ORIGINAL ARTICLE

The Effect of Distance Learning in the Pandemic on the Depression, Anxiety, Stress, and Occupational Commitment of Senior Nursing Students: A Cross-sectional Study

Pandemide Uzaktan Eğitimin Hemşirelik Son Sınıf Öğrencilerinin Depresyon, Anksiyete, Stres ve Mesleki Bağlılıklarına Etkisi: Kesitsel Bir Çalışma

 Esin Çetinkaya Uslusoy[1], Eylem Paslı Gürdoğan[2], Berna Aksoy[2], Ezgi Kınıcı Dirik[2]

[1]Department of Nursing, Süleyman Demirel University Faculty of Health Sciences, Isparta, Turkey
[2]Department of Nursing, Trakya University Faculty of Health Sciences, Edirne, Turkey

Abstract

Objective: The study was conducted to determine the effects of distance learning during the pandemic on the depression, anxiety, stress, and professional commitment of senior nursing students.

Method: This study is descriptive and cross-sectional design. The population of the study consisted of senior students and the sample consisted of students who agreed to participate in the study (n=235). Data were collected at the academic year 2020-2021. The data were obtained with the socio-demographic characteristics form, depression, anxiety, stress 21 scale, and the scale of commitment to professional in nursing.

Results: As a result of the study, the mean depression level of the students was 7.05±4.42, the mean anxiety level was 5.44±4.24, the mean stress level was 7.42±4.01, and the mean score of the nursing professional commitment scale was 80.63±10.68. It was determined that female students feeling more stress than male students. In addition, there was a negative statistical relationship between increased depression, anxiety and stress and decreased professional commitment.

Conclusion: It was observed that students' depression, anxiety and stress levels increased, and their professional commitment decreased due to distance education. It is recommended that nurse educators provide support to students against psychological changes and develop strategies that will increase their professional commitment.

Keywords: Depression, anxiety, stress, senior nursing student, professional commitment

Öz

Amaç: Araştırma, pandemi döneminde uzaktan eğitimin hemşirelik son sınıf öğrencilerinin depresyon, kaygı, stres ve mesleki bağlılıklarına etkisini belirlemek amacıyla yapıldı.

Yöntem: Bu çalışma tanımlayıcı ve kesitsel bir çalışmadır. Çalışmanın evrenini son sınıf öğrencileri, örneklemini ise araştırmaya katılmayı kabul eden öğrenciler oluşturdu (n=235). Veriler 2020-2021 akademik yılında toplandı. Veriler sosyo-demografik özellikler formu, depresyon, kaygı, stres 21 ölçeği ve hemşirelikte mesleğe bağlılık ölçeği ile elde edildi.

Bulgular: Çalışma sonucunda öğrencilerin depresyon düzeyinin ortalaması 7,05±4,42, kaygı düzeyinin ortalaması 5,44±4,24, stres düzeyinin ortalaması 7,42±4,01 olarak, hemşirelikte mesleğe bağlılık ölçeği puan ortalaması ise 80,63±10,68 olarak bulundu. Kadın öğrencilerin erkek öğrencilere göre daha fazla stres hissettikleri belirlendi. Ayrıca artan depresyon, kaygı ve stresin mesleki bağlılığı azalttığı arasında negatif yönde istatistiksel ilişki olduğu saptandı.

Sonuç: Öğrencilerin uzaktan eğitim nedeniyle depresyon, anksiyete ve stres düzeylerinin arttığı ve mesleki bağlılıklarının azaldığı görülmüştür. Hemşire eğitimcilerinin öğrencilere psikolojik değişimlere karşı destek sağlamaları ve mesleki bağlılıklarını artıracak stratejiler geliştirmeleri önerilmektedir.

Anahtar Kelimeler: Depresyon, anksiyete, stres, hemşirelik son sınıf öğrencisi, mesleğe bağlılık

Introduction

Coronavirus disease-2019 (COVID-19), which emerged in late 2019, was seen by the World Health Organization (WHO) in 118,000 people in 114 countries as of 11 March 2020. It was declared a pandemic after it caused the deaths of 4291 people (1). This pandemic gave rise to myriad problems in many areas. One of these areas was education. Schools were closed in many countries during the COVID-19 pandemic (2,3). It also effected the education system worldwide and to caused radical changes to traditional teaching methods (4). Some schools have started to continue their education by choosing systems that support distance learning (3).

