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The Impact of Simulation-based Education on Nursing Students' Learning and Ethical Sensitivity: A Quasi-experimental Follow-up Study

Simülasyon Tabanlı Eğitimin Hemşirelik Öğrencilerinin Öğrenme ve Etik Duyarlılığı Üzerine Etkisi: Yarı Deneysel İzlem Çalışması

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ABSTRACT

Objective: Simulation technologies have become integral in healthcare education, enhancing nursing students' learning experiences by allowing them to engage in realistic scenarios without risking patient safety. This study was conducted to investigate the effects of simulation-based education on nursing students' learning outcomes and ethical sensitivity.

Methods: A quasi-experimental design was employed. Forty-five first-year nursing students participated in a three-week simulation program, which included vital sign assessment and medication administration scenarios. Data collection involved pre-tests, post-tests, and follow-up assessments made using the Evaluation of Learning through Simulation Scale and the Adapted Ethical Sensitivity Scale. Statistical analyses were performed on the SPSS, with significance set at $p<0.05$.

Results: Significant improvements were observed in simulation-based learning scores immediately after training and one month later ($p<0.05$). However, no significant differences were noted in ethical sensitivity scores across assessments ($p=0.85$).

Conclusion: While simulation-based education markedly improves learning outcomes, its impact on ethical sensitivity remains limited. Integration of ethical training with simulation practices is essential so that a comprehensive nursing education can be fostered and students can develop both technical competencies and ethical awareness.

Keywords: Simulation training, learning, ethic, nursing education

ÖZ

Amaç: Simülasyon teknolojileri, sağlık eğitiminin ayrılmaz bir parçası haline gelmiş ve hemşirelik öğrencilerinin öğrenme deneyimlerini, hasta güvenliğini riske atmadan gerçekçi senaryolarla zenginleştirmektedir. Bu çalışma, simülasyon tabanlı eğitimin hemşirelik öğrencilerinin öğrenme çıktıları ve etik duyarlılıkları üzerindeki etkilerini incelemek amacıyla yapılmıştır.

Yöntem: Yarı deneysel bir tasarım kullanılmıştır. Kırk beş birinci sınıf hemşirelik öğrencisi, yaşam bulgularının değerlendirilmesi ve ilaç uygulama senaryolarını içeren üç haftalık bir simülasyon programına katılmıştır. Veri toplama, Simülasyon Yoluyla Öğrenmeyi Değerlendirme Ölçeği ve Uyarlanmış Etik Duyarlılık Ölçeği kullanılarak ön-test, son-test ve takip değerlendirmeleri ile gerçekleştirilmiştir. İstatistiksel analizler SPSS programında yapılmış ve anlamlılık düzeyi $p<0,05$ olarak belirlenmiştir.

Bulgular: Eğitim sonrasında ve bir ay sonra yapılan değerlendirmelerde simülasyon tabanlı öğrenme puanlarında anlamlı artışlar gözlenmiştir ($p<0,05$). Ancak, değerlendirmeler arasında etik duyarlılık puanlarında anlamlı bir fark bulunmamıştır ($p=0,85$).

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Sonuç: Simülasyon tabanlı eğitim öğrenme çıktılarında belirgin bir iyileşme sağlarken, etik duyarlılık üzerindeki etkisi sınırlı kalmaktadır. Kapsamlı bir hemşirelik eğitimi sağlamak ve öğrencilerin hem teknik yeterlilik hem de etik farkındalık geliştirmelerini desteklemek için etik eğitimin simülasyon uygulamalarıyla entegre edilmesi gereklidir.

Anahtar kelimeler: Simülasyon eğitimi, öğrenme, etik, hemşirelik eğitimi

INTRODUCTION

Simulation technologies have been utilized in the education of healthcare professionals for a long time. These technologies are becoming increasingly important and widespread [1,2]. Simulation is a method in which real situations and activities are imitated to gain artificial or virtual experience without taking risks [3,4].

