Eskisehir Medical Journal
Eskişehir Tıp Dergisi

Eskisehir Med J. 2024; 5(3): 101-109.
doi: 10.48176/esmj.2024.168.

Original Article / Araştırma Makalesi

# APPROACH TO THE PATIENT WITH COVID-19 WITH HIGH-FIDELITY SIMULATION EDUCATION

## YÜKSEK GEÇERLİKLİ SİMÜLASYON EĞİTİMİYLE COVID-19'LU HASTAYA YAKLAŞIM

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**ABSTRACT**

**Introduction:** Simulation-based learning is widely used in nursing education, and simulation-based education can help nursing students to reduce their anxiety levels by improving many psychomotor skills. This study was planned to examine the effect of using personal protective equipment with scenario-based simulation training for first-year nursing students during the pandemic on their fears, satisfaction, and skill status toward COVID-19 patients.

**Method:** This study was a randomized, controlled experimental design. Simulation was given to the intervention group (n=26), and routine training was given to the control group (n=26). The data were collected from the Personnel Identification Form, Personal Protective Equipment Steps Checklist, Visual Analog Scale Satisfaction, and Fear of COVID-19 Scale.

**Results:** The mean PPESC scores in the intervention and control groups were 13.76±1.60 and 10.73±2.21. The intervention group's Visual Analog Scale Satisfaction score and Personal Protective Equipment Steps Checklist score were higher than the control group, and there was a statistically significant difference. There was no significant difference between the Fear of COVID-19 Scale and the groups.

**Conclusion:** The satisfaction status and the mean score of the Personal Protective Equipment Steps Checklist of the nursing students who received scenario-based simulation training were higher. It was concluded that scenario-based training effectively managed the training requirements during the pandemic.

**Keywords:** Personal protective equipment, simulation, satisfaction, COVID-19

**ÖZET**

**Giriş:** Simülasyona dayalı öğrenme, hemşirelik eğitiminde yaygın bir şekilde kullanılmaktadır ve simülasyona dayalı eğitim ile hemşirelik öğrencilerinin birçok psikomotor becerilerinin geliştirilerek kaygı düzeylerinin azaltılmasında yardımcı olabilir. Bu çalışma, pandemi döneminde hemşirelik birinci sınıf öğrencilerine senaryo tabanlı simülasyon eğitimi ile kişisel koruyucu ekipman kullanımının COVID-19 hastalarına yönelik korku, memnuniyet ve beceri durumlarına etkisini incelemek amacıyla planlanmıştır.

**Yöntem:** Bu çalışma randomize, kontrollü bir deneysel tasarım yapısına sahiptir. Müdahale grubuna (n=26) senaryo tabanlı simülasyon eğitimi, kontrol grubuna (n=26) ise rutin eğitim verilmiştir. Çalışmanın verileri Birey Tanılama Formu, İşlem Basamakları Kontrol Listesi, Görsel Analog Skala memnuniyet ve COVID-19 Korkusu Ölçeği kullanılarak toplanmıştır.

**Bulgular:** Müdahale ve kontrol gruplarının ortalama kontrol listesi puanları 13,76±1,60 ve 10,73±2,21'dir. Müdahale grubunun Görsel Analog Skala Memnuniyet ve kontrol listesi puanı kontrol grubundan daha yüksek yüksek olduğu ve istatiksel olarak anlamlı farklılık bulunduğu saptanmıştır. COVID-19 Korkusu Ölçeği puan ortalaması ile gruplar arasında istatiksel olarak anlamlı fark bulunmamıştır.

**Sonuç:** Senaryo tabanlı simülasyon eğitimi alan hemşirelik öğrencilerinin memnuniyet ve kontrol listesi puan ortalamaları daha yüksek bulunmuştur. Senaryo temelli eğitimin pandemi sürecinde eğitim gereksinimlerini etkin bir şekilde karşıladığı sonucuna varılmıştır.