In the wake of COVID-19, the traditional teacher-centered education model has turned into student-centered model. E-learning is advantageous in that lessons are available anywhere and anytime. However, it also suffers from some disadvantages such as lack of student feedback, requirement for self-motivation, dependence on the expensive digital tools and internet and difficulty in transferring affective and psychomotor skills (4,5). Although theoretical courses in nursing education have been conducted through distance education in the past, educational activities for practical courses have been negative affected and changed in the face of the COVID-19 pandemic (6).

Some studies report that students must use many digital platforms or devices that they are not accustomed to during the transition to online education, and their interactions with instructors, peers, and patients are adversely affected (7-9).

The WHO (2020) has observed a very high reoccurrence of depression and identified it as the fourth significant cause of disease worldwide (10). Depression is increasingly widespread among university students, largely due to stress, which is an important and inevitable part of their studies (11).

Anxiety is a common symptom in society and can significantly reduce the quality of life of individuals. Stress and anxiety can weaken the immune system and make individuals vulnerable to diseases such as COVID-19. Evidence shows that in this process, like the public, students in the health field experience problems such as stress and anxiety and cannot fulfill their social duties (12,13).

Students may feel more stress due to the new expectations they face as part of enrolling in the nursing profession and the underlying unclearly regarding their academic advancement amid socializing into the nursing profession along pandemic. Studies have shown that nursing students are significantly more stressed than faculty members; some socio-demographic characteristics affect this, due to which they experience academic burnout (14-16).

Professional commitment includes personal commitment to professional values and goals, acting in consonance with these working towards professional activities, values, and being honorable of their professional careers (17). As nursing professional values and professionalism are improved through education and interacting with educators, the professionalism or lack of instructors can greatly affect the professional commitment of nursing students (18). By contact with role models, students can improve a positive attitude towards the nursing career, develop emotional identity, role expectations, and a sense of belonging (19). However, it has been determined that the stress feeling along pandemic process and the underlying complexity in clinical settings reduce the professional commitment of nursing students (20,21).

During the pandemic process, nursing students had to take distance learning. Therefore, their interaction with appropriate role models is limited. In this case, it is thought that their professional commitment may be affected.

Material and Method

Aim

This study aims to determine the effects of distance learning along pandemic, one of the extraordinary situations on depression, anxiety, stress, and the professional commitment of senior nursing students.

Design

This study is descriptive and cross-sectional design.

Participants

Participants were students at a city-based university in Turkey's Mediterranean Region, studying in a faculty of health science. Only senior nursing students who volunteered to participate in the study were included. First, 2nd, and 3rd year students were not included in the study. The sample consisted of 235 senior nursing students who answered the questions completely between May and June 2021.

Data Collection

Socio-demographic characteristics form: In this form, there are questions about age, gender, having a psychological disorder, distance learning during the pandemic, and nursing during the pandemic.

Depression, anxiety, and stress (DAS-21) scale: The scale created by Lovibond and Lovibond (1995) was converted

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Main Points

- During the pandemic, students may be quite vulnerable to mental health problems and may experience mental health problems.

- During the pandemic process, the distance learning method interrupted especially skill development and clinical education.

- It was determined that senior nursing students experienced depression and anxiety.

- Nursing students' depression, anxiety, and stress conditions negative affected their professional commitment.

into a 21-item short-form by Henry and Crawford (22). The 21-item short-form (DAS-21) of the scale was adapted into Turkish by Saricam (23). This scale is a 4-point Likert-type scale and comprises seven questions each measuring "depression, stress and anxiety dimensions". In the depression dimension, the aim is to measure emotions and situations such as pessimism, slackness, and difficulty in starting any work, low morale, grief, worthlessness, malaise, and reluctance, feeling life meaningless. Anxiety dimension includes the evaluation of emotions and situations such as fear, panic, anxiety, as well as the body's reactions to them. In the stress dimension, the aim is to measure emotions and situations such as not being comfortable, having difficulty in comfort, anger, anger, impatience, and intolerance. If the depression score averages are higher than 5 score, the anxiety score averages are higher than 4 score, and the stress point averages are higher than 8 score, which indicates the presence of these emotional states. The Cronbach Alpha values for this study were as follows: 0.88 for depression, 0.87 for anxiety, and 0.84 for stress.

