

# Effect of Laughter Yoga on Anxiety, Depression and Physiological Parameters in Nursing Students During the COVID-19 Pandemic: A Randomized Controlled Study

## COVID-19 Pandemisi Sırasında Kahkaha Yogasının Hemşirelik Öğrencilerinde Anksiyete, Depresyon ve Fizyolojik Parametreler Üzerine Etkisi: Randomize Kontrollü Bir Çalışma

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**ABSTRACT Objective:** This study was conducted to determine the effects of laughter yoga (LY) on anxiety, depression and physiological parameters (heart rate, blood pressure and oxygen saturation measurements) in first-grade nursing students during the coronavirus disease-2019 (COVID-19) pandemic. **Material and Methods:** This randomized controlled study was conducted with 79 first-year nursing students studying at a state university in Türkiye who agreed to participate in the study. Students were randomly assigned to the intervention ( $n=39$ ) and control ( $n=40$ ) groups, and LY was applied to the intervention group. Data were collected by measuring Beck Depression Inventory, State-Trait Anxiety Inventory I-II and physiological parameters (blood pressure, pulse and oxygen saturation measurements). Data analysis was done with Mann-Whitney U and Wilcoxon sign tests. **Results:** State-Trait Anxiety Inventory I ( $z=-3.05$ ,  $p=0.002$ ) and II ( $z=-0.293$ ,  $p=0.049$ ) score averages were found to be lower in the intervention group after LY compared to the pre-intervention group ( $p<0.05$ ). It was found that the mean pulse rate ( $z=-2.7$ ,  $p=0.006$ ) and oxygen saturation ( $z=-3.9$ ,  $p=0.0001$ ) scores after LY in the intervention group were higher than before the intervention ( $p<0.05$ ). **Conclusion:** In this study, LY was found to be effective in reducing anxiety, increasing heart rate and oxygen saturation, but not in depression and blood pressure. It is recommended that LY be integrated into the nursing education process in order to reduce the anxiety levels of university students and improve their physical health, even if there is no COVID-19 epidemic.

**Keywords:** Laughter yoga; nursing student; anxiety; depression; physiological parameters

**ÖZET Amaç:** Bu çalışma, koronavirüs hastalığı-2019 [coronavirus disease-2019 (COVID-19)] pandemisi sürecinde kahkaha yogasının birinci sınıf hemşirelik öğrencilerinde anksiyete, depresyon ve fizyolojik parametreler (kan basıncı, nabız hızı ve oksijen saturasyon ölçümü) üzerindeki etkilerini belirlemek amacıyla yapılmıştır. **Gereç ve Yöntemler:** Bu randomize kontrollü çalışma, Türkiye'de bir kamu üniversitesinde öğrenim gören ve araştırmaya katılmayı kabul eden 79 birinci sınıf hemşirelik öğrencisi ile yürütülmüştür. Öğrenciler, müdahale ( $n=39$ ) ve kontrol ( $n=40$ ) gruplarına rastgeli atanmış olup, müdahale grubuna kahkaha yogası uygulanmıştır. Araştırma verileri, Beck Depresyon Ölçeği, Durumlu-Sürekli Kaygı Ölçeği I-II ve fizyolojik parametrelerin (kan basıncı, nabız ve oksijen saturasyon ölçümü) ölçümü ile toplanmıştır. Verilerin analizi, Mann-Whitney U ve Wilcoxon işaretli sira testi ile yapılmıştır. **Bulgular:** Kahkaha yogası sonrası müdahale grubunda Durumlu-Sürekli Kaygı Ölçeği I ( $z=-3.05$ ,  $p=0.002$ ) ve II ( $z=-0.293$ ,  $p=0.049$ ) puan ortalamalarının müdahale öncesine göre daha düşük olduğu belirlendi ( $p<0.05$ ). Müdahale grubunda kahkaha yogası sonrası nabız hızı ( $z=-2.7$ ,  $p=0.006$ ) ve oksijen saturasyon ( $z=-3.9$ ,  $p=0.0001$ ) puan ortalamalarının müdahale öncesine göre daha yüksek olduğu bulundu ( $p<0.05$ ). **Sonuç:** Bu çalışmada, kahkaha yogasının kaygıyı azaltma, kalp atış hızını ve oksijen saturasyonunu artırmada etkili olduğu ancak depresyon ve tansiyon için etkili olmadığı bulunmuştur. Kahkaha yogasının COVID-19 salgını olmasa bile üniversite öğrencilerinin kaygı düzeylerini azaltmak ve fiziksel sağlıklarını iyileştirmek için hemşirelik eğitim sürecine entegre edilmesi önerilmektedir.

