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Effects of High-Fidelity Postpartum Care Management Simulation on Nursing Students: A Quasi-Experimental Design

Yüksek Gerçekli Postpartum Bakım Yönetimi Simülasyonunun Hemşirelik Öğrencileri Üzerine Etkisi: Yarı Deneysel Bir Çalışma

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ABSTRACT Objective: This study aimed to compare the effectiveness of high-fidelity simulation (HFS) and case study (CS) methods in managing postpartum care on nursing students' satisfaction and self-efficacy levels. **Material and Methods:** A quasi-experimental, pretest, and posttest comparison group design was used. It was conducted in a public university in west Türkiye with four-year nursing students (46 in the HFS group and 46 in the CS group). The Satisfaction Questionnaire, Self-Efficacy Scale, and Simulation Design Scale were utilized to gather data. The Postpartum Care Management Clinical Skills Checklist was used to assess postpartum care skills in the HFS group. Data were analyzed with the χ^2 test, Mann-Whitney U test, and repeated-measures Wilcoxon. **Results:** The HFS enhanced students' satisfaction levels. Simulation feedback/guided reflection and fidelity had scored higher than other simulation design features. Although the students' self-efficacy levels increased, there was no significant difference observed (p>0,05). **Conclusion:** The use of HFS has the potential to enhance student satisfaction with learning and can increase self-efficacy in performing postpartum nursing care skills. When creating scenarios and sessions for HFS, nurse educators need to be careful as it can impact student satisfaction. In order to conduct an effective simulation, it is crucial to incorporate debriefing sessions and strive for realism in the scenarios.

Keywords: High fidelity simulation training; self-efficacy; students, nursing; pleasure

ÖZET Amaç: Bu çalışma, doğum sonu bakımın yönetiminde yüksek gerçekli simülasyon [high-fidelity simulation (HFS)] ve vaka çalışması [case study (CS)] yöntemlerinin hemşirelik öğrencilerinin memnuniyet ve öz yeterlilik düzeyleri üzerindeki etkinliğinin karşılaştırılması amacıyla yapılmıştır. **Gereç ve Yöntemler:** Araştırma Türkiye'nin batısında yer alan bir devlet üniversitesinde dördüncü sınıf hemşirelik öğrencileri ile gerçekleştirilmiştir. Yarı deneysel, ön test-son test araştırma tasarımı kullanılmıştır (46 öğrenci HFS grubunda ve 46 öğrenci ise CS grubunda). Veriler Eğitim Yöntemlerinden Memnuniyet Anketi, Öz Etkililik-Yeterlilik Ölçeği ve Simülasyon Tasarım Ölçeği kullanılarak toplanmıştır. HFS grubunda doğum sonrası bakım becerilerinin değerlendirilmesi Doğum Sonrası Bakım Yönetimi Klinik Beceriler Kontrol Listesi kullanılarak yapılmıştır. Veriler ki-kare testi, Mann-Whitney U testi ve tekrarlı ölçümler Wilcoxon testi ile analiz edilmiştir. **Bulgular:** HFS'nin öğrencilerin memnuniyet düzeyini anlamlı düzeyde artırdığı, çözümleme ve senaryonun gerçeği yansıtma özelliklerinin diğer simülasyon tasarım özelliklerinden daha yüksek puan aldığı saptanmıştır. Öğrencilerin öz yeterlilik düzeyleri yükselmesine rağmen anlamlı fark saptanmamıştır (p>0,05). **Sonuç:** HFS hemşirelik öğrencilerinin öğrenme memnuniyetini artırabilir ve doğum sonrası hemşirelik bakım becerilerini yerine getirmede öz yeterliliği yükseltebilir. HFS için senaryolar ve oturumlar oluştururken, öğrenci memnuniyetini etkileyebileceğinden hemşire eğitimcilerin dikkatli olması önerilmektedir. Etkili bir simülasyon yürütebilmek için çözümleme oturumunun aktif kullanılması ve senaryolarda gerçekçilik düzeyinin özellikle iyi planlanması gerektiği düşünülmektedir.