Professional commitment in nursing scale (PCNS): The scale was created to establish the level of professional commitment of nurses [Lu et al. (24)]. The scale was adapted into Turkish by Cetinkaya et al. (25). The four-point Likert-type scale consists of 26 items. The score to be taken from the whole scale is from 26-104. The higher the mean scores obtained from the professional commitment in nursing scale, the higher the professional commitment. The Cronbach alpha value of the scale in this study was 0.91.

Data Collection Process

The research was conducted online, as distance learning was carried out during the COVID-19 pandemic. Socio-demographic characteristics form and scales questions were processed into "Google forms" and a shareable link was created. Data collection forms were sent to students' e-mail addresses. Formed approval page was introduced to the students on the entry page of the forms and the students who accepted answered.

Statistical Analysis

Research data were evaluated using the IBM Statistical Package for the Social Sciences (version 26.0) package program. When evaluating the demographic data obtained, frequencies (number, percentage) were used for categorical variables and descriptive statistics [mean, standard deviation (SD)] were used for numerical variables. One-Way ANOVA tests and Independent-Samples t-test were used to compare quantitative continuous data between independent groups. Relationships between scales were evaluated using Pearson Correlation Analysis. Statistical significance cut-off value was accepted as $p < 0.05$.

Ethical Consideration

Permissions from the relevant institutions and Süleyman Demirel University's Ethics Committee approval (date: 10.11.2021, number: 53/5) were obtained to conduct the

research. Informed consent was signed by the students before starting the research. It was stated to the students that their participation in the study was voluntary, that they could terminate their participation at any point, and that the information they provided would not be used outside of the research.

Results

Socio-demographic Characteristics of Nursing Students

The mean age of the nursing students was 22.25 ± 1.43, with 76.4% female and 83% female (Table 1). Importantly, 88.5% of the students stated that they did not have a psychological disorder, whereas 82.1% stated that the distance learning given during the pandemic increased their stress. Also, 77.4% of them stated that they thought that the distance learning they received was not sufficient, and 76.6% of them stated that they were not ready to start their profession with the distance learning they received. However, 62.6% of the students stated that they would like to work in the pandemic when they graduate.

DAS-21 Level of Participants

The depression mean scores of the students were higher than 5 (M=7.05, SD=4.42), the anxiety score mean was higher than 4 (M=5.44, SD=4.24) and the stress score mean was lower than 8 (M=7.42, SD=4.01) was determined. In this case, it can be said that students' depression and anxiety levels are high and their stress levels are low. When the mean scores of the students' commitment to the nursing profession were examined, they were found to score M=80.63, SD=10.68, and their commitment to the profession was at a good level (Table 2).

Relationship Between Participants Demographic Data, Perceived Depression, Anxiety, Stress Levels, and Professional Commitment

In Table 3, comparisons of students' characteristics and DAS-21 and NPCS were given. In the study, female students were observed to experience more stress than male students (t=2.268, p=0.024). It was determined that distance learning increased the level of depression (t=3.321, p=0.001), anxiety (t=3.693, p=0.000) and stress (t=3.464, p=0.001) in students. The stress (t=-2.497, p=0.013) level of the students who did not think that the distance learning given during the pandemic was sufficient to start the profession was found to be higher. Depression (t=-4.346, p=0.000), anxiety (t=-3.276, p=0.001) and stress (t=-4.834, p=0.000) levels of students who did not feel ready to do their job with distance learning during the pandemic process were higher was found to be excessive. Depression (F=5.593, p=0.004) and anxiety (F=3.134, p=0.045) levels were higher in students who had a negative view of the nursing profession before the pandemic. Along with the pandemic, students who currently have a negative view of the nursing profession were found to have higher depression (F=16.225, p=0.000), anxiety (F=4.904, p=0.008) and stress (F=13.587, p=0.000) levels. Depression (F=5.992, p=0.003) and stress (F=4.845,

Table 1.
Participants' Characteristics (n=235)

Participants' characteristics	n	%
Age mean of age = 22.25±1.43		
Gender Female Male	195 40	83.0 17.0
Have you been diagnosed with a psychological disorder before? Yes No	27 208	11.5 88.5
Did distance learning increase your stress about education during the pandemic process? Yes No	193 42	82.1 17.9
Do you think that the distance learning you received during the pandemic process is enough to start the profession? Yes No	53 182	22.6 77.4
Do you feel ready to work as a profession with the distance learning you received during the pandemic process? Yes No	55 180	23.4 76.6
What was your perspective on the nursing profession before the pandemic? Positive Negative Indecisive	165 26 44	70.2 11.1 18.7
How is your perspective on the nursing profession with the pandemic? Positive Negative Indecisive	111 53 71	47.2 22.6 30.2
Are you willing to do your job during the pandemic process when you graduate? Positive Negative Indecisive	147 23 65	62.6 9.8 27.7