**Anahtar Kelimeler:** Kahkaha yogası; hemşirelik öğrencisi; endişe; depresyon; fizyolojik parametreler

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First-year nursing students encounter various stress factors that affect their psychological health in the first years of their education.<sup>1</sup> Coronavirus disease-2019 (COVID-19) pandemic is a global crisis and is one of these stress factors, and it seriously affects the education systems causing rapid changes in the education/teaching methods and the daily lives of the students.<sup>2</sup> The changes the students experienced during the pandemic process include fear of being infected, the restrictions applied to control and slow down the spread of the virus, feelings such as uncertainty, fear, confusion, panic, being socially isolated from society; and all these may cause stress, anxiety, depression, fear, sleep disturbances and physical discomfort in the students.<sup>3</sup> Failure to relieve stress may lead to tension, depression, rebellion, anxiety, smoking, alcohol, substance and drug use. In addition, if stress continues and progresses, impairs immune function and adversely affects physical, psychological and social well-being.<sup>4</sup> Eventually, the intense stress experienced by students may impair their learning capacity and motivation, the perceived stress level may increase and this may cause absenteeism and getting distant to nursing profession and the students may leave nursing education without graduating from their faculties.<sup>4</sup>

Studies have been carried out in many countries to better understand the physiological and psychological effects of the COVID-19 process and related factors in the university students. Wang et al. examined general population, and concluded that university students felt the psychological effects of the COVID-19 pandemic more intensely than other individuals in the society, and that the level of stress, anxiety and depression was higher in university students.<sup>5</sup> Cao et al. stated that 24.9% of university students felt anxiety symptoms during the COVID-19 pandemic.<sup>6</sup> In the study of Tang et al., the prevalences of stress and depression were found as 2.7% and 9.0%, respectively in university students quarantined at home during the COVID-19 pandemic.<sup>7</sup> It was determined that the main risk factors for psychological distress in students were fear of serious contamination, short sleep time, and living in places that were heavily affected by the pandemic. In the same study, it was concluded that the psychological

consequences of the pandemic may be serious in students, psychological interventions are necessary to reduce their fear and to improve their sleep quality, and students living in areas more affected by the pandemic should be given priority in interventions. In the study of Li et al., clinically significant psychological distress was found in 26.6% of the students studying health sciences during the COVID-19 pandemic, and acute stress reaction symptoms were found in 11.1%.<sup>8</sup> Savitsky et al. found that 42.8% of student nurses had moderate anxiety and 18.1% had severe anxiety during the COVID-19 pandemic.<sup>9</sup> The data showed that using humor as a coping method was associated with lower anxiety levels, however using mental disengagement methods (alcohol, sedatives, overeating) were associated with higher anxiety levels.

