet platforms (2). Although distance education is currently seen as being only supplemental to face-to-face education, when considering the contributions from digitalization and new technological systems, distance education is forecast to be the main mode of education in the near future (3).

Owing to how rapidly the transition to distance education occurred, students, educators, and administrators encountered problems adapting. Adequate evaluations could not be made beforehand about whether students were ready for the transition (4). Adaptation issues arose because many faculty members possessed limited technology knowledge and because students often experienced problems with internet connection (5). Factors such as having high computer usage skills, fast and reliable internet access, and available electronic devices were associated with more positive perspectives on distance education (6,7). One way to promote the acceptance of distance education is with interactive lessons. In addition, student-content, student-student, and student-educator interactions significantly improve learning outcomes (8). Software that have been designed for distance education and that are suitable for interactive coursework are preferred over non-interactive ones (5). Students find distance education positive in terms of advantages such as being able to learn at one's own pace and being able to listen to recorded lessons at any time (9).

The transition to new classroom formats for distance education has affected instructor motivation. Although online classes may seem more manageable at first glance, on the instructor's part, online classes actually require more responsibility and leadership skills than face-to-face classes, and this fact affects the quality of the courses being delivered (9). In an online learning system, students cannot receive practical training, tend to lack sufficient feedback from instructors, tend to think that they cannot express themselves adequately, and struggle to retain the subjects that they have studied—all factors that reduce the acceptability of this teaching model (10). It can be seen that ease of access to technology and to the use of appropriate tools directly affects the acceptability of the distance education system.

In addition to the factors discussed above, it can be said that levels of epidemic-disease anxiety, which have increased with the COVID-19 pandemic, also affect the acceptability of the distance education system (6,7). Accordingly, the factors affecting the acceptability of distance education; It is possible to divide it into two as factors related to technological opportunities/distance education and related to anxiety. When these two factors were evaluated together, it was seen that distance education was more acceptable in countries with strong technological infrastructure, even though there was no difference in anxiety and anxiety levels across different countries (5). This situation has brought to mind the question of whether the acceptability of distance education will decrease in the absence of epidemic-disease concerns. Some of the studies that were based on this premise indicated that students would prefer for the online education model to continue even if pandemic restrictions were to be lifted (11,12).

As far as we know, many studies have been done on distance education. However, there is a lack of literature on the effectiveness of distance education in dentistry as evaluated after the height of the COVID-19 pandemic. This study aims to evaluate dentistry students for changes in anxiety levels between the initial outbreak of the COVID-19 pandemic and the point where pandemic restrictions were reduced to a minimum, as well as to compare the effectiveness of distance education at both points in time.

## Materials and Methods

Ethical approval was obtained from the Scientific Research Ethics Committee of Necmettin Erbakan University Faculty of Dentistry for this study (No. 2022/142). The survey questions were compiled by the researchers and administered via an online structured survey. The link to the questionnaire on Google Forms was sent to individuals who had volunteered to participate in the study and who matched the criteria for the sample of our research.

The sample of the research comprised Necmettin Erbakan University Faculty of Dentistry students who had access to the survey link via e-mail or various messaging platforms; who volunteered to participate in the study; and who had received distance undergraduate education during the COVID-19 pandemic. The survey study was published by the Ministry of Internal Affairs of the Republic of Turkey on May 30, 2022. The survey was conducted in June 2022, after a circular stating that the epidemic had ceased to be a threat to public health.

The questionnaire consists of three parts. The first part collected demographic information, such as the gender and study level of participants, and whether they had received distance education during the COVID-19 pandemic period. In order to exclude any students participating in the survey who had not received distance education, a "no" option was included for the question asking for this information.

The questionnaires of participants who answered “no” to this question were not included in the study.

The second part contains two questions asking participants to report their anxiety during the COVID-19 period and in recent months. A numeric rating scale (NRS), which is a subjective evaluation method, was used to answer these questions (13). Students were asked to score their anxiety levels according to a value between 0 and 10, where 0 means “I am not at all worried” and 10 means “I am extremely worried” (14).

The last part contained three Likert-type questions, which asked the opinions of participants about the theoretical dentistry courses taught by distance education. In order to collect qualitative observations, an open-ended question was added to this last part of the questionnaire, which asked students to write down any thoughts they wanted to add. The question-and-answer options of the questionnaire are presented in Table 1.