Table 2.
Mean Scores of DASS and PCNS (n=235)

	Min	Max	Mean	SD
Depression	0	20	7.05	4.42
Anxiety	0	20	5.44	4.24
Stress	1	20	7.42	4.01
PCNS	55	101	80.63	10.68

PCNS=professional commitment in nursing scale, DASS=depression, anxiety and stress scale, SD=standard deviation

p=0.009) levels were found to be higher in students who were not willing to do their job during the pandemic process upon their graduation (Table 3).

Students who thought that the distance learning they received during the pandemic was not sufficient (t=1.975, p=0.049) and who did not feel ready to do the profession (t=2.153, p=0.032) were found to be less committed to the profession. Students who perceived the nursing profession negatively before the pandemic (F=43.335, p=0.000) and during the pandemic (F=41.272, p=0.000) and did not want to do their job during the pandemic (F=31.728, p=0.000) were also found to have a lower professional commitment (Table 3).

Correlation of Depression, Anxiety and Stress Scale (DAS) and PCNS

As a result of the correlation analysis, there was a weak but negative significant relationship between professional commitment and depression (r=-0.271, p=0.000), anxiety (r=-0.165, p=0.011) and stress (r=-0.231, p=0.000) was determined (Table 4). According to this result, with an increase in DAS-21 levels of senior nursing students increase, their commitment to the nursing profession decreases.

Discussion

This research was conducted to determine the effects of distance learning on depression, anxiety, stress, and professional commitment of senior nursing students during the pandemic. It was observed that students' DAS-21 levels increased, and their professional commitment decreased due to distance education.

In this study, it was determined that female students were more stressed than male students. Asturias et al. (14) and Fawaz and Samaha (26) concluded that female students are more stressed than male students in their studies. During the pandemic, women feel more psychologically vulnerable than men due to additional responsibilities at home. The psychological impact of the pandemic is therefore significantly higher among women. In addition, women often have higher levels of stress, insomnia, anxiety, adjustment disorder, perceived stress, and depression than men (27).

It has been reported that students are very vulnerable to mental health problems and their mental health problems increase along pandemic (28,29). This may affect not only students' personal health and academic performance but also their contact with patients during clinical placement and the quality and safety of health care provided. During the pandemic process, the distance learning method has interrupted especially skill development and clinical education. Therefore, the stress and anxiety levels of the students who felt themselves professionally inadequate due to distance learning were found to be high in this study. In other studies, it can be observed that the experienced stress among nursing students increased moderately along pandemic, and fourth-year students had an experienced

Table 3.
Comparison of Mean Scores of Scales (n=235)