**Anahtar kelimeler:** Kişisel koruyucu ekipman; simülasyon; memnuniyet; COVID-19

## INTRODUCTION

During the COVID-19 pandemic, most nursing students have experienced anxiety. Studies have revealed the relationships between anxiety in nursing students and variables such as job opportunities, helplessness, and doubt, while fear of getting infected with COVID-19 may trigger this anxiety (1, 2, 3). Previous studies have also determined that along with COVID-19-related fear, personal protective equipment (PPE) usage has also increased (3, 4). Therefore, the importance of PPE for infection control during the COVID-19 pandemic has increased since 2020 (4). To prevent hospital infections, take such infections under control, and manage the COVID-19 pandemic effectively, nurses need to learn skills such as wearing and removing PPE, and there is a need for comprehensive and systematic education and instruction processes starting at the undergraduate nursing education level (5). Under infection control precautions, wearing and removing PPE are included among basic nursing skills (6, 7). It was determined that with simulation-based education, many

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**Received date:** 24.06.2024 **Accepted date:** 16.09.2024

**Cite as:** Doğu Ö, Bozkurt R. Approach to the Patient with COVID-19 with High-Fidelity Simulation Education. Eskisehir Med J. 2024; 5(3): 101-109. doi: 10.48176/esmj.2024.168.

psychomotor skills of nursing students were improved, and their anxiety levels were reduced (8). This study was planned to examine the effect of using personal protective equipment with scenario-based simulation training on first-year nursing students during the pandemic on their fears, satisfaction, and skill status towards COVID-19 patients.

### Background

In nursing education, students learn basic knowledge and skills regarding the profession of nursing in theoretical training and laboratory practices within the scope of the Fundamentals of Nursing Course. Laboratories are safe, controlled environments where students do not have to worry about harming the patient, and learning is facilitated through classical learning methods, including a demonstration with conventional mannequins, roleplaying, and practicing in turns (9). Traditional education methods used in nursing are not effective in the active participation of students in practices and in the transfer of theoretical knowledge to practice but also lag behind technological developments (10).

Simulation-based learning has been used in nursing education for more than a century, and it is defined as an educational approach based on theories of learning together (11). The simulation experience is implemented over scenarios, fidelity is achieved by combining the psychomotor skills to be taught with abstract concepts, and the opportunity to integrate theory and practice is provided (12). Because clinical scenarios as close to those in real-life situations can be created with a high-fidelity simulation (HFS), its control is provided by educators, and it can react to student interventions (13) its integration into nursing curricula contributes to the learning of students (12). It has been demonstrated that simulation is more effective than conventional education methods, and this method is used at several different universities worldwide (14).

During the COVID-19 pandemic, most nursing students have experienced anxiety, and research has revealed the relationship between anxiety and future job prospects, helplessness and doubt in nursing students. Fear of being infected with COVID-19 can trigger this anxiety (1-3). Studies have shown that the use of PPE has also increased with the fear of COVID-19 (3-4). In this way, the importance of PPE use has also increased in the last three years to ensure infection control with the COVID-19 pandemic (4). With the simulation application, it was also determined that students' anxiety levels decreased and their psychomotor skill learning success increased (8). In this context, the study was planned to determine the effect of the training given to nursing students in line with the relevant scenario in order to gain the skills of appropriate approach to the patient with COVID-19, fear and correct use of PPE during the pandemic period.

## METHODS

### Study Design

This study was planned with a randomized controlled experimental design to compare the effectiveness of a scenario-based education program using simulation and the routine education program based on demonstration in teaching first-year nursing students during the pandemic on their fears, satisfaction, and skill status towards COVID-19 patients.

### Hypotheses

H1: Students who apply simulation have higher Personal Protective Equipment Steps Checklist scores than those who do routine applications.

H2: The students who use simulation applications have higher satisfaction scores than those who use routine applications.

H3: Students who practice simulation have higher COVID-19 fear scores than those who do routine applications.

### Settings and participants

The study was conducted with first-year nursing students at a state university under the Fundamentals of Nursing Course. The course comprises six hours of theoretical content and four hours of laboratory application. Laboratory application of each subject is done after the theoretical training. In the faculty where the study was conducted, basic nursing skills are taught at three nursing skills laboratories and two simulation laboratories. In this study, students taking the course first completed their theoretical training on wearing and removing PPE. The next step was applied training to develop their skills in laboratory classes. PPE education within the study's scope is a topic explained to first-year nursing students (7). Nursing students are prepared for laboratory practice by watching a video about the subject before laboratory training.