Anahtar Kelimeler: Yüksek gerçekli simülasyon uygulamaları; öz yeterlik; öğrenciler, hemşirelik; memnuniyet

In the field of nursing, education is a combination of theoretical and clinical knowledge and aims to enhance the professional nursing skills of students. However, with limited accessing in-real-life clinical experiences for students, the simulation has transformed into a way to support learning clinical experiences.[1,2] Simulation-based education (SBE) provides students with many advantages, such as making mistakes, experiencing clinical skills, receiving feedback, and practicing in a safe environment.[3,4] SBE has

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become increasingly popular in nursing education at all levels, and the coronavirus disease-2019 pandemic has further enhanced its use. Due to limited face-to-face training during the pandemic, SBE provided a safe environment for practice. SBE enables students to develop clinical skills with learning objectives for cognitive, affective, and psychomotor skills.[5,6] World Health Organization recommends using different simulation methods (from high to low reality) at appropriate levels of reality to train healthcare professionals.[7] High-fidelity simulation (HFS) reflects clinical experience with a computerized patient simulator that provides immediate feedback on interventions with interactive features and provides students to be more active in learning.[8,9] The evidence that compares the effectiveness of HFS with traditional methods presents that it improves students' self-confidence, knowledge, clinical practice abilities, satisfaction, and self-efficacy.[2,10]

SBE can be an appropriate learner-centered approach to reducing errors and risks in obstetrics.[11] Students can learn how to improve obstetric competencies in a simulated environment, different simulation methods may provide managing knowledge and skills and nursing educators can prepare nursing students for practice. Students use cognitive, communicative, and clinical skills in obstetrics while intervening in many situations.[12,13] Practicing postpartum care skills in a safe environment gives students confidence and empowers their competency in postpartum care. Nursing assessment and care management are crucial for a healthy postpartum period. According to the American College of Obstetricians and Gynecologists, patient-centered maternal postpartum care has the potential to maintain the well-being of mothers, newborns, and families, and improving the outcomes of postpartum care should be an ongoing process. And the Sustainable Development Goals include specific targets focusing on maternal and child health and safety care. It is vital that nurses manage obstetrics cases in an autonomous manner, therefore they should have high levels of skill in practice.[14-16]

This study presents a comparative outcome that measured the effect of HFS methods on the satisfaction and self-efficacy of undergraduate nursing students in a postpartum care management scenario. The primary goal of this study is to improve nursing students' care management skills and self-efficacy levels in the postpartum period. The study aims to evaluate the effectiveness of the training methods used to achieve this objective. Bandura's theory of self-efficacy, defined as a person's belief that they can do a task, is a measure used to evaluate the learning outcomes and fits well with simulation training and NLN/Jeffries' Simulation Framework.[17,18] The simulation studies reported statistically improved self-efficacy in nursing. Results of studies measuring self-efficiency gains through HFS have been fairly consistent in showing a positive effect.[19,20] The other learning outcome that could be affected by simulation in nursing education is learner satisfaction. Based on various studies conducted on satisfaction levels, it has been observed that the level of satisfaction is on the rise.[20]

AIM

This study aimed to compare the effects of HFS and traditional case study (CS) on nursing students' satisfaction and self-efficacy levels in managing postpartum care. Hypothesis 1 predicted that the HFS group would have higher satisfaction than the CS group, whereas Hypothesis 2 predicted higher self-efficacy levels for the HFS group.

MATERIAL AND METHODS

DESIGN

This study has a quasi-experimental, pretest-posttest comparison design. The HFS group was exposed to scenario-based HFS training, and the CS group was exposed to the traditional CS. Allocation of students to the groups was performed randomly after theoretical training. Random assignment to groups was performed by giving numbers to the students starting from one, and random numbers were drawn lots. A homogeneous distribution between the groups by matching the students' genders, ages, and academic achievement ($p>0.05$). The independent variables were the HFS training versus the CS training method. The dependent variables were self-efficacy and satisfaction. Throughout four weeks, students from the HFS group participated in scenario-based high-fi-