Participants' characteristics	DASS			PCNS $\overline{X} \pm SD$
	Depression $\overline{X} \pm SD$	Anxiety $\overline{X} \pm SD$	Stress $\overline{X} \pm SD$	
Gender Female[a] Male[b]	7.07±4.2 6.97±4.5 t=0.132 p>0.05	5.6±4.2 4.67±4.3 t=1.258 p>0.05	7.69±4.1 6.12±3.2 t=2.268 **p=0.024**	80.64±10.4 80.57±11.9 t=0.38 p>0.05
Have you been diagnosed with a psychological disorder before? Yes No	8.4±4.1 6.88±4.4 t=1.689 p>0.05	6.25±4.2 5.33±4.2 t=1.064 p>0.05	6.44±3.8 7.55±4.0 t=-1.351 p>0.05	81.03±11.7 80.58±10.5 t=0.208 p>0.05
Did distance learning increase your stress about education during the pandemic process? Yes No	7.49±4.5 5.04±3.3 t=3.321 **p=0.001**	5.9±4.3 3.3±2.6 t=3.693 **p=0.000**	7.83±3.9 5.52±4 t=3.464 **p=0.001**	80.48±10.5 81.30±11.2 t=-0.451 p>0.05
Do you think that the distance learning you received during the pandemic process is enough to start the profession? Yes No	6.52±5.1 7.21±4.1 t=-0.993 p>0.05	5.15±4.5 5.52±4.1 t=-0.568 p>0.05	6.22±4.3 7.77±3.8 t=-2.497 **p=0.013**	83.16±11.4 79.89±10.3 t=1.975 **p=0.049**
Do you feel ready to work as a profession with the distance learning you received during the pandemic process? Yes No	4.87±4.1 7.72±4.3 t=-4.346 **p=0.000**	3.83±3.5 5.93±4.3 t=-3.276 **p=0.001**	5.23±3.4 8.09±3.9 t=-4.834 **p=0.000**	83.32±11.9 79.81±10.1 t=2.153 **p=0.032**
What was your perspective on the nursing profession before the pandemic? Positive[a] Negative[b] Indecisive[c]	6.46±4.1 9.07±3.7 8.09±5.2 F=5.593 p=0.004 b>a,c	5.04±4.1 7.11±4.59 5.95±4.6 F=3.134 **p=0.045** **b>a,c**	7.03±3.9 8.5±4.1 8.25±4.9 F=2.669 p>0.005	84.24±9.5 71.00±9.2 72.79±7.3 F=43.335 p=0.000 a>b,c
How is your perspective on the nursing profession with the pandemic? Positive[a] Negative[b] Indecisive[c]	6.25±4.1 9.92±4.8 6.18±3.6 F=16.225 **p=0.000** **b>a,c**	4.81±4.1 6.98±4.5 5.26±4.1 F=4.904 **p=0.008** **b>a**	6.74±3.7 9.83±3.9 6.69±3.8 F=13.587 **p=0.000** **b>a,c**	85.39±9.8 71.45±7.56 80.04±9.3 F=41.272 **p=0.000** **a>b>c**
Are you willing to practice your profession during the pandemic process when you graduate? Yes[a] No[b] Indecisive[c]	6.51±4.4 9.82±4.4 7.32±4.1 F=5.992 **p=0.003** **b>c>a**	5.33±4.1 6.43±4.5 5.33±4.2 F=0.696 p>0.005	6.86±3.9 9.3±4.6 8.03±3.7 F=4.845 **p=0.009** **b>a**	84.28±9.7 70.52±6.9 75.93±9.7 F=31.728 **p=0.000** **a>b,c**

F=One-Way ANOVA test, t=Independet Student t-test, p<0.05 significant value, SD=standard deviation

stress score above the average (7,15,30). These results are like this study. However, Sveinsdóttir et al. (31), on the other hand, most of the students reported that their studies went well during the pandemic, that they liked online learning, that they were able to organize them, that they had enough time to study, and that they received enough support. The study's results suggest that most of the students pursue their nursing education actively even though the COVID-19

Table 4.
Correlation of Depression, Anxiety and Stress Scale and Professional Commitment in Nursing Scale (n=235)

	Depression	Anxiety	Stress
Professional commitment in nursing scale	r=-0.271 p= 0.000	r=-0.165 p= 0.011	r=-0.231 p=0.00
r=Pearson Correlation, p<0.05 significant value			

pandemic. In addition, most of the students stated their physical and mental health as good and stated that they did not feel significant stress. This discrepancy in research findings can be described by the fact that Icelandic students were able to participate in the clinical part of their studies and therefore continue their programs mostly continuous despite the pandemic, while students from other countries could not.

Distance learning has been implemented in many countries during the pandemic. Most nursing students could not do face-to-face training. In this study, 77.4% of the students stated that they thought that they could not get enough education with distance learning in the pandemic to start the profession. Bdair (32) emphasizes that online learning can be used as an alternative method and that eliminating the difficulties related to online education (such as lack of students' feedback, students' lack of in using the software programs) will increase the quality of education. On the other hand, Singh et al. (5) determined that medical and nursing students experience headaches and anxiety in distance learning and that only 30% of them can interact with the instructors. The results of the study show that for distance learning to be effective, the necessary infrastructure and the competence of the instructor to provide online education should be provided.

Students in the health field are expected to fulfill their responsibilities to help people in a society overcome their physical and mental problems. Deng et al. (33) determined that the prevalence of anxiety and depression symptoms increased in higher education students comparatively the pre-pandemic period. Faronbi et al. (34) reported that nursing students receiving open and distance learning experience mild to moderate depression. Similarly, Bai et al. (35) found that Chinese nursing students had irritability, uncontrollable anxiety, relaxation problems, and depressed mood during the COVID-19 pandemic. Thus, it can be seen that the pandemic has brought many unknowns. Due to distance learning, nurse candidates who will graduate, although they have theoretical knowledge, cannot be sure of practical knowledge.