The population consisted of 119 students taking the course. The necessary sample size was calculated using the G*Power 3.1 program. Based on a power of 0.80 and an error margin of 0.05, it was determined that the sample needed to include at least 52 students.

### Inclusion and Exclusion Criteria

The criteria for inclusion in the study are the students who took this course for the first time, participated in the theoretical training of the course, and volunteered to participate in the study. The exclusion criteria are the students who took the course before and did not volunteer to participate in the study.

### Randomization

After the theoretical education, lists of students who volunteered to participate in the study and met the inclusion

criteria (n=86) were created. Random assignments were made by a person who did not participate in the study by drawing lots. Since the sociodemographic data of the groups would be similar in randomisation, allocation to the groups was based on the median value of the academic grade point average. To achieve randomization, the lists of students were randomly assigned to HFS group (n=26) or the control group (n=26). Allocation was made based on the last two digits of student numbers. In order to prevent the interaction of the students in the groups with each other, the researchers carried out the applications of the intervention and control groups simultaneously. At the end of the study, the control group students were also allowed to receive training with HFS.

The methods and results of this study are reported based on the CONSORT criteria (15). Figure 1 summarizes the inclusion process of the participants.

**Data collection tools**

***The Personal Information Form*** was developed by the researchers in line with the relevant literature and included 11 questions (e.g., age, gender, high school of graduation, grade point average (GPA)) (16-19).

***The Personal Protective Equipment Steps Checklist (PPESC)*** was created for PPE-wearing-removal skills by the researchers based on the relevant literature (6, 7, 20). Opinions were received from five faculty members with expertise in the fundamentals of nursing, and Kendall's W coefficient for the checklist was found to be 0.776 (p<.001). Kuder Richardson-20 coefficient of PPESC was 0.64, which showed moderate internal consistency. The checklist was finalized to consist of 17 items. Each item was scored 0 or 1, with minimum and maximum total scores of 0 and 17. When the participants performed the procedural step, they received 1 point for the related item, while they received 0 points when they failed to perform the step. In order to be considered successful, the student must get at least 12 points from the control steps. The literature states that this score corresponds to 70% of the total score and is classified as successful in education (21).

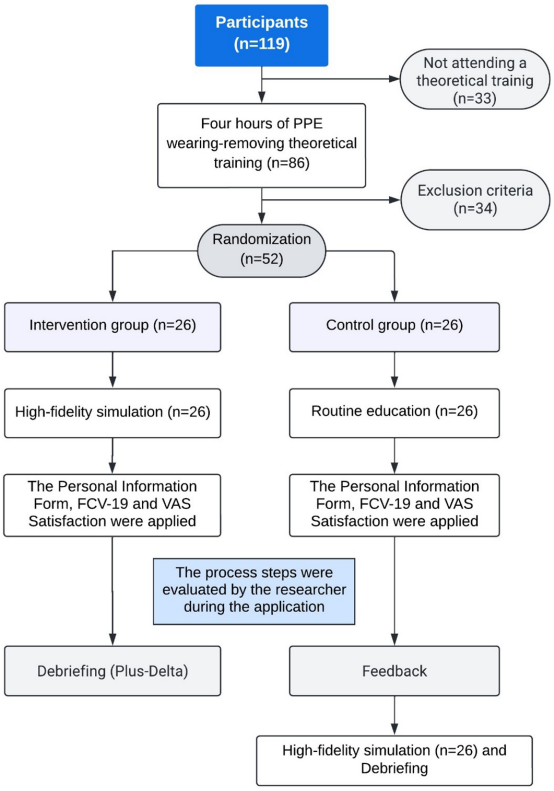


**Figure 1:** Study flow diagram

***The Visual Analog Scale (VAS)*** was used to measure the satisfaction levels of the participants based on their assessments between "0 (not satisfied at all) and 10 (very satisfied)".