It is critical to support nursing students with evidence-based practices to reduce their stress, anxiety, depression, physical symptoms and increase their satisfaction and performance. As a matter of fact, Khodabakhshi-Koolaee has stated that it is important for the governments and schools to cooperate in order to provide high-quality, crisis-focused psychological services to students to solve these problems during the pandemic.<sup>10</sup> Gebhart et al., on the other hand, has recommended conducting experimental studies involving stress coping techniques in first-grade nursing students.<sup>1</sup> Among mind-body-based complementary practices, yoga, acupuncture, relaxation techniques, meditation can be used to increase well-being and facilitate adaptation to changes in the pandemic process.<sup>11</sup> One of the strategies that should be considered and executed is laughter yoga (LY), is a new, cost-effective and effective method.<sup>11</sup>

LY is a humorless, non-pharmacological, non-invasive complementary therapy that combines fake and real laughter with yoga breathing technique, supported by body movements, exercises such as neck and shoulder stretching, and rhythmic chants sung in a steady voice.<sup>12</sup> Laughter is initiated as a physical exercise by ensuring that everyone in a group makes eye contact and plays like a child. In many cases, this translates into a genuine and contagious laughter. It has been scientifically proven that our body cannot distinguish between real and fake laughter. LY is the only technique where adults can get heartfelt laugh-

ter without cognitive thinking. It disables intellectual systems that suppress and inhibit natural laughter.<sup>12</sup>

As a result of the studies conducted, LY reduces stress, depression and anxiety levels and turns negative emotions into positive ones.<sup>13</sup> When the studies on nursing students are examined, Ozturk and Tezel stated that LY had positive effects on general health, improved sleep disorder symptoms, decreased anxiety, depression, hostility, negative self and somatization, and improved social functions.<sup>14</sup> It has been stated that our body gives physical responses to laughter such as an increase in respiratory rate, blood oxygen saturation, heart rate, beta endorphin level; decrease in blood pressure, muscle tension, stress hormones such as cortisol, adrenaline.<sup>12,15</sup> In addition to reducing anxiety and depression, laughter is supposed to buffer the effects of these factors on the cardiovascular system. Despite the positive effects of LY on mental health, there is limited evidence for its physiological effects such as reducing pain and blood pressure or increasing endorphin and cortisol levels.<sup>16</sup>

When the literature was examined, online LY significantly reduced depression and increased in life satisfaction and psychological well-being and decreased anxiety.<sup>14,17</sup> In another study conducted with nurses during the pandemic, it was determined that LY significantly reduced perceived stress and burnout; while increased life satisfaction.<sup>11</sup> We suppose that this study will both contribute to the international literature, and provide moral, motivation and psychological support to students who have to cope with this stressful process. This study was conducted to determine the effects of LY on anxiety, depression and physiological parameters in first-grade nursing students during the COVID-19 pandemic. The hypotheses of the study are:

**H.1.** LY has an effect on reducing the level of anxiety during the pandemic process.

**H.2.** LY has an effect on reducing the level of depression during the pandemic process.

**H.3.** LY has an effect on increasing the heart rate and oxygen saturation during the pandemic process.

**H.4.** LY has an effect on reducing the blood pressure during the pandemic process.

## MATERIAL AND METHODS

### STUDY DESIGN

This study was conducted as a randomized controlled study including a pre-test, post-test and control group experimental design. This study was conducted on first-year nursing students at a state university faculty of health sciences, nursing department, Türkiye, in the fall semester of the 2021-2022 academic years.

### PARTICIPANTS

The inclusion criteria were first-grade nursing students who were aged above 18 years old, in good general health and did not use any medications. The exclusion criteria were conditions such as abdominal surgery, hypertension, chronic obstructive pulmonary disease, respiratory distress, glaucoma, hernia and epilepsy, which are the conditions that LY should be avoided unintended side effects of laughing.<sup>18</sup>

### SAMPLE SIZE AND SAMPLING

The universe of the research consisted of 121 students enrolled in the first grade of the Faculty of Health Sciences, Nursing Department of Çankırı Karatekin University, in the fall semester of the 2021-2022 academic years. Hundred and ten students who met the inclusion criteria and agreed to participate in the study were included in the study. A power analysis was performed to determine the sample size. With an effect size of 0.80, power of 0.90, a margin of error of 0.05, and to determine whether the difference between the mean values of the 2 groups was different from 0, the required sample size for each group was calculated as 28. Therefore, taking possible dropouts into account, the sample of the study consisted of 80 students (Figure 1).