**Table 1.** Questionnaire evaluating the opinions of dentistry students about distance education.

Questions		Answer options
1st Part	Your gender	Female Male
	Your grade	1st grade 2nd grade 3rd grade 4th grade 5th grade
	Did you receive distance education for dentistry education during the COVID-19 pandemic?	Yes No
2nd Part	Q.1. Rate your level of anxiety about the COVID-19 pandemic.	Numeric rating scale 0: I am not at all worried 10: I am extremely worried
	Q.2. Rate your level of anxiety about the pandemic in the last months.	Numeric rating scale 0: I am not at all worried 10: I am extremely worried
3rd Part	Q.1) Do you think the COVID-19 pandemic is causing you to miss out on educational opportunities?	Yes I'm undecided No
	Q.2) Do you think online exams are a useful method for assessing students?	Yes I'm undecided No
	Q.3) Did you feel more motivated/enthusiastic while following distance education?	Yes I'm undecided No
	Q.4) Would you prefer distance education to face-to-face education?	Yes I'm undecided No
	Q.5) Do you think technology-based education is beneficial for you?	Yes I'm undecided No
	Q.6) Do you think that courses taught via distance education and face-to-face make-up programs should be used during the COVID-19 period?	Yes I'm undecided No
	Q.7) Do you think that theoretical training should be provided via distance education during the post-COVID-19 period?	Yes I'm undecided No
	If you have anything to add about distance education in dentistry, please specify.	(Open-ended question)

## Statistical analysis

The IBM SPSS Statistics software package (IBM Corp., V 22.0. Armonk, NY, USA) was used for the analysis of the obtained data. Categorical data were expressed as numbers and percentages. The normality evaluation of the numerical data was analyzed using the Kolmogorov-Smirnov test. Since the numerical data indicated normal distribution, mean and standard deviation values were given. An independent sample t-test was used for the comparison of the measurement values between the groups, and a one-way analysis of variance test was used for the comparison of more than two groups. Pearson's correlation analysis was used to evaluate the relationship between the two scales in the second part of the study. A p value of <0.05 was considered statistically significant.

## Results

A total of 303 dentistry students participated in the study; 297 students (98.1%) who completed the questionnaire were included. Altogether 40.7% (n = 121) of the participants were men, and 59.3% (n = 176) were women. Regarding the study level, 25.6% (n = 76) of the participants were in the first grade, 19.5% (n = 58) were in the second grade, 24.6% (n = 73) were in the third grade, 22.2% (n = 66) were in the fourth grade, and 8.1% (n = 24) were in the fifth grade (see Table 2).

There was no statistically significant difference between the levels of anxiety about the pandemic disease during the COVID-19 pandemic or in the last months based on the gender of the participants ( $p = 0.056$ ). There was no statistically significant difference between the levels of anxiety related to the pandemic disease during the COVID-19 pandemic or in the last months based on the study level of the participants ( $p = 0.066$ ) (see Table 3).

**Table 2.** Comparison of the coloring effects of different coffee types

		n (%)
Gender	Male	121 (40.7)
	Female	176 (59.3)
Grade	1st Grade	45 (88.2)
	2nd Grade	35 (92.1)
	3rd Grade	69 (98.6)
	4th Grade	72 (97.3)
	5th Grade	24 (92.3)
Did you receive distance education for dentistry education during the COVID-19 pandemic?		
	Yes	297 (100)
	n	Average (ss)
Rate your level of anxiety about the COVID-19 pandemic.	297	6,27 (2.29)
Rate your level of anxiety about the pandemic in the last months.	297	3,61 (2.33)
		n (%)
Do you think the COVID-19 pandemic is causing you to miss out on educational opportunities?	Yes	161 (54.2)
	No	92 (31)
	Undecided	44 (14.8)
Do you think online exams are a useful method for assessing students?	Yes	112 (37.7)
	No	103 (34.7)
	Undecided	82 (27.6)
Did you feel more motivated/enthusiastic while following distance education?	Yes	101 (34)
	No	137 (46.1)
	Undecided	59 (19.9)
Would you prefer distance education to face-to-face education?	Yes	120 (40.4)
	No	120 (40.4)
	Undecided	57 (19.2)
Do you think technology-based education is beneficial for you?	Yes	157 (52.9)
	No	62 (20.9)
	Undecided	78 (26.3)
Do you think that courses taught via distance education and face-to-face make-up programs should be used during the COVID-19 period?	Yes	47 (15.8)
	No	167 (56.2)
	Undecided	83 (27.9)
Do you think that theoretical training should be provided with distance education in the post-COVID-19 period?	Yes	139 (46.8)
	No	97 (32.7)
	Undecided	61 (20.5)