In this study, many of the students defined that they did not feel ready to start their profession in the pandemic with the distance learning they received along pandemic, and the depression, stress, and anxiety levels of these students were high. Studies show that although nursing and medical students have willingness and a high moral responsibility to treat infected patients, their confidence in treating contaminated patients is low (36). This situation shows that distance learning given is not sufficient for clinical work in applied sciences, and various teaching methods used in distance learning such as video, movie watching, case discussion do not replace the real patient. Cheah et al. (37), in their study, determined that medical and nursing students have a high willingness and determination to treat COVID-19 patients, demonstrating their potential workforce as healthcare providers. Similarly, most students were willing to practice the profession in the pandemic, even though they think that they do not get enough education and do not feel ready for the pandemic.

Nursing students' professional commitment largely reflects their degree of commitment and positive attitudes toward their profession, which serve as strong predictors of their future commitment to work. Therefore, those with higher levels of professional commitment during academic study are likely to exhibit better professional commitment after becoming registered nurses (38). However, many studies have shown that negative emotions tend to affect health care workers and college students during the COVID-19 pandemic (39,40). Therefore, it is important to increase nursing students' professional commitment by reducing their negative emotions. Evidence from nursing students shows that their level of commitment to nursing programs is damaged by high levels of stress. In this study, it was found that as the depression, stress, and anxiety levels of the students increased, their professional commitment was negatively affected. Students may experience that they identify with this field of study, but when under stress, they may believe that they incomplete the necessary skills to be successful and/or they may perceive the nursing profession as something unwanted for them personally (21). Li et al. (41) who obtained similar findings in their study, emphasize that effective intervention strategies are urgently needed to ensure the healthy and sustainable development of nursing professionals during the COVID-19 pandemic process and to increase the level of professional commitment of nursing students by reducing negative emotions and improving their psychological capital.

It is thought that the positive professional perception of the student will increase the motivation, self-confidence, satisfaction in his professional life as a health care professional, and the standard of the health care service he provides. The service provided to society by a nurse equipped with a positive perception of profession and professional qualifications will be of higher quality. In this study, it was defined that students' negative professional perceptions increased during the pandemic compared to the pre-pandemic period, and their positive professional perceptions decreased. This could be attributed to the health policies (overwork, shortage of nurses, increased risk, insufficient wages, etc.) regarding nurses carried out in this country during the pandemic process. Similarly, Mao et al. (42) found that the social factors of the profession negatively affect the professional identity. In addition, they

found that first-year nursing students were more idealistic and committed to the profession, while final-year students were less committed. The reason for this is that as the level of education increases, the gap between the ideal in the profession and the realities is attributed to their experiences.

Study Limitations

The end of university and COVID-19 pandemic can be distressed term for students. therefore, stress levels may have been higher for this group of students depending on the timing of the survey.

Social desirability bias is another limitation of using self-report surveys. However, the study was conducted in only one nursing school. Therefore, generalization of the findings cannot be expected. In later research, they can use mixed or qualitative methodologies to examine their experiences more effectively.

Implication for Study

The COVID-19 pandemic process and the findings of this study assume significance in terms of strengthening the educational role of nurse educators and aiming to train nurses who will provide the most effective nursing care in different environments in changing and developing conditions. Therefore, this necessitates important changes that will change the educational environment not only during the pandemic process but also forever. In this context, the sharing of experience and the creation of accessible education opportunities by nurse educators with different resources and experiences are considered important in terms of developing more effective distance learning strategies. The findings can be used as a resource when structuring nursing programs or providing support for emotionally at-risk students. In addition, mental health screening and interventions should be carried out at appropriate intervals to prevent psychological disorders in such cases. However, factors that reduce students' professional commitment should be evaluated and interventions that increase professional commitment should be made.

Conclusion

In this study, it was observed that students' depression, anxiety and stress levels increased, and their professional commitment decreased due to distance education. For decrease negative feels, and increase professional commitment of nursing students, it is recommended that universities create opportunities for students with limited opportunities, constantly update their distance education infrastructure systems for all courses and develop more effective education methods for applied courses during the pandemic process.

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