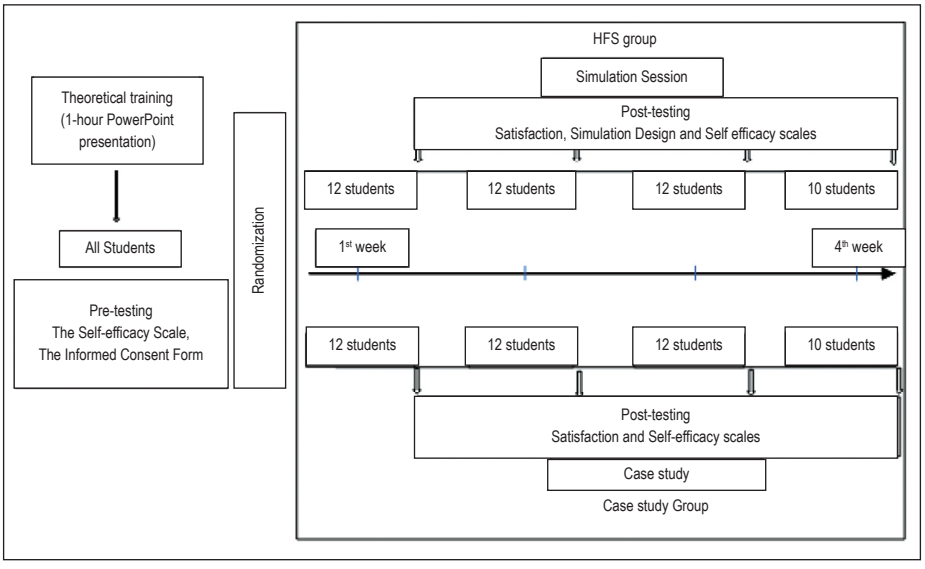

FIGURE 1: Study design.

delity postpartum care management simulation training sessions. The CS group participated in the CS in the classroom (Figure 1).

PARTICIPANTS

The study population consisted of 4th-grade nursing students at a university in western Türkiye.

The study's inclusion criteria were being a fourth-year student in the fall semester, not actively working as a nurse, and having never participated in simulation training (n=236). The sample selection was determined based on a power analysis. The sample was determined to be 80 students by power analysis with 1-ß error probability and 80% power using the effect size. The effect size was determined by comparing the data of the first ten students in the groups. To ensure the sufficiency of the sample, 12 students were added to the study because of the power analysis performed with the data obtained at the end of the study. A power of 0.97 was achieved at the 0.05 alpha level with 92 students (46 in the HFS group and 46 in the CS group).

DATA COLLECTION

After the announcement of the study, both groups were invited to a one-hour PowerPoint (Microsoft, USA) presentation of theoretical training about postpartum care from the researchers. Before the training, both groups completed the Self-Efficacy Scale and the Informed Consent Form. The training included four topics. Each of the topics ran over about 15 minutes (Table 1).

TABLE 1: The topics of postpartum care training.

Topic	Duration
Postpartum period and its features	15
Involution process	20
Postpartum nursing care	15
The Postpartum Care Management Clinical Skills Guide	10

The CS Group

After one week of theoretical training, the CS group was divided into four subgroups and given information to each group about the session. The students developed nursing care plans in accordance with the postpartum care scenario in 30 minutes. Then the care plan developed by the researcher and the students' care plans were compared and discussed. Each feedback session took approximately 60 minutes. After the feedback sessions, the Satisfaction Questionnaire and the Self-Efficacy Scale were administered.

The HFS Group

After theoretical training, the HFS group was invited to the simulation session in groups of four. The stu-

dents completed the sessions in groups of 3 to 4 each week (Total 12 students in one week). The first part of the session comprised information about the scenario with the pre-briefing guide. It explained what was expected from them and the roles assigned. The researcher managed the simulator during the scenarios, and the facilitator monitored the students' practices using the Postpartum Care Management Clinical Skills Checklist. The simulation session ended when the researcher entered the simulation room after 30 minutes. After each scenario, the student's performance was discussed with a debriefing guide and the plus-delta method for 60 minutes. Then, the Satisfaction Questionnaire, the Self-Efficacy Scale, and the Simulation Design Scale were administered.