**Table 3.** Gender- and class-based comparison of anxiety levels

	Gender	n	Average (ss)	p
P2.Q1	Male	121	5.97 (2.54)	0.056
	Female	176	6.48 (2.09)	
P2.Q2	Male	121	3.65 (2.72)	0.066
	Female	176	3.58 (2.02)	
	Year Level	n	Average (ss)	p
P2.Q1	1st Year	76	6.12 (2.62)	0.472
	2nd Year	59	5.98 (2.36)	
	3rd Year	72	6.29 (2.18)	
	4th Year	66	6.70 (2.01)	
	5th Year	24	6.25 (2.07)	
	Total	297	6.27 (2.29)	
	1st Year	76	3.78 (2.79)	0.110
P2.Q2	2nd Year	59	3.29 (2.04)	
	3rd Year	72	3.24 (2.05)	
	4th Year	66	4.18 (2.36)	
	5th Year	24	3.42 (1.86)	
	Total	297	3.61 (2.33)	

There was a statistically significant, positive, and strong correlation between the participants' anxiety over the entirety of the COVID-19 pandemic and their anxiety with respect to the pandemic in the last few months ( $r: 0.604$ ,  $p < 0.05$ ). No statistically significant difference was found between genders in terms of the

status of receiving distance education for dentistry during the pandemic ( $p > 0.05$ ). In both groups, the number of individuals receiving such education was high, but the first-year students accounted for the lowest number of recipients of distance education for dentistry ( $p = 0.001$ ) (Table 4).

**Table 4.** Comparison of distance education received according to gender and year level

	Gender	Yes n (%)	No n (%)	Total n (%)	p
	Male	113 (93.4)	8 (6.6)	121 (100)	0.661
	Female	161 (91.5)	15 (8.5)	176 (100)	
	Total	274 (92.3)	23 (7.7)	297 (100)	
	Year Level	Yes n (%)	No n (%)	Total n (%)	p
	1st Year	56 (73.7)	20 (26.3)	76 (100)	0.001
	2nd Year	56 (96.6)	2 (3.4)	58 (100)	
	3rd Year	72 (98.6)	1 (1.4)	73 (100)	
	4th Year	66 (100)	0 (0)	66 (100)	
	5th Year	24 (100)	0 (0)	24 (100)	
	Total	274 (92.3)	23 (7.7)	297 (100)	

The female participants answered “yes” at a higher rate than their male counterparts when asked whether the COVID-19 pandemic resulted in missed educational opportunities ( $p = 0.042$ ). However, the latter exceeded the former in terms of choosing “yes” as a response to whether online exams are a useful method for evaluating students ( $p = 0.001$ ). They were also more strongly motivated/willing to adhere to distance education than women ( $p = 0.001$ ). Finally, compared with the female participants, more male

respondents preferred distance education to face-to-face instruction ( $p = 0.001$ ), viewed technology-based education as beneficial ( $p = 0.037$ ), and believed that theoretical instruction should be provided under distance education in the post-COVID-19 period ( $p = 0.006$ ) (Table 5). However, many members of both groups did not believe it was necessary to deliver distance education courses and face-to-face make-up programs during the COVID-19 pandemic ( $p = 0.037$ ).