As an instructional strategy, simulation can be employed to train skilled and competent nursing professionals. Teaching through simulation allows for the repeated practice of technical and non-technical skills until students gain confidence [5]. Simulation-based education provides students with a realistic learning environment, where they can experience real-life situations, thereby developing the knowledge, skills, and attitudes necessary to provide high-quality and safe care [3,6,7].

Nursing students often find out about their profession for the first time in the fundamentals of nursing course. This course includes basic concepts, theories, principles, and methods related to the profession, with cognitive, affective, and psychomotor learning objectives, forming the foundation for other professional courses [8]. Therefore, the educational risks arising from the practices carried out by students who are experiencing the profession for the first time can be prevented through simulation-based instruction. This method provides a safe environment for integrating theory and practice without exposing patients to potential risks, thus enabling a secure treatment process that respects patient rights, and without the fear of harming individuals [9-11]. In this way, students can learn through experiencing their knowledge, skills, and mistakes in a risk-free environment. Additionally, the method has been reported to be highly beneficial in terms of working in accordance with ethical rules, providing safe and quality service, and gaining clinical judgment skills [12,13]. With this experience, the learning objectives are achieved, and the effectiveness of education is maximized. In this context, simulation-based education improves nursing students' clinical decision-making, self-efficacy, communication skills, and confidence levels while reducing their anxiety levels [2,14-16]. Our study aimed to evaluate the learning outcomes and ethical sensitivity of nursing students through simulation-based education.

Study Questions

What is the effect of simulation-based teaching of the fundamentals of nursing course on nursing students' learning outcomes?

Does simulation-based teaching of the fundamentals of nursing course affect nursing students' ethical sensitivity?

Hypotheses

Hypothesis 1

H_0: The simulation-based teaching of the fundamentals of nursing course does not have a positive effect on nursing students' learning outcomes.

H_1: The simulation-based teaching of the fundamentals of nursing course has a positive effect on nursing students' learning outcomes.

Hypothesis 2

H_0: The simulation-based teaching of the fundamentals of nursing course does not have a positive effect on nursing students' ethical sensitivity.

H_1: The simulation-based teaching of the fundamentals of nursing course has a positive effect on nursing students' ethical sensitivity.

MATERIAL AND METHOD

Study Design

This study was conducted using a single-group, quasi-experimental design, one of the quantitative research methods. The TREND statement checklist, which improves the reporting quality of non-randomized quasi-experimental studies, was used [17]. Scenario implementation is based on the criteria of the International Nursing Association for Clinical Simulation and Learning standards.

Population and Sample

The study population consisted of a total of 45 first-year students studying in the Nursing Department at Cappadocia University. The study aimed to reach the entire population and was completed with the participation of all 45 students.

Study Groups

Inclusion Criteria

- Being a first-year nursing student,
- Willingness to participate in the study, and
- Having no communication barriers.

Blinding

A blinding procedure was employed in this research to ensure objectivity and minimize bias throughout the simulation-based training and assessment process. Specifically, the instructor responsible for delivering the training was blinded to the post-test and follow-up outcomes to avoid influencing the results. Additionally, the two researchers who facilitated the scenario

implementations were blinded to the students' pre-test results to prevent any unconscious bias in their interactions. This blinding helped maintain consistency and neutrality in evaluating students' performance and learning outcomes during both the immediate and follow-up assessments.

In the debriefing sessions, all researchers were also blinded to previous test scores to ensure an objective evaluation of student progress. Moreover, students themselves were unaware of the specific focus of the assessments regarding their ethical sensitivity, thereby reducing response bias and ensuring genuine responses during scenario-based simulations. Implementation of blinding at multiple stages aimed to increase the reliability of the results, particularly concerning nursing students' learning and ethical sensitivity outcomes.