Instruments

The Satisfaction Questionnaire: One of the study's dependent variables, satisfaction with the training method, was measured using the Satisfaction Questionnaire developed by Gurpinar et al.[21] The questionnaire consists of 16 Likert-type scale items (1-strongly disagree, 5-strongly agree). Higher scale scores indicate more satisfaction with the training method. The highest possible scale score is 80, and the lowest is 20. The Cronbach's alpha value of the original scale was 0.84. In our study, it was 0.92.

The Self-Effic+acy Scale: The scale was developed by Sherer et al. in 1982 and adapted to Turkish by Gözüm and Aksayan.[22] It was used to determine the study's second dependent variable, self-efficacy levels. Higher scale scores indicate higher self-efficacy perceptions. The highest possible scale score is 115, and the lowest is 23. The Cronbach's alpha internal consistency coefficient of the original scale was 0.81, and its test-retest reliability was 0.92. In our study, Cronbach's alpha values were 0.86 for the pretest and 0.87 for the posttest.

The Simulation Design Scale: The original Simulation Design Scale was developed by Jeffries and Rizzolo, and its Turkish adaptation study was done by Unver et al.[23,24] The Simulation Design Scale has 20 items in 5 subscales: objectives and information, support, problem-solving, feedback/guided reflection, and fidelity. These subscales' original Cronbach's alpha values were 0.77, 0.73, 0.76, 0.75, and 0.86, respectively. The Cronbach's alpha value of the entire scale was 0.90. In our study, Cronbach's alpha value of the scale was 0.93. The Cronbach's alpha values of the subscales were 0.79, 0.81, 0.88, 0.88, and 0.86, respectively.

The Postpartum Care Management Clinical Skills Checklist: It was a postpartum assessment guide that the researchers developed with lecture notes to measure students' skills in postpartum nursing care. It comprised seven parts the general physical examination, breast examination, involution assessment, fundus massage, lochia assessment, perineum examination, and Homan's sign. Students' performances were evaluated under two categories done or not done.

The simulation design template: The stages of the simulation session were prepared according to the International Nursing Association for Clinical Learning and Simulation standards and Jeffries Simulation Framework.[18] The measurable aims of the simulation session were to make the physical and psychosocial assessment of the puerperal following the BUBBLERS parameters and administer the medications included in the doctor's order. The postpartum care scenario was developed for use with the CS and HFS groups that included medical history, doctor's orders, laboratory signs, and clinical status information derived from a real clinical case. The scenario involved a postpartum woman with her baby who required postpartum assessment and care. The scenario had four roles (primer nurse, intern nurse, doctor, and patient relative). Ten experts were involved in validating the scenario for content and accuracy. The HFS model, NOELLE S554.100 (Gaumard, USA), was used according to the postpartum period characteristics with postpartum bleeding moulage. The simulation environment was organized as a basic patient room. The simulator was placed in a lying position with a newborn baby simulator. The materials needed to measure oxygen saturation and monitor the patient were put in the room. A chair was put up for the patient's relatives. Before the simulation activities, all scenarios and forms were piloted with nursing students. The results and feedback given by students were used to improve the scenario. Before beginning the scenarios, students

were briefed about the scenario, patient information, environment, equipment, patient's file, and simulator with the pre-briefing guide. During the scenarios, the simulation scenario flow chart that included the patient's physical parameters, the scenario flow, patient statements, the interventions expected of the participants, the effects of mistakes on patient outcomes, tips, and analysis points were used. After each scenario finished, the students were taken to the debriefing session. The debriefing session guide, simulation records, and the Postpartum Care Management Clinical Skills checklist were used to assess the student's performance.

ANALYSIS

All the statistical analyses were completed using SPSS 22 (IBM, USA) software. Descriptive statistics were used to describe demographic data. A Mann-Whitney U test was used to analyze students' satisfaction and self-efficacy. The Wilcoxon signed-rank test was used to determine whether there were differences in the pretest and posttest scores within groups. The findings were evaluated at a 95% confidence interval, and $p<0.05$ was used as the threshold for statistical significance.