**Table 5.** Comparison of participants' opinions about theoretical dentistry courses taught via distance education according to gender

	Gender	Yes n (%)	No n (%)	Undecided n (%)	Total n (%)	p
P3.Q1	Male	60 (49.6)	47 (38.8)	14 (11.6)	121 (100)	0.042
	Female	101 (57.4)	45 (25.6)	30 (17)	176 (100)	
	Total	161 (54.2)	92 (31)	44 (14.8)	297 (100)	
P3.Q2	Male	64 (52.9)	31 (25.6)	26 (21.5)	121 (100)	0.001
	Female	48 (27.3)	72 (40.9)	56 (31.8)	176 (100)	
	Total	112 (37.7)	103 (34.7)	82 (27.6)	297 (100)	
P3.Q3	Male	57 (47.1)	41 (33.9)	23 (19)	121 (100)	0.001
	Female	44 (25)	96 (54.5)	36 (20.5)	176 (100)	
	Total	101 (34)	137 (46.1)	59 (19.9)	297 (100)	
P3.Q4	Male	66 (54.5)	39 (32.2)	16 (13.2)	121 (100)	0.001
	Female	54 (30.7)	81 (46)	41 (23.3)	176 (100)	
	Total	120 (40.4)	120 (40.4)	57 (19.2)	297 (100)	
P3.Q5	Male	74 (61.2)	18 (14.9)	29 (24)	121 (100)	0.037
	Female	83 (47.2)	44 (25)	49 (27.8)	176 (100)	
	Total	157 (52.9)	62 (20.9)	78 (26.3)	297 (100)	
P3.Q6	Male	22 (18.2)	70 (57.9)	29 (24)	121 (100)	0.374
	Female	25 (14.2)	97 (55.1)	54 (30.7)	176 (100)	
	Total	47 (15.8)	167 (56.2)	83 (27.9)	297 (100)	
P3.Q7	Male	67 (55.4)	27 (22.3)	27 (22.3)	121 (100)	0.006
	Female	72 (40.9)	70 (39.8)	34 (19.3)	176 (100)	
	Total	139 (46.8)	97 (32.7)	61 (20.5)	297 (100)	

The number of students who thought that the COVID-19 pandemic led to missed educational opportunities was high at all year levels ( $p = 0.403$ ). The highest number of participants who regarded the use of online exams as a useful method for evaluating students was the first-year students, whereas the lowest was the second-year participants ( $p = 0.001$ ). The fourth-year students were the most strongly motivated/willing to adhere to distance education, whereas the sophomores were the least motivated/willing ( $p = 0.016$ ). The former also exhibited the strongest preference for distance education over face-to-face instruction, whereas the third-year students showed the least preference for the

mentioned mode of education ( $p = 0.038$ ). Yet again, the fourth-year students most strongly regarded technology-based education as beneficial, but the fifth-year students showed the least agreement with this idea ( $p = 0.018$ ). In all the year levels, a considerable number of students were of the opinion that distance education courses and face-to-face make-up programs should be offered during the pandemic ( $p = 0.249$ ). With respect to such a provision after the pandemic period, the greatest agreement with the statement was found among the fourth-year respondents, whereas the least occurred among the fifth-year participants ( $p = 0.038$ ) (Table 6).



**Table 6.** Comparison of participants' opinions about theoretical dentistry courses taught via distance education according to year level