Data Collection Tools

Data were collected using an eight-item participant information form developed by the researcher based on a literature review [18,19], the Evaluation of Learning through Simulation Scale [20], and the Adapted Ethical Sensitivity Scale for Nursing Students [21]. Permission of the authors to use the relevant scales was obtained via email.

Statistical Analysis

Data were analyzed on the SPSS (Statistical Program for Social Sciences) version 25.0. The normality of data distribution was assessed using the Shapiro-Wilk test, and the Skewness and Kurtosis values were examined. As the data did not show a normal distribution, non-parametric tests were used. Descriptive data were analyzed using frequency, mean, and standard deviation values. Scale scores were evaluated through pre-test, post-test, and follow-up measurements. The comparison of repeated measures in the experimental group was made using the Wilcoxon test and Friedman test. Internal consistencies of the scales were determined with Cronbach's alpha coefficient. A p-value of <0.05 was considered statistically significant.

Procedure

The simulation-based training was conducted for three weeks between June 17, 2024 and July 5, 2024, and some scenarios for the assessment of vital signs and administration of patient treatment were applied. In the first week, the instructor provided information about the course content and the prepared training on the assessment of vital signs and administration of oral drug therapy and administered a pre-test to assess students' current skills and perceptions. In the second week, students participated in 10-minute-long scenarios according to a planned schedule. After the implementation of the scenarios, they participated in debriefing sessions according to the planned schedule. The test was administered immediately after the debriefing, and a follow-up test was administered one month later in August. To ensure objectivity in the study, a single researcher provided the training, two researchers actively participated in the execution of the scenarios, and all researchers participated in the debriefing sessions. The study design is shown in Figure 1.

The topics of the simulation-based instruction:

- Assessment of vital signs
- Treatment of the patient.

Ethical Consideration

Before the study was initiated, the approval of the Cappadocia University was obtained (approval no: 24.08, date: 08.05.2024). After receiving ethical approval, participants were informed about the research, and their informed consent was obtained on the data collection date.

RESULTS

Of the students who participated in the study, 77.8% were female, 91.1% came from a nuclear family, 77.8% had equal income and expenses, 68.9% lived in urban areas, 57.8% had chosen their department willingly, 51.1% had selected their department because they thought it was easier to find a job, and 46.7% were satisfied with their choice of the department (Table 1).