Hundred and ten nursing students were numbered 1 to 110 according to the class list by a co-investigator blinded to the study. Random selection was made over <https://www.random.org> to eliminate the possibility of bias. Thirty nine students for the intervention group and 40 students for the control group were selected with a 1:1 distribution. However, one student from the intervention group wanted to exit the study. As a result, 79 students completed the study (intervention group n=39 and control group n=40) (Figure 1).

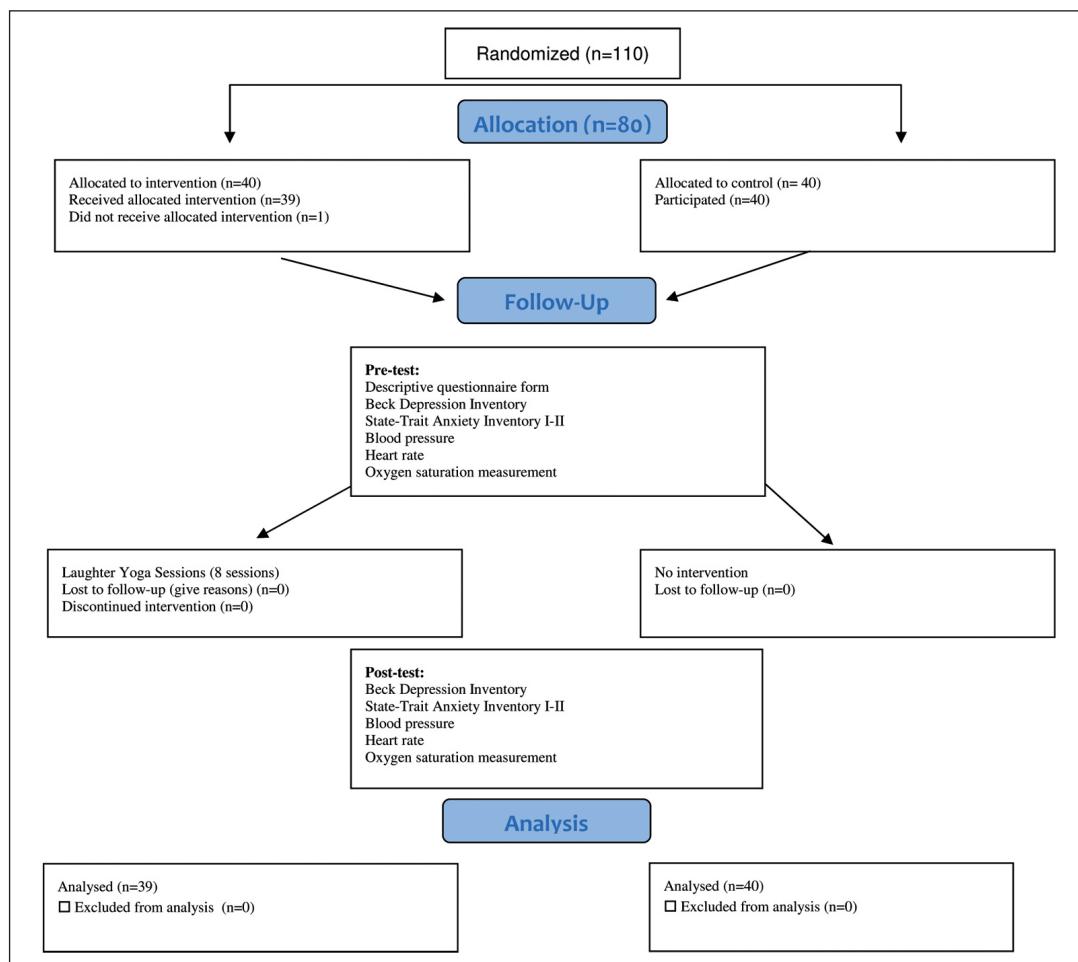


FIGURE 1: Study enrollment.