	Year Level	Yes n (%)	No n (%)	Undecided n (%)	Total n (%)	p
P3.Q1	1st Year	40 (52.6)	21 (27.6)	15 (19.7)	76 (100)	0.403
	2nd Year	32 (55.2)	21 (36.2)	5 (8.6)	58 (100)	
	3rd Year	41 (56.2)	19 (26)	13 (17.8)	73 (100)	
	4th Year	3 (50)	26 (39.4)	7 (10.6)	66 (100)	
	5th Year	15 (62.5)	5 (20.8)	4 (16.7)	24 (100)	
	Total	161 (54.2)	92 (31)	44 (14.8)	297 (100)	
P3.Q2	1st Year	43 (56.6)	14 (18.49)	19 (25)	76 (100)	0.001
	2nd Year	13 (22.4)	29 (50)	16 (27.6)	58 (100)	
	3rd Year	21 (28.8)	27 (37)	25 (34.2)	73 (100)	
	4th Year	28 (42.4)	19 (28.8)	19 (28.8)	66 (100)	
	5th Year	7 (29.2)	14 (58.3)	3 (12.5)	24 (100)	
	Total	112 (37.7)	103 (34.7)	82 (27.6)	297 (100)	
P3.Q3	1st Year	28 (36.8)	32 (42.1)	16 (21.1)	76 (100)	0.016
	2nd Year	12 (20.7)	35 (60.3)	11 (19)	58 (100)	
	3rd Year	19 (26)	40 (54.8)	14 (19.2)	73 (100)	
	4th Year	34 (51.5)	20 (30.3)	12 (18.2)	66 (100)	
	5th Year	8 (33.3)	10 (41.79)	6 (25)	24 (100)	
	Total	101 (34)	137 (46.1)	59 (19.9)	297 (100)	
P3.Q4	1st Year	31 (40.8)	32 (42.1)	13 (17.1)	76 (100)	0.038
	2nd Year	20 (34.5)	29 (50)	9 (15.5)	58 (100)	
	3rd Year	23 (31.5)	29 (39.7)	21 (28.8)	73 (100)	
	4th Year	38 (57.6)	20 (30.3)	8 (12.1)	66 (100)	
	5th Year	8 (33.3)	10 (41.7)	6 (25)	24 (100)	
	Total	120 (40.4)	120 (40.4)	57 (19.2)	297 (100)	
P3.Q5	1st Year	38 (50)	16 (21.1)	22 (28.9)	76 (100)	0.018
	2nd Year	27 (46.6)	17 (29.3)	14 (24.1)	58 (100)	
	3rd Year	39 (53.4)	10 (13.7)	24 (32.9)	73 (100)	
	4th Year	44 (66.7)	11 (16.7)	11 (16.7)	66 (100)	
	5th Year	9 (37.5)	8 (33.3)	7 (29.2)	24 (100)	
	Total	157 (52.9)	62 (20.9)	78 (26.3)	297 (100)	
P3.Q6	1st Year	12 (15.8)	40 (52.6)	24 (31.6)	76 (100)	0.249
	2nd Year	8 (13.8)	32 (55.2)	18 (31)	58 (100)	
	3rd Year	16 (21.9)	36 (49.3)	21 (28.8)	73 (100)	
	4th Year	9 (13.6)	46 (69.7)	11 (16.7)	66 (100)	
	5th Year	2 (8.3)	13 (54.2)	9 (37.5)	24 (100)	
	Total	47 (15.8)	167 (56.2)	83 (27.9)	297 (100)	
P3.Q7	1st Year	33 (43.4)	24 (31.6)	19 (25)	76 (100)	0.038
	2nd Year	24 (41.4)	23 (39.7)	11 (19)	58 (100)	
	3rd Year	31 (42.5)	26 (35.6)	16 (21.9)	73 (100)	
	4th Year	44 (66.7)	14 (21.2)	8 (12.1)	66 (100)	
	5th Year	7 (29.2)	10 (41.7)	7 (29.2)	24 (100)	
	Total	139 (46.8)	97 (32.7)	61 (20.5)	297 (100)	

## Discussion

Dental education, including clinical practice, is carried out intensively in Turkey and worldwide and has transitioned from face-to-face education to a distance education model (15). Studies evaluating distance education state that students should interact with their colleagues during web-based education, group learning is more active in a classroom environment, and listening to and understanding each other's ideas is necessary (16,17).

In online education, group learning occurs through social interaction (18). A previous study concluded that while dental students can adapt to online learning, they are concerned about their physical and mental health (19). Another study reported that distance education encouraged students to learn on their own and it improved their ability to use online resources (20), whereas other studies reported that face-to-face education is more effective than online education (15,21). Indeed, face-to-face sessions in the classroom are generally considered more valuable for students (22).

In our study, the choice of distance education was affected by academic year. Specifically, more fourth-year students than third-year students prefer distance education. Sritongthaworn et al. (23) and Teo et al. (24) reported that young students tend to adapt better to e-learning than older students. In addition, post-clinical physical fatigue, which students taking dental clinical practice may experience, plays a role in students' distance education, and some students find web-based education exciting and interactive, while others report feeling disadvantaged (25).

In our study, students' thoughts on distance education were generally positive. This finding is supported who stated that students were more motivated and willing in the distance education process. Other studies conducted to evaluate students' satisfaction with distance education stated that a web-based education-based classroom environment should be created for students to enable their interaction with colleagues so that they are active in a learning community and understand and test each other's ideas and concepts (16,17). Students who receive distance education reportedly have higher interaction and participation rates and perform better in their courses (26).