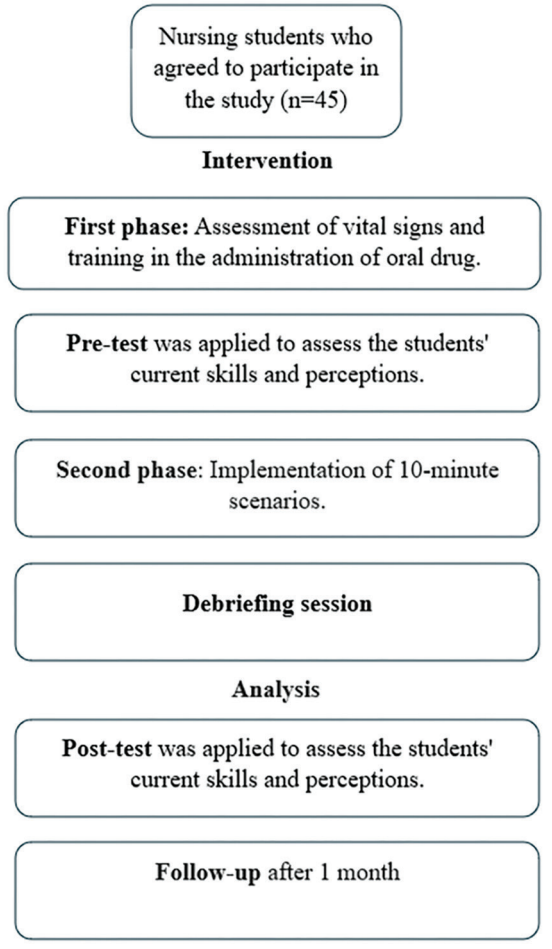


Figure 1. Flow diagram of the study

The intra-group comparison results of the total score rank averages of the experimental group students who received simulation-based training for simulation-based learning and ethical sensitivity are presented in Table 2. Accordingly, the simulation-based learning scores of the students differed statistically significantly between the before-the-training, immediately-after-the-training, and one-month-after-the-training measurements ($p<0.05$). However, the intra-group comparison of students' ethical sensitivity scores yielded no statistically significant difference between the before-the-training, immediately-after-the-training, and one-month-after-the-training measurements ($p=0.85$).

The significance results of the repeated measures of the simulation-based learning scores among the experimental group students are presented in Table 3. There was a significant difference between the pre-test measurements and the immediate-post-test measurements of the simulation-based learning scores ($p<0.02$), whereas no significant difference was found between the immediate-post-test and the one-month-follow-up measurements ($p=0.39$). The ethical sensitivity measurements of the students showed no significant difference between the pre-test and immediate-post-test measurements ($p=0.63$) as well as between the immediate-post-test and the one-month-follow-up measurement ($p=0.64$).

Table 1. Distribution of Students' Descriptive Data (n=45)

Descriptive data		Intervention group	
		n	%
Age (mean ± SD)		19.51±0.94	
Gender	Female	35	77.8
	Male	10	22.2
Family type	Family at the core	41	91.1
	Extended family	4	8.9
Income	Income more than expenditure	9	20.0
	Income matches expenditure	35	77.8
	Income less than expenditure	1	2.2
Place of live	Village	3	6.7
	District	11	24.4
	City	31	68.9
Coming to the department willingly	Yes	26	57.8
	No	19	42.2
Reason for choosing the department*	Being my dream profession	6	13.3
	Easy to find a job site	23	51.1
	I have enough points	18	40.0
	Willingness to help people	10	22.2
	Family-environment request	15	33.3
Satisfaction with choosing the nursing department	Satisfied	21	46.7
	Not satisfied	3	6.7
	Undecided	21	46.7

*: Students selected more than one item in this question, SD: Standard deviation

Table 2. Comparison of Repeated Measurements of Scores from the Evaluation of Learning Through Simulation Scale and the Adapted Ethical Sensitivity Scale for Nursing Students

Experimental group (n=45)	Pre-test mean rank	Post-test mean rank	Follow-up mean rank	X^2	p-value
Simulation-based learning	1.71	2.14	2.14	5.761	0.05
Ethical sensitivity	1.98	2.07	1.96	0.316	0.85

X^2: Friedman test value

Table 3. Distribution of Score Differences Between the Simulation-based Learning Evaluation Scale and the Adapted Ethical Sensitivity Scale for Nursing Students

Experimental group (n=45)	Pre-test to immediate post-test	Immediate post-test to follow-up
Simulation-based learning	Z: -2.288[b] p: 0.02	Z: -0.858[c] p: 0.39
Ethical sensitivity	Z: -0.479[b] p: 0.63	Z: 0.455[c] p: 0.64

Z: Test value, [b]: Pre-test to immediate post-test-Wilcoxon signed-rank test, [c]: Immediate post-test to follow-up-Wilcoxon signed-rank test

DISCUSSION

Developing affective aspects, instilling values, and fostering ethical sensitivity in nursing education are just as important as teaching technical skills. The fundamentals of nursing course is where nursing students learn the most critical skills related to their profession and, at the same time, begin to understand the values of the profession and develop ethical sensitivity.

Simulation-based education plays a significant role in nursing education, particularly in enhancing learning outcomes. As observed in our study, simulation-based education significantly improves nursing students' learning levels. Many studies in the literature have consistently supported the idea that simulation not only enhances students' technical skills but also improves their clinical decision-making competencies, self-confidence, and communication skills [15,22-24]. This educational approach provides students with a safe learning environment, thereby reducing the fear of making mistakes and allowing them to bridge the gap between theory and practice. The results observed in our study confirmed the effectiveness of simulation as a method in nursing education.