## DATA COLLECTION

Data were collected with descriptive questionnaire form, Beck Depression Inventory (BDI), State-Trait Anxiety Inventory I-II (STAI I-II) and physiological parameters (blood pressure, heart rate and oxygen saturation measurements).

## DESCRIPTIVE QUESTIONNAIRE FORM

This form includes questions about age, gender, graduated school, family structure, status of having had COVID-19, COVID-19 vaccination status, informed about the LY and LY training status.

## BDI

To measure depression symptoms, the 21-item BDI developed by Beck et al., was used.<sup>19</sup> Each item shows a symptom of depression. BDI, a self-report tool, is the most widely used depression measurement

tool around the world. BDI was translated into Turkish by Hisli, its psychometric properties were investigated, and it was found to have sufficient reliability and validity.<sup>20</sup> Total scores range from 0 to 63, and high scores indicate greater depression severity. Cronbach's alpha value was calculated as 0.80.<sup>20</sup> Cronbach's alpha value of the study was determined as 0.89.

## STAI I-II

The scale was developed by Spielberger et al., and the validity and reliability studies of its Turkish version were done by Öner and Le Compte.<sup>21,22</sup> The scale consists of a total of 40 items that determine state and trait anxiety levels. The STAI I evaluates how an individual feels at a certain moment and under certain conditions, and the state of anxiety may change depending on the stress of a particular moment. The

items are scored as “not at all”, “somewhat”, “moderately so” or “very much so”. STAI II, on the other hand, evaluates how the individual generally feels oneself, that is, it is an anxiety feature that reflects the personality tendency that affects total anxiety. The items are scored as “almost never”, “sometimes”, “often”, or “almost always”. Items 1, 2, 5, 8, 10, 11, 15, 16, 19, 20, 21, 26, 27, 33, 36, and 39 in the scale are reversely scored. The scores obtained from both scales theoretically vary between 20 and 80. The same is true when interpreting scores in percentile order. Higher scores indicate higher levels of anxiety. In our study, both STAI scales were used, considering that students’ personalities may also affect their current anxieties.

### PHYSIOLOGICAL PARAMETERS

Heart rate, blood pressure and oxygen saturation measurements were used as physiological parameters. Systolic and diastolic pressures were measured using a manual sphygmomanometer with stethoscope while sitting and after resting. Heart rate was counted for 1 minute by palpation of a peripheral artery. Oxygen saturation was measured on the finger using a calibrated oximeter device. All participants were asked to remain still throughout the measurements.

### DATA COLLECTION

#### Pre-Test

The descriptive questionnaire form, BDI, and STAI I-II were administered and the heart rate, blood pressure and oxygen saturation were measured to the students in the intervention and control groups before the LY sessions.

#### Post-Test

The descriptive questionnaire form, BDI, and STAI I-II were administered and the heart rate, blood pressure and oxygen saturation were measured to the students in the intervention and control groups after the LY sessions.

#### Intervention

The responsible author who applied the intervention holds the “International Laughter Yoga Leadership Certificate” and the intervention were carried out by

the researcher. In line with the literature, a single session of LY was applied to the intervention group for 8 weeks.<sup>14</sup> Each LY session lasted approximately 40-45 minutes. The LY was carried out in the drama hall of the faculty. The drama hall was preferred because it is quiet, calm, dim, the sound is not transmitted to the outside, and it is an environment suitable for pandemic conditions. Yoga mats were used so that students could sit on the floor. Since the research was carried out during the pandemic process, attention was paid to facemask, distance and hygiene rules. A distance of 1.5 meters was maintained between the sitting areas, and the hall was ventilated throughout the session. The students were informed to be sure that they had finished eating at least one hour before coming to the practice, and not to wear too tight clothes.

#### Application of LY

A LY session is about 45 minutes long and consists of 4 parts. These sections are clapping and warming up exercises, deep breathing exercises, childish playfulness and laughter exercises.<sup>18</sup>

### DATA ANALYSIS

The data obtained in this study were analyzed with the SPSS 22 package program (IBM Statistical Packages for the Social Sciences-Corp.; Armonk, NY, USA). Due to the non-normal distribution of the data, Mann-Whitney U test was used for comparisons between paired groups and Wilcoxon sign test was used to determine the differences between pre-tests and post-tests.