The integration of web-based learning with the virtual community reportedly can also encourage student participation and improve learning outcomes (27). In addition, our study shows that theoretical training should be included in distance education in the post-COVID-19 period. This ensures that distance education allows students to learn information at their own pace and times. Furthermore, in distance education, students can listen to their lectures again, have easy access to lecture notes, and participate in webinars (28). However, distance education also has some disadvantages for students, such as insufficient feedback from tutors, inability to express themselves adequately, and forgetting topics they have listened to quickly (10). Solutions can be achieved by further

developing the system and integrating interactive applications into it.

In the COVID-19 pandemic environment, unit area standardizations have also changed, the number of usable units in the current area has reduced, and clinical times have been limited due to the decrease in the number of students in the application groups, but an increased number of groups. The number of applications for students under normal conditions has also decreased. By developing the library digital archive, both faculty members and students have been provided with rapid access to resources (29).

Studies have shown that male students use the internet more frequently than female students (30,31). In our survey, male students gave a higher number of positive responses than female students to the questions of whether technology-based education is beneficial, their preference for distance education, and motivation for distance education. This could be attributed to the fact that male students spend more time on the internet, so they are more used to the online environment. Still, these methods only cover theoretical lessons. For courses that require practice, additional summer courses will need to be given after the pandemic ends (32). Since dental education requires intensive clinical practice in addition to theoretical education, this shortcoming causes inevitable anxiety among students (33).

In a study conducted with dentistry students in Turkey it was determined that students' anxiety levels increased during the COVID-19 pandemic (34). Mekhemar et al. (35) showed that dental students experienced mild anxiety, stress, and depression during the pandemic, and that women were significantly more affected than men. Our study showed that anxiety levels increased during the COVID-19 pandemic, especially later on, and there was a strong positive relationship between these two parameters.

## Conclusions

Compared to earlier in the COVID-19 pandemic, it was observed that there was a decrease in the anxiety scores among the participants when COVID-19 control measures were relaxed. Our study revealed a correlation between the increase in students' anxiety levels related to COVID-19 disease and the increase in the anxiety levels related to the pandemic.

In our study, it was observed that male students were more inclined to use the internet than female students. Therefore, technology-based education was more beneficial to them, and they preferred and were more motivated by distance education. The study has provided evidence of a better productivity experience in distance learning for dental students, since measures to control the COVID-19 pandemic have been reduced.

Due to the interruption of face-to-face education and the sudden transition to distance education caused by the COVID 19 pandemic, it is important to identify deficiencies in distance education to improve and develop this method of education.



Recent innovative technological approaches and the integration of blended learning into the curriculum to include the best features of classroom and distance learning have improved the overall dental education learning environment.

**Acknowledgments:** This study has been presented at the Necmettin Erbakan University 2<sup>nd</sup> International Dentistry Congress in Konya, Turkey held between October 1-3, 2022.

**Ethical Approval:** Ethics committee approval was received for this study from Necmettin Erbakan University, Faculty of Dentistry Scientific Research Ethics Committee, in accordance with the World Medical Association Declaration of Helsinki, with the approval number: 2022/142).

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Conception - H.Y.G.; Design - H.Y.G., M.S.; Supervision - H.Y.G.; Materials - H.Y.G., S.A.; Data Collection and/or Processing - H.Y.G., M.G.D.; Analysis and/or Interpretation - M.F., M.S.; Literature Review - H.Y.G., M.F.; Writer - H.Y.G.; Critical Review - İ.B.Y.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study has received no financial support.