Although nursing students may gain skills-based experience in clinical or laboratory settings, they may not always encounter ethical dilemmas [25]. Ethical sensitivity is a fundamental component of a nurse's skill to make sound decisions when faced with a dilemma and represents the moral aspect of care [26]. In this context, the study focuses on the effects of simulation-based education on nursing students' learning outcomes and ethical sensitivity. Research utilizing some methods, such as discussion, case analysis, video-supported training, and traditional education, to enhance nursing students' ethical sensitivity has shown no significant differences in their ethical sensitivity [25,27]. Similarly, our study showed that simulation-based education did not produce the anticipated effect on ethical sensitivity. There was no statistically significant difference between the ethical sensitivity scores of the groups (p=0.85). This suggests that simulation-based education may not be enough to internalize ethical concepts. These findings indicate that simulation has limitations in improving students' skills to make appropriate decisions when confronted with ethical dilemmas. Therefore, while simulation is effective in enhancing technical skills, it is thought that additional strategies should be implemented to foster the development of emotional components such as ethical awareness.

This study underscores the pivotal role of simulation-based education in enhancing nursing students' learning outcomes, particularly in developing technical skills, clinical decision-making, and confidence. For nursing education, the findings emphasize the need to integrate ethical training into simulation curricula to address the observed limitations in fostering ethical sensitivity. Educators should design scenarios that include ethical dilemmas and use debriefing sessions to reflect on ethical principles, ensuring a comprehensive learning experience.

In clinical practice, the results highlight the potential of simulation to prepare students for real-world challenges by providing a safe and controlled environment for skill development. Incorporating simulation into routine training programs for healthcare professionals could further enhance patient safety and care quality.

From a policy perspective, these findings advocate for the inclusion of simulation-based learning as a standard component of nursing curricula and licensing requirements. Policymakers should prioritize funding and resources for advanced simulation technologies and encourage collaboration between educational institutions and healthcare organizations to align training with professional standards. This integrated approach can bridge the gap between theoretical knowledge and practical application, ensuring the preparation of ethically aware and technically competent nursing professionals.

Study Limitations

This study benefits from a robust quasi-experimental design, employing validated measurement tools and a structured approach to data collection, which enhances the reliability of its findings. The integration of blinding procedures at various stages minimizes bias, and the inclusion of both technical skill improvement and ethical sensitivity provides a comprehensive perspective on simulation-based education. However, the study's single-institution context and small sample size limit the generalizability of the results. Additionally, the one-month follow-up period may not fully capture long-term changes, and the lack of a control group hinders the ability to attribute outcomes solely to the intervention. While the study addresses ethical sensitivity, the selected scenarios may not sufficiently represent the complexity of real-world ethical dilemmas, suggesting the need for more nuanced approaches in future research.

Conclusion

Simulation-based education emerges as an effective method for improving learning outcomes in nursing education. However, it is crucial to strengthen ethical education by utilizing simulation practices to foster ethical sensitivity. Nursing education institutions should focus on integrating these two areas to enhance both technical skills and ethical sensitivity. This approach will not only ensure high-quality and safe patient care in nursing practice but also support the professional identity development of students.

Ethics

Ethics Committee Approval: Before the study was initiated, the approval of the Cappadocia University was obtained (approval no: 24.08, date: 08.05.2024).

Informed Consent: After receiving ethical approval, participants were informed about the research, and their informed consent was obtained on the data collection date.

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Footnotes

Author Contributions

Concept: AYİ, SS; Design: AYİ, SS; Data Collection or Processing: AYİ, SS; Analysis or Interpretation: AYİ, SS, MB, RY; Literature Search: AYİ, SS, MB, RY; Writing: AYİ, SS, MB, RY.

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

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