### ETHICAL CONSIDERATIONS

Permission was obtained from the ethics committee of Çankırı Karatekin University Science, Mathematics and Social Sciences Ethics Committee to conduct LY sessions (date: September 11, 2021; no: 20ad25e068d04e9d). The students participated in the study were informed about the study, and their informed consents were obtained. Information was provided on voluntary participation, confidentiality, and the right to withdraw from the study at any time without any explanation. This study was conducted in accordance with the principles of the Declaration of Helsinki 2008.

## RESULTS

72.1% of the students participating in this study were 18-19 age group, 73.4% were female and Anatolian high school graduates, 83.5% had a nuclear family structure, 91.1% previously diagnosed with COVID-19, 96.2% were COVID-19 vaccinated, 67.0% had no prior knowledge of LY and 98.8% had no prior LY training. As regards these characteristics, the groups were homogeneous (Table 1).

**Table 2** shows the variables of anxiety and depression were measured using data from the STAI I-II and BDI, with means for each of the measures at pre-test and post-test by group. Before the intervention had undergone the LY, no significant difference was found between the intervention and control groups in terms of mean STAI-I-II and BDI. It was determined that the mean scores of STAI-I ( $z=-3.05$ ,  $p=0.002$ ) and STAI-II ( $z=-0.293$ ,  $p=0.049$ ) in the intervention group after LY were lower than those be-

**TABLE 1:** Distribution of the descriptive characteristics of the nursing students in the experimental and control groups.

Variables	Groups					
	Intervention group (n=40)		Control group (n=40)		Total	
	n	%	n	%	n	%
Age average		19.4±2.1		19.1±0.8		19.2±1.6
Age	18-19 age	27	69.2	30	75.0	57
	20-22 age	12	30.8	10	25.0	22
Gender	Female	3	79.5	27	67.5	58
	Male	8	20.5	13	32.5	21
High school	Anatolian high school	26	66.7	32	80.0	58
	Science high school	5	12.9	3	7.5	8
	Normal high school	2	5.2	4	10.0	6
	Health vocational high school	1	2.3	0	0.0	1
	Other	5	12.9	1	2.5	6
Family structure	Nuclear family	29	74.3	37	92.5	66
	Extended family	8	20.5	3	7.5	11
	Single parent family	2	5.2	0	0.0	2
Previously diagnosed with	Yes	37	94.9	35	87.5	72
COVID-19	No	2	5.1	5	12.5	7
State of being COVID-19	Yes	38	97.4	38	95.0	76
vaccination	No	1	2.6	2	5.0	3
Informed about the	Yes	11	28.2	15	37.5	26
laughter yoga	No	28	71.8	25	62.5	53
Laughter therapy	Yes	0	0.0	1	2.5	1
training status	No	39	100.0	39	97.5	78
						98.8

**TABLE 2:** Comparison of STAI I-II and BDI mean scores before and after the intervention according to groups.

	Mean scores of STAI I-II					
	Intervention group (n=40)		Statistical evaluation*		Control group (n=40)	
	$\bar{X} \pm SD$	z	p value	$\bar{X} \pm SD$	z	p value
Pre-test	41.43±7.86	-3.05	0.002	40.68 (8.54)	-1.2	0.207
Post-test	32.30±8.72			38.03±8.95		
Pre-test	46.33±8.90	-0.293	0.049	42.95 (7.78)	-1.01	0.311
Post-test	40.53±9.14			45.38 (10.09)		
Pre-test	16.10±9.12	-1.3	0.192	15.10 (9.41)	-1.35	0.177
Post-test	14.38±8.41			12.43 (8.66)		

\*Wilcoxon sign test; STAI: State-Trait Anxiety Inventory; BDI: Beck Depression Inventory; SD: Standard deviation.