ETHICAL CONSIDERATIONS

The Ege University Ethics of Scientific Research and Publication approved the study (date: August 23, 2017, no: 267-2017/). Permission was acquired in writing from the institution where the research was carried out (E.312083/ December 05, 2017). Students who agreed to participate signed a written informed consent form. The research was carried out following the guidelines set forth in the 2008 Declaration of Helsinki.

RESULTS

Table 2 presents the students' demographic profiles. Table 3 presents the satisfaction and self-efficacy scores of the students. The study supported hypothesis 1. The HFS group's mean simulation satisfaction score was 73.69±6.41. The CS group's mean satisfaction score was 68.84±7.40. The difference was statistically significant (U=670.00; p=0.002). The study did not support hypothesis 2. The mean Self-Efficacy Scale score before the simulation was 87.71±11.61 in the HFS group and 89.86±11.61 in the CS group. The HFS group's mean Self-Efficacy Scale score was 90.32±1.20 after the simulation. The CS group's mean Self-Efficacy Scale score was 92.36±11.69. This difference was insignificant (p=0.696>0.05;

TABLE 2: Students demographics.

	HFS group		CS group		
	n	%	n	%	p value*
Gender					
Female	39	84.8	39	84.8	1.000
Male	7	15.2	7	15.2	
	HFS group		HFS group		
	X̄±SD		X̄±SD		p value**
Age	22.34±1.21		22.34±0.84		0.930
	HFS group		HFS group		
	X̄±SD		X̄±SD		p value**
Grade point average	2.74±0.36		2.75±0.32		0.928

*p value from the chi-squared test;**p value from the t-test;
HFS: High-fidelity simulation; CS: Case study; SD: Standard deviation.

TABLE 3: The mean satisfaction and self-efficacy scores of the students.

Satisfaction	X±(SD)	Minimum-Maximum		
HFS	73.69±6.41	58-80	U=670.00	
CS	68.84±7.40	52-80	p=0.002	
Self-efficacy-competence	X̄±(SD) Pretest	X̄±(SD) Posttest	z**	p value
HFS	87.71±11.61	90.32±1.20	1008	0.696
CS	89.86±11.61	92.36±11.69	961.5	0.451

*Mann-Whitney U test; **Wilcoxon; HFS: High-fidelity simulation; CS: Case study; SD: Standard deviation.

TABLE 4: The mean total simulation design scale and subscale scores of the HFS group.

	X̄±SD	Minimum-Maximum	Number of items
Simulation mean total score	4.71±0.35	3.60-5.00	20
Simulation objectives and information	4.65±0.42	3.60-5.00	5
Simulation support	4.59±0.47	3.75-5.00	4
Simulation problem-solving	4.67±0.48	3.40-5.00	5
Simulation feedback/guided reflection	4.88±0.30	3.75-5.00	4
Simulation fidelity	4.80±0.40	3.50-5.00	2

HFS: High-fidelity simulation; SD: Standard deviation.

p=0.451>0.05). Table 4 presents the HFS group's Simulation Design Scale score. Their mean score was 4.71±0.35. Their mean objectives and information subscale score was 4.65±0.42, their mean support subscale score was 4.59±0.47, and their mean problem-solving subscale score was 4.67±0.48. Their mean feedback subscale score was 4.88±0.30, and their mean fidelity subscale score was 4.80±0.40. In the second part of the scale, the students evaluated the importance of the simulation design elements. Their mean general item importance score was 4.74±0.38, their mean objectives and information subscale score was 4.70±0.47, and their mean support subscale score was 4.71±0.41. Their mean problem-solving subscale score was 4.73±0.42, their mean feedback subscale score was 4.82±0.38, and their mean fidelity subscale score was 4.78±0.43.