***The Fear of COVID-19 Scale (FCV-19S)*** was developed by Ahorsu et al. (2020) and adapted to Turkish by Bakioğlu et al. (2020). It is a unidimensional scale with seven items. The item-total correlation coefficients of the scale were reported to vary from 0.47 to 0.56, while its factor loads were reported to vary from 0.66 to 0.74. The Cronbach's alpha coefficient of the scale was reported as α=0.82. According to the results of adaptation studies conducted for the scale, it is valid and reliable (22, 23).

**Implementation**

Five experts reviewed and approved the scenario designed to teach nursing students PPE skills during the care of a hospitalized patient diagnosed with COVID-19. After the theoretical training, the control and intervention group students practiced PPE training through demonstration. Students in the intervention group applied PPE with scenario-based HFS. On the other hand, in the nursing skills laboratory, PPE was applied again to the participants in the control group with the routine demonstration method.

After the students' applications were completed, the camera recordings of the simulation were examined by two researchers, and the scoring of the PPESC was made. In the debriefing session, students collected data on FCV-19S and satisfaction. After completing the research, the control group students also participated in the HFS.

***Intervention group***

A Gaumard® SUSIE® S1001 simulator was used in the study. This high-fidelity simulator was developed to teach skills in nursing education, and it is sized to represent an adult male patient. The mannequin can be controlled using software; it can breathe, and its vital signs can be monitored using a bedside monitor. For the simulation, a scenario for a patient hospitalized with the diagnosis of COVID-19 was created by the researchers in line with the International Nursing Association of Clinical Simulation and

**Table 1.** Scenario Outline for Patient with COVID-19.

<table>
<tr><td colspan="4">Scenario</td></tr>
<tr><td colspan="2">Scenario: 20 min</td><td colspan="2">Debriefing: 40 min</td></tr>
<tr><td colspan="2">Patient information<br>Name Surname: H. K.<br>Sex: Male<br><br>Age: 65<br><br>Anamnesis: The patient was hospitalized at the COVID-19 inpatient clinic as his PCR test came out positive after his presentation to the Emergency Service with complaints of cough and shortness of breath<br><br>Occupation: Retired</td><td colspan="2">Medical diagnosis: COVID-19<br><br>Medical history: No chronic disease<br><br>Medications used: 0.9% NaCL® 500 ml + 2500 mg ascorbic acid® 100 ml/h (IV), Ceftriaxone® 1 gr 2*1 (IV), Clexane® 6000IU/0.6 ml 2*1 (SC), Paracetamol® 100 mg/ml 1*100 ml (IV) when needed, Pantpas® 40/10 vial 2*1 (IV), Combivent® 4*1 (INH), Prednol® 40 mg IV 2*1 (IV)</td></tr>
<tr><td colspan="4">Information is given to the participants:<br><br>H. K. (M) is 65 years old. He presented with complaints of cough and shortness of breath. Stays at the COVID-19 inpatient clinic due to PCR positivity for COVID-19. You are a nurse working at this clinic. You will perform the care and treatment of this patient.<br>Preliminary briefing:<br>• Sharing information about the simulator<br>• Understanding expectations/goals regarding the scenario<br>• Obtaining permissions for videos/photographs<br>• Achieving the expected timeline<br>• Informing participants about their roles</td></tr>
<tr><td colspan="4">Simulation Learning Outputs<br>1. Starts communication with the patient.<br>Identifies the abnormal findings of the patient.<br>2. Wears personal protective equipment in the correct order.<br>3. Implements contact/air transfer/droplet measures.<br><br>4. Removes personal protective equipment in the correct order.<br><br>The primary objective of the scenario is: Ability to use personal protective equipment in line with the principles that apply while performing the treatment and care of the patient being monitored with the diagnosis of COVID-19.</td></tr>
<tr><td colspan="4">Scenario process</td></tr>
<tr><td>0-7 min</td><td>Body temperature: Axillary 38.8°C, BP: 160/105 mmHg, RR: 26/min, HR: 124/min regular 2+, $SpO_2$: 89%, the patient is in the supine position, he is covered with a blanket<br>-Name: Hasan Karagöz<br>-Birth date: 01/01/1957 -“I can’t breathe, I feel cold, I have a headache”<br>-“Please help. I’m shivering; put a blanket on me”.</td><td>-Ensuring hand hygiene<br>-Wearing personal protective equipment<br>1. Apron<br>2. Mask<br>3. Goggles<br>4. Gloves<br>-Starting communication<br>-Putting the patient in the semi-Fowler position<br>-Assessing the patient (vital signs, lung sounds)</td><td>The patient may ask “What are you doing to me?” if no information is given regarding the procedures Patient may ask, “Who are you?”, “What is your job?” if the nurse does not introduce oneself</td></tr>
<tr><td>7-15 min</td><td>Body temperature: Axillary 38.8°C, BP: 160/105 mmHg, RR: 26/min, HR: 124/min regular, $SpO_2$: 89%<br>-Characteristics of pain: throbbing, 8 on the numerical scale”<br>-Spread: Spreading to the back of the head.<br>-“Please, do something. I couldn’t sleep at all at night because of my headache.”<br>-“What is happening, help me. Am I going to die?”<br>-The concern of the patient’s relative will also increase if the necessary interventions are not made.<br>-The patient’s relative will calm down, and the patient’s vital signs will improve if the necessary interventions are made.”</td><td>-Lifting the blanket on the patient<br>-Including the head nurse in the scenario at this point and having them bring the test results for the blood sample collected in the morning<br>-Assessments of the results coming from the laboratory<br>-Informing the head nurse about the state of the patient<br>-Calling the physician and informing them about the patient<br>-Administering Paracetamol and Clexane<br>-Informing and calming the patient’s relative</td><td>The patient says, “the nurse from last evening put a pillow under my back, I could breathe more easily.” “I feel like no air is coming from the thing in my nose.” When the patient is not positioned: Patient’s relative (spouse): “the monitor constantly beeped at night.”</td></tr>
</table>