**TABLE 3:** Analysis of pre and post test scores of physiological measures of the intervention and control group: heart rate, systolic blood pressure, diastolic blood pressure and oxygen saturation.

		Intervention group (n=40)		Statistical evaluation*		Control group (n=40)		Statistical evaluation*	
		X±SD		z	p value	X±SD		z	p value
Heart rate	Pre-test	85.26±19.26		-2.7	<b>0.006</b>	80.23±17.55		-0.035	0.372
	Post-test	90.05±15.46				80.42±12.99			
Systolic blood pressure	Pre-test	122.38±23.26		-3.17	0.082	113.66±12.63		-2.52	0.594
	Post-test	120.98±15.06				114.20±18.44			
Diastolic blood pressure	Pre-test	76.26±12.13		-1.03	0.301	77.92±7.22		-0.36	0.129
	Post-test	82.55±7.55				75.17±13.30			
Oxygen saturation	Pre-test	98.0±2.01		-3.9	<b>0.0001</b>	98.22±3.11		-1.84	0.092
	Post-test	99.20±3.30				97.25±2.24			

\*Wilcoxon sign test; SD: Standard deviation.

fore the intervention. While, there were no statistical difference between the groups in terms of mean BDI ( $u=637.5$ ,  $p=0.117$ ) mean scores between intervention and control groups after LY (Table 2).

The values obtained from pre-test and post-test physiological measurements in the intervention and control group are shown in the Table 3. No significant difference was found between the intervention and control groups in terms of mean systolic and diastolic blood pressure ( $p>0.05$ ). It was found that the mean scores of heart rate ( $z=-2.7$ ,  $p=0.006$ ) and oxygen saturation ( $z=-3.9$ ,  $p=0.0001$ ) in the intervention group after LY were higher than those before the intervention (Table 3).

## DISCUSSION

This study was conducted to determine the effects of LY on anxiety, depression and physiological parameters in first-year nursing students during the COVID-19 pandemic. The students' mean scores on the STAI-I ( $z=-3.05$ ,  $p=0.002$ ) and STAI-II ( $z=-0.293$ ,  $p=0.049$ ) who received laughter therapy decreased significantly ( $p<0.05$ ) (Table 2). Thus, our H1 hypothesis was confirmed. According to Eraydin and Alpar, anxiety is "a natural response and a necessary stimulation adaptation in individuals and defined as fear, worry, and uneasiness in the presence or absence of psychological stress, which may lead to physical or bodily symptoms".<sup>17</sup> Considering the literature, anxiety was quite common among nursing students during the COVID-19 pandemic.<sup>23-25</sup> The results of our study are similar to those of previous randomized controlled studies in which LY significantly reduced

the anxiety levels of nurses and nursing students during the pandemic.<sup>11,17,26</sup> In the field of nursing, other studies before the pandemic with different populations also reported significant decrease in anxiety levels.<sup>13,14,27</sup> Researchers have stated that LY reduces stress hormones, reduces psychological stress and has positive effects on mental health.<sup>13,28</sup> The results of the above studies have shown that LY provides a significant reduction in anxiety levels, which supports the results of our study. First-year nursing students, who have just stepped into the profession, encounter concepts related to the nursing profession for the first time and get to know the nursing profession in their first year. Because the nursing profession addresses human health, it is very important for students to have a positive perception of this profession. A negative perception about the profession may cause people to dislike the profession they will eventually serve in and their course success to decrease.<sup>29</sup> First-year nursing students had to take face-to-face through distance education due to the pandemic. This caused them to feel inadequate in terms of anxiety about failing their courses. Furthermore, the students may feel intense and constant anxiety and stress like economic difficulties brought by the pandemic process, restrictions, diseases, false discourses about the disease, getting used to a different lifestyle, etc.<sup>30</sup> We can explain the significant decrease in the level of anxiety in our study in several ways. Firstly, the ability of students to interact with their new friends in a social environment during the COVID-19 pandemic restrictions may have affected the significance of the study results. Secondly, the gathering of the students at the