DISCUSSION

The findings revealed a statistically significant difference in student satisfaction with the two training methods: HFS versus CS. However, the study revealed a lack of support for differences between self-efficacy of postpartum care management. The findings could be explained by increased satisfaction in the HFS group following simulation interventions may be based on providing active learning with simulation and taking structured feedback in the debriefing sessions. In addition, the HFS group scored "the simulation feedback/guided reflection" the highest on the simulation design scale. The design features of a simulation activity influence its learning outcomes and student satisfaction.[25-27] The clarity of the scenario objectives and fidelity are important factors affecting student satisfaction in HFS.[25,27] Alinier recommended referring to students' educational curriculum when developing learning objectives for the scenario.[28] Kim et al. have reported that using appropriate fidelity levels of simulation is important to meet learning outcomes.[29] Ahn and Kim have reported a positive and significant correlation between design and learning outcomes.[26] In this study, it was found that the HFS group scored "simulation fidelity" higher than others too. The learning objectives of the scenario were developed according to the fourth-year nursing education curriculum. A meta-analysis found that HFS is more effective when the number of students in each group is limited to under six.[30] In this study, each HFS group size is planned with 3 or 4 students. According to this study using HFS in postpartum care management training for nursing students can be beneficial, however, there are studies that have reported different outcomes. Tosterud et al. compared three different simulation methods in their study. It was determined that students were satisfied with the scope of the scenario regardless of the simulation methods. The satisfaction level in the paper/pencil CS group was found to be higher than in all groups.[31] A meta-analysis found that HFS is equal to other teaching methods in enhancing learning satisfaction.[32] Therefore, it is essential that well-designed scenario augments learning outcomes. Nurse educators should carefully design HFS teaching, using specific, real clinical scenarios and effective debriefing sessions.

Self-efficacy might be explained that is an individual's belief in performing certain tasks.[17] A meta-analysis of self-efficacy found that simulation is efficient in improving self-efficacy towards tradi-

tional methods.[33] Bambini et al. found that students' self-efficacy levels increased significantly after postpartum and neonatal care simulations.[34] Kimhi et al. determined that simulations increased self-efficacy and confidence before and after clinical practice.[35] Akalin and Sahin reported that the use of obstetric simulations in undergraduate education had a positive effect on self-efficacy.[11] In this study, students' self-efficiency levels have increased, but the lack of differences in self-efficacy from simulation vs. CS methods might also be explained by the measurements made immediately after interventions. The CS group may have higher levels of self-efficacy due to the novel learning method of SBE for students and the limitations of the study.

LIMITATIONS

The limitations of this study were that there was only one high-fidelity simulator in the faculty, SBE was not part of our nursing education, and limited time due to student rotations. The generalization can be made only to populations that share the characteristics of the sample. Another limitation was not being able to measure satisfaction and self-efficacy levels after students cared for postpartum patients in the clinical area. Another limitation includes the short time for evaluating students' self-efficacy.

CONCLUSION

Our study results have provided that using HFS when teaching postpartum care management to undergraduate nursing students is more satisfying than CS. In addition, debriefing sessions and fidelity of scenarios in HFS were found to have higher scores in the simulation design. Self-efficiency levels have increased, but a lack of differences in self-efficacy from simulation vs. CS methods. These findings can provide guidance for nursing educators designing HFS sessions. HFS can be an appropriate teaching method for intended postpartum care learning outcomes.

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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

Idea/Concept: *Sümeyye Bakır, Şenay Ünsal Atan;* ***Design:*** *Sümeyye Bakır, Şenay Ünsal Atan;* ***Control/Supervision:*** *Sümeyye Bakır, Şenay Ünsal Atan;* ***Data Collection and/or Processing:*** *Sümeyye Bakır;* ***Analysis and/or Interpretation:*** *Sümeyye Bakır;* ***Literature Review:*** *Sümeyye Bakır;* ***Writing the Article:*** *Sümeyye Bakır, Şenay Ünsal Atan;* ***Critical Review:*** *Sümeyye Bakır, Şenay Ünsal Atan;* ***References and Fundings:*** *Sümeyye Bakır, Şenay Ünsal Atan;* ***Materials:*** *Sümeyye Bakır, Şenay Ünsal Atan.*

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