**Table 1.(continued)** Scenario Outline for Patient with COVID-19.

| | | | |
|---|---|---|---|
| 15-20 min | Body temperature: Axillary 37.8°C, BP: 140/90 mmHg, RR: 22/min, HR: 95/min regular, $SpO_2$: 97%<br><br>After the implementation of the necessary interventions<br><br>-The patient says, "Thank you very much, I feel much better now, I feel relaxed." | -Checking vital signs again<br><br>-Recording information<br><br>-Continuing to communicate with the patient constantly<br><br>-Explaining all procedures that are being performed, including the patient's relative in these explanation processes<br><br>-Removing the personal protective equipment<br><br>1. Gloves<br><br>2. Goggles<br><br>3. Apron<br><br>4. Mask | |
| Debriefing (Plus-Delta) | | | |
| Plus stage | | Delta stage | |
| What did you feel?<br><br>What did you do for the patient? What do you think was the purpose of the scenario?<br><br>What do you think you did well? | | If you had the chance to try again, what would you change?<br><br>Which issues do you consider to be your behaviors that could be improved?<br><br>What did you infer from the experience?<br><br>What will you take from this scenario and carry to the clinic? | |
| (7,25) | | | |

Learning standards and the opinions of two experts (24). The scenario was implemented based on the operation of the HFS.

A simulation application was used to teach PPE use with HFS to 26 students. The simulation involved 13 groups of three students, each playing different roles (nurse, head nurse, patient relative). Each participant was included in the scenario and prevented from observing or interacting with others. A pre-briefing session was conducted by the researchers, who had received training on clinical simulations, and the facilitator. Before starting the simulation, the researcher informed the students about the purposes of the simulation and introduced them to the settings. The roles were distributed by drawing lots. Throughout the scenario, those who played the roles of nurse and head nurse simulated the PPE practice to cover all process steps (preparation, implementation, and evaluation). The student playing the role of patient relative provided guiding clues to the nurse when needed.

The implementation of the scenario took approximately 20 minutes. The details of the scenario and learning goals are presented in Table 1. The application process was recorded on camera. The scores of the students for the process steps were obtained by carefully monitoring the records. Debriefing sessions were held in groups of three students right after the implementation. Following the scenario-based HFS training program, structured debriefing was implemented for approximately 30 minutes with the Plus-Delta model (24-26). During the evaluation session, the students were asked open-ended questions with the Socratic inquiry technique, such as "What did you feel during the simulation?" and a reflective thought environment was provided. The students talked about their thoughts regarding their personal experiences sincerely with the facilitator whom they trusted. One of the researchers was the instructor who directed the scenario. The other researcher is the instructor who provided the theoretical education part of the study and directed the evaluation session.