beginning of the new semester through this practice may have eliminated the negative effects of being isolated from society during the pandemic and may have been successful in reducing the anxiety levels of individuals by promoting social interactions and laughter. When the students of the present study were asked how they felt after the LY sessions, they expressed feeling relaxed, energetic, happy and perfect. These feelings of liveliness, mobility, joy and sincerity observed in students may reflect positively on their daily lives, and this may be effective in reducing their anxiety levels. LY is a form of therapy that can be performed in any environment during the pandemic period. It helps to reduce stress, anxiety and depression when engaged for at least 30 minutes, three days a week, for a minimum of one month.<sup>30</sup> The use of this therapy, which allows the integration of nursing students who experienced social isolation during the pandemic process, could be considered a good alternative for nursing students. In this sense, the results obtained from the current study suggest that LY can be a noninvasive, nonpharmacological and cost-effective intervention method that can be used to reduce nursing students' anxiety, especially during intense and stressful periods such as pandemics.

This study found that laughter therapy had a significant effect on nursing students' heart rate ( $z=-2.7$ ,  $p=0.006$ ) and oxygen saturation ( $z=-3.9$ ,  $p=0.0001$ ) (Table 3). Thus, our H3 hypothesis was confirmed. The heart rate ranges from 60 to 100 beats per minute in a normal adult.<sup>31</sup> SpO<sub>2</sub> is a measurement of oxyhemoglobin saturation in the arterial blood and expresses the amount of hemoglobin saturated with oxygen. Its normal range is between 95% and 100%. Values below 90% are abnormal and indicate insufficient oxygenation of the tissues.<sup>31</sup> The significant increase in heart rate and SpO<sub>2</sub> value may be related to the effect of LY on body physiology. Various physiological changes occur in the body with deep breathing exercises, warming up and physical exercises, childlike play and laughter.<sup>26</sup> "Laughter is the best medicine." Experimental studies on laughter support this folk wisdom, showing that laughter has many physiological and psychological health benefits.<sup>32,33</sup> Our body responds physically to laughter in various forms, such as an increase in breathing rate,

an increase in blood oxygen saturation, an increase in heart rate, a decrease in blood pressure, a decrease in muscle tension, an increase in beta endorphin levels, a decrease in stress hormones such as adrenaline, noradrenaline and cortisol, and an improvement in immune system functions and mental processes.<sup>32,33</sup> However, it is essential to remember that the physiological measurements of university students are within normal limits since they constitute a young population. The literature notes that LY triggers the release of cortisol and endorphin hormone.<sup>12</sup> Twenty-eight elderly individuals living in an elderly nursing home were administered LY for 30 minutes once a week for a 6-week period. A decrease in systolic blood pressure (first and sixth sessions) was detected after the application.<sup>34</sup> A study conducting LY with hemodialysis patients, reported that the therapy was effective in lowering blood pressure in hemodialysis patients.<sup>35</sup> Studies have shown that there is limited evidence about the effect of LY on physiological parameters, especially measurements such as blood pressure, heart rate, and oxygen saturation, which need to be investigated in less studied sample groups such as university students. It is important to reduce the stress experienced by nursing students during the pandemic and to increase their happiness, strengthen their positivity and ensure their health. Therefore, LY is an effective intervention to reduce stress, ensure happiness, promote health and increase morale during the pandemic.

## CONCLUSION

In this study, LY was found to be effective in reducing anxiety, increasing heart rate and oxygen saturation but was not found to be effective for depression and blood pressure. In order to reduce the anxiety levels of university students and improve their physical health during the COVID-19 pandemic that may occur in the coming years, it is recommended that the LY initiative be implemented and integrated into the nursing education process even if the COVID-19 process does not occur. It is thought that it is important for nursing students to have LY education in their undergraduate curriculum for integrating this initiative into their care practices and making more positive contributions to individuals during their working years.

### Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

### Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

### Authorship Contributions

This study is entirely author's own work and no other author contribution.

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