## References

- Gewin V. Five tips for moving teaching online as COVID-19 takes hold. *Nature* 2020;580(7802):295-6. <https://doi.org/10.1038/d41586-020-00896-7>
- Gungor AS, Uslu YS, Donmez N. Perceptions of dental students towards online education during the COVID-19 pandemic. *Eur Oral Res* 2021;55(3):124. <https://doi.org/10.26650/eor.2021869185>
- Telli SG, Altun D. Coronavirüs ve çevrimiçi (online) eğitimin önlenemeyen yükselişi. *Üniversite Araştırmaları Derg* 2020; 3(1): 25-34. <https://doi.org/10.32329/uad.711110>
- Iyer P, Aziz K, Ojcius DM. Impact of COVID-19 on dental education in the United States. *J Dent Educ* 2020;84(6):718-22. <https://doi.org/10.1002/jdd.12163>
- Santos GNM, da Silva HEC, Leite AF, Mesquita CRM, Figueiredo PTS, Stefani CM, et al. The scope of dental education during COVID-19 pandemic: A systematic review. *J Dent Educ* 2021;85(7):1287-300. <https://doi.org/10.1002/jdd.12587>
- Asiry MA. Learning styles of dental students. *Saudi J Dent Res* 2016;7(1):13-7. <https://doi.org/10.1016/j.sjdr.2015.02.002>
- Alhabeeb A, Rowley J. Critical success factors for eLearning in Saudi Arabian universities. *Int J Educ Manag* 2017;31(2):131-47. <https://doi.org/10.1108/IJEM-01-2016-0006>
- Bernard RM, Abrami PC, Borokhovski E, Wade CA, Tamim RM, Surkes MA, et al. A meta-analysis of three types of interaction treatments in distance education. *Rev Educ Res* 2009;79(3):1243-89. <https://doi.org/10.3102/0034654309333844>
- Regmi K, Jones L. A systematic review of the factors - Enablers and barriers - Affecting e-learning in health sciences education. *BMC Med Educ* 2020;20(1):1-18. <https://doi.org/10.1186/s12909-020-02007-6>
- Keskin M, Özer Kaya D. COVID-19 Sürecinde öğrencilerin web tabanlı uzaktan eğitime yönelik geri bildirimlerinin değerlendirilmesi. *İKÇÜ SBFD* 2020;5(2):59-67.
- Pani SC, Vieira LAC. Integrating online learning management systems to dental simulation clinics-An example of blended learning in pediatric dentistry. *J Dent Educ* 2021;85(5):1163-6. <https://doi.org/10.1002/jdd.12381>
- Kakadia R, Chen E, Ohyama H. Implementing an online OSCE during the COVID-19 pandemic. *J Dent Educ* 2021; 85(5):1006-8. <https://doi.org/10.1002/jdd.12323>
- Walawender I, Rocznik W, Nowak D, Skowron M. Applicability of the numeric scale for anxiety evaluation in patients undergoing dental treatment. *Dent Med Probl* 2015;52(2):205-14.
- Nugent SM, Lovejoy TI, Shull S, Dobscha SK, Morasco BJ. Associations of pain numeric rating scale scores collected during usual care with research administered patient reported pain outcomes. *Pain Med* 2021;22(10):2235-41 <https://doi.org/10.1093/pm/pnab110>
- Temizci T. COVID-19 sürecinde diş hekimliği fakültesine yeni başlayan öğrencilerin uzaktan eğitime tepkileri. Necmettin Erbakan Üniversitesi Uluslararası Diş Hekimliği Kongresi. 1. Baskı. Ankara: Türkiye Klinikleri; 2022. p.74-7.
- Akyol Z, Garrison DR. The development of a community of inquiry over time in an online course: Understanding the progression and integration of social, cognitive and teaching presence. *Journal of Asynchronous Learning Networks* 2008;12:3-22. <https://doi.org/10.24059/olj.v12i3.72>
- Kuo YC, Walker AE, Belland BR, Schroder KEE. A predictive study of student satisfaction in online education programs. *Int Rev Res Open Distrib Learn* 2013;14(1):16-39. <https://doi.org/10.19173/irrodl.v14i1.1338>
- Clark C, Strudler N, Grove K. Comparing asynchronous and synchronous video vs. Text based discussions in an online teacher education course. *Online Learn J* 2015;19(3):1-22. <https://doi.org/10.24059/olj.v19i3.510>
- Abdalla E, Id E, Raja Mohd N, Naimie Z, Ahmadid A. Undergraduate dental students' perspective of online learning and their physical and mental health during COVID-19 pandemic. *PLoS One* 2022;17(6):e0270091. <https://doi.org/10.1371/journal.pone.0270091>
- Prati C, Pelliccioni GA, Sambri V, Chersoni S, Gandolfi MG. COVID-19: its impact on dental schools in Italy, clinical problems in endodontic therapy and general considerations. *Int Endod J* 2020;53(5):723-5. <https://doi.org/10.1111/iej.13291>
- Abbasi S, Ayoob T, Malik A, Memon SI. Perceptions of students regarding E-learning during Covid-19 at a private medical college. *Pakistan J Med Sci* 2020; 36(COVID19-S4): 57-61. <https://doi.org/10.12669/pjms.36.COVID19-S4.2766>
- Richardson JC, Maeda Y, Lv J, Caskurlu S. Social presence in relation to students' satisfaction and learning in the online environment: A meta-analysis. *Comput Human Behav* 2017;71:402-17. <https://doi.org/10.1016/j.chb.2017.02.001>
- Siritongthaworn S, Krairit D, Dimmitt NJ, Paul H. The study of e-learning technology implementation: A preliminary investigation of universities in Thailand. *Educ Inf Technol* 2006;11(2):137-60. <https://doi.org/10.1007/s11134-006-7363-8>
- Teo T, Luan WS, Thammetar T, Chattiwat W. Assessing e-learning acceptance by university students in Thailand. *Australas J Educ Technol* 2011;27(8):1356-68. <https://doi.org/10.14742/ajet.898>