***Control group***

The 26 students in the control group performed the PPE practice once under the researcher's supervision at the nursing skills laboratory. They applied experiential learning principles through active experience and reflective observation. Demonstration practice, which was routinely done within the scope of the course, was carried out by the researcher. Then, the students were expected to do the demoted application individually. After the implementations, the students in both groups were administered the Personal Information Form, VAS for Satisfaction, and FCV-19S. During the implementations, the skill performances of the students were evaluated using PPESC. Equal time was given to each student for the evaluations.

**Statistical Analysis**

The SPSS version 22 program was used for the analyses. Skewness-kurtosis and Kolmogorov-Smirnov analysis results were considered to determine the normality of the data

**Table 2.** Distribution of the characteristics of the participants and comparisons of the groups based on COVID-19-related variables.

| Characteristics | Intervention group (n=26) | | Control group (n=26) | | Test | p |
|---|---|---|---|---|---|---|
| | % | x̄ | % | x̄ | | |
| Age | 19.69±1.64 | | 19.15±0.73 | | 308* | 0.544 |
| Gender | | | | | | |
| Male | 19.2 (5) | | 0 (0) | | 273* | 0,020 |
| Female | 80.8 (21) | | 100 (26) | | | |
| GPA | 3.27±0.43 | | 3.06±0.47 | | 255* | 0.129 |
| High School | | | | | | |
| Anatolian-Science-Religious High Schools | 92.3 (24) | | 96.2 (25) | | 325* | 0.556 |
| Vocational High Schools of Health | 7.7 (2) | | 3.8 (1) | | | |
| Has tested positive for COVID-19 in the last three months | | | | | | |
| Yes | 7.7 (2) | | 7.7 (2) | | 338* | 1.000 |
| No | 92.3 (24) | | 92.3 (24) | | | |
| A relative has tested positive for COVID-19 in the last three months | | | | | | |
| Yes | 34.6 (9) | | 30.8 (8) | | 325* | 0.770 |
| No | 65.4 (17) | | 69.2 (18) | | | |
| Practices isolation measures | | | | | | |
| Yes | 46.2 (12) | | 50 (13) | | 324.5* | 0.783 |
| No | 53.8 (14) | | 50 (13) | | | |
| Level of knowledge about COVID-19 isolation measures | | | | | | |
| Sufficient | 53.8 (14) | | 76.9 (20) | | 3.417** | 0.065 |
| Partially sufficient | 38.5 (10) | | 23.1 (6) | | | |
| Insufficient | 7.7 (2) | | 0 (0) | | | |

Abbreviations: *Mann-Whitney U (independent variable) was used;**Kruskal-Wallis test was used; p – p-value; %- percentage
GPA: grade point average

distributions. Descriptive statistics included mean, standard deviation, minimum, maximum values, frequencies, and percentages for the categorical variables. Expert opinions were evaluated using Kendall's W, and the differences between the groups were tested using the Mann-Whitney U and Kruskal-Wallis tests. The level of statistical significance was accepted as p<0.05.

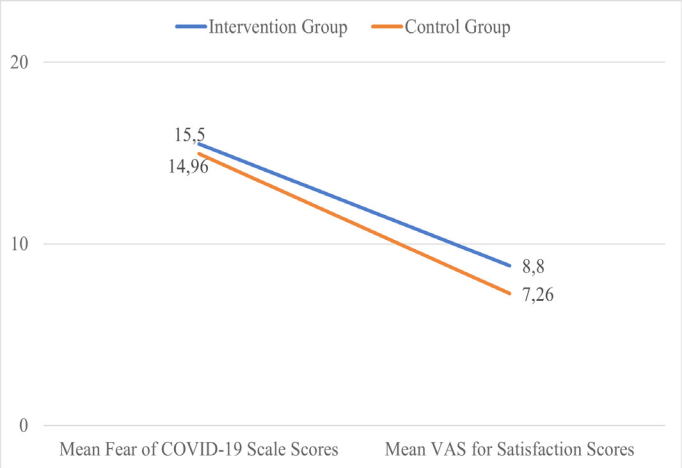


**Figure 2:** Mean FCV-19S and VAS satisfaction scores of the groups

## Ethical Consideration

Permission was obtained from the Sakarya University Educational Research and Publication Ethics Committee (12.05.2022, E-61923333-050.99-130416) and relevant organisations. Before starting the study, the participants were informed about the purpose of the study and their written consent was obtained based on the principle of volunteerism. Before the simulation application, it was stated that the simulation would be recorded with a camera,

**Table 3.** Comparisons of Groups Based on Some Variables

| Scales | Intervention group | Control group | Test | p |
|---|---|---|---|---|
| | x̄ | x̄ | | |
| VAS for Satisfaction | 8.80±1.29 | 7.26±1.37 | 152.5* | 0.000 |
| Procedural Steps Checklist (PSCL) | 13.76±1.60 | 10.73±2.21 | 85* | 0.000 |
| Fear of COVID-19 Scale (FCV-19S) | 15.5±4.93 | 14.96±5.03 | 325.5* | 0.818 |

Abbreviations: *Mann-Whitney U (independent variable) was used; x̄– arithmetic mean; p – p-value
VAS: Visual Analog Scale

and the consent of the students in the intervention group was obtained. After the 'completion of the study, the control group participants were given training with the HFS over the same scenario to provide equal treatment.

## RESULTS

### Sociodemographic characteristics

The mean age of the participants in the intervention group was 19.69±1.64; 80.8% of these participants were female, their mean GPA was 3.27±0.43, and 92.3% had Anatolian-Science-Religious High School degrees. The mean age of the participants in the control group was 19.15±0.73; all were female, their mean GPA was 3.06±0.47, and 96.2% had Anatolian-Science-Religious High School degrees (Table 2).

### Skills and satisfaction

The mean PPESC scores were 13.76±1.60 in the intervention group and 10.73±2.21 in the control group. Accordingly, the mean score of the intervention group was significantly higher (Table 3). The mean VAS scores were 8.80±1.29 in the intervention group and 7.26±1.37 in the control group. The satisfaction levels of the intervention group were significantly higher. The result of the Mann-Whitney U test was significant ($p<0.001$) (Table 3) (Figure 2). This finding of the study reveals that hypotheses H1 and H2 are accepted. Among the student statements in the debriefing, *"It was like real life (Participant (P) 3)", "I think it is a beneficial practice that has a great contribution in terms of education" (P7)", "This provided a better experience because we always deal with patients (P2)" and "This was a practice that I experienced for the first time. Although I do not completely remember what I was doing, I saw my mistakes more clearly when I watched it later (P5)"* expressed.

### Fear of COVID-19

The mean FCV-19S scores were found as 15.5±4.93 in the intervention group and 14.96±5.03 in the control group. In contrast, the difference between the groups was not significant ($p>0.05$), despite a noticeable numerical difference (Table 3) (Figure 2).

No significant difference was found between the two groups regarding their COVID-19 diagnosis status, relatives' diagnosis status, implementation of isolation measures, or knowledge levels of COVID-19 isolation measures ($p>0.05$) (Table 2). FCV-19S had a Cronbach's alpha coefficient of 0.75 in this study. This finding of the study revealed that the H3 hypothesis was rejected. Despite the moderate level of fear, it is stated that *"I experienced some concern and some nervousness (P2)"* and *"I felt panic (P1)"* students' opinions in debriefing.

## DISCUSSION

The advantage of HFS-based education is that it allows students to work in similar clinical environments (27). In this context, it was thought that using a simulation activity that was prepared with a scenario based on the reflection of a real clinical environment and a case of providing care to a COVID-19 patient would affect students' PPE usage skills and COVID-19 fear levels. Therefore, this study was planned to examine the effect of using PPE with HFS training on first-year nursing students on their fears, satisfaction, and skill status towards COVID-19 patients.