25. Reime MH, Harris A, Aksnes J, Mikkelsen J. The most successful method in teaching nursing students infection control - E-learning or lecture? Nurse Educ Today 2008;28(7):798-806. <https://doi.org/10.1016/j.nedt.2008.03.005>
26. Lai CH, Lin HW, Lin RM, Tho PD. Effect of peer interaction among online learning community on learning engagement and achievement. Int J Distance Educ Technol 2019;17(1): 66-77. <https://doi.org/10.4018/IJDET.2019010105>
27. Panigrahi R, Srivastava PR, Sharma D. Online learning: Adoption, continuance, and learning outcome-A review of literature. Int J Inf Manage 2018;43:1-14. <https://doi.org/10.1016/j.ijinfomgt.2018.05.005>
28. Ay YE, Altındağ A, Güven ME. Ay YE, Altındağ A, Güven ME, Uyar M. Diş hekimliği öğrencilerinin COVID-19 pandemi döneminde uzaktan eğitim süreçleri. Necmettin Erbakan Üniversitesi Uluslararası Diş Hekimliği Kongresi. 1. Baskı. Ankara: Türkiye Klinikleri; 2022. p.148-53.
29. Onur Ö, Değer İşler S, Ak G, Peker K, Açıkgöz M. COVID-19 pandemi döneminde diş hekimliği eğitiminde yeni normaller. J Adv Res Heal Sci 2021;5(1):32-40. <https://doi.org/10.26650/JARHS2021-945208>
30. Okay Ş, Aydoğan E. MYO öğrencilerinin internet kullanım amaçlarının incelenmesine ilişkin bir araştırma. Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi. 2010;23:283-96.
31. Balcı Ş, Arsal Gölcü A, Eray Öcalan M. Üniversite öğrencileri arasında internet kullanım örüntüleri. Selçuk İletişim 2013; 7(4):5-22.
32. Machado RA, Bonan PRF, Perez DEDC, Martelli Júnior H. COVID-19 pandemic and the impact on dental education: discussing current and future perspectives. Braz Oral Res 2020;29;34:e083. <https://doi.org/10.1590/1807-3107bor-2020.vol34.0083>
33. Deery C. The COVID-19 pandemic: implications for dental education. Evid Based Dent 2020;21(2):46-7. <https://doi.org/10.1038/s41432-020-0089-3>
34. Özdede M, Sahin SC. Views and anxiety levels of Turkish dental students during the COVID-19 pandemic. J Stomatol 2020;73(3):123-8. <https://doi.org/10.5114/jos.2020.96867>
35. Mekhemar M, Attia S, Dörfer C, Conrad J. Dental students in Germany throughout the COVID-19 Pandemic: A psychological assessment and cross-sectional survey. Biology (Basel) 2021;10(7): 611. <https://doi.org/10.3390/biology10070611>