### Skills

The mean PPESC score of the participants in the intervention group was significantly higher than that of those in the control group. In a quasi-experimental study with a pretest, a posttest, and a control group in the context of the Fundamentals of Nursing, it was determined that the simulation group's knowledge levels were higher than those of the control group (28, 29). According to a meta-analysis, simulation was beneficial for nursing students to increase their knowledge levels, improve their vocational skills, and develop clinical application skills (critical thinking, communication, clinical judgment) (30). These results may guide nursing educators and show that HFS instruction effectively transitions students from their learning environments to clinical practice. Accordingly, it may be stated that with the scenario practiced with the HFS-based education program, similarity to a real case and a real clinic was achieved. The program positively contributed to the achievement of learning goals in nursing education.

### Satisfaction

The mean satisfaction level of the participants in the intervention group was significantly higher than those in the control group. Likewise, it has been emphasized that the satisfaction levels of students who receive education with HFS-based education are higher (10, 13, 27, 31). Moreover, a study conducted with first-year nursing students revealed increases in the motivation and clinical knowledge levels of the students in the intervention group after HFS-based education (32). The result of our study suggested that using different techniques and methods in education contributes positively to the education of students.

In debriefing, nursing students stated that simulation experiences brought them closer to the reality of patient care and that this benefited their future professional activities. The number of errors students make in practice will decrease with simulation-based learning. In the study by Watson et al. (2021), students reported that they were better prepared for reality with their simulation experiences. Another study shows that nursing skills should be supported with HFS-based education to increase the learning outcomes of nursing students (33).

### Fear of COVID-19

The mean FCV-19S scores of the participants in the intervention and control groups were moderate. Other studies conducted with nursing students yielded similar results (18, 34). In this study, it was found that most of the participants had sufficient knowledge about PPE. Similarly, a previous study showed that nursing students had good knowledge of COVID-19 isolation measures (17). It can be said that the fact that all students in this study have adequate knowledge about COVID-19 and, therefore, isolation precautions is due to the theoretical content of the Fundamentals of Nursing course.

### Limitations

Compared to skills teaching with the routine education model, HFS education requires planning long laboratory practices. Due to time constraints and the hybrid education model implemented at the institution, not all students taking the Fundamentals of Nursing Course could be included, and students from only one classroom were included. The lack of a measurement instrument with tested validity and reliability to evaluate the PPE skills of students during the simulation limited the generalizability of our results. Furthermore, the generalizability of our findings to other populations and settings was limited further by the small sample size and the inclusion of students from the same institution.

### Strengths of the Study

The fact that it was carried out during the pandemic period and that it was carried out in simulation laboratory facilities is its strength. The fact that it is the only study that evaluates Covid measures with practice and fear and its experimental design are other strengths.

## CONCLUSION

It was determined that nursing students who received an education with the scenario based HFS had higher PPESC steps checklist scores than those who received an education with the routine method. The education activity carried out using the HFS improved the psychomotor skills of the students and increased their satisfaction. Although there was no statistically significant difference between the mean FCV-19S scores of the intervention and control groups, the mean score of the intervention group was higher. Considering the positive outcomes identified based on the feedback provided by the students in the evaluation session, the addition of simulation-based education methods to the nursing curriculum is recommended. Simulation applications can be carried out with different scenarios for each theoretical subject, and can support students to develop competences.

**Additional information:** The abstract of this article was presented as an oral presentation at the 3rd International 9th National Intensive Care Nursing Congress held in Antalya between 9-12 November 2022.

**Ethics Committee Approval:** Permission was obtained from the Sakarya University Educational Research and Publication Ethics Committee (12.05.2022, E-61923333-050.99-130416) and relevant organisations.

**Informed Consent:** Informed consent was provided from all patients who wanted participated in the study.

**Authorship Contributions:** Idea/Concept: ÖD, Design: ÖD, RB, Supervision: ÖD, Data Collection or Processing: RB, Analysis or Interpretation: ÖD, RB, Literature Search: ÖD, RB, Writing: ÖD, RB, Critical Review: ÖD, References And Fundings: -, Materials: ÖD, RB.

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

**Financial Disclosure:** The authors declare that they have no relevant financial.

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