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The impact of incorporating a simulation program into the undergraduate nursing curricula: A cross-sectional descriptive study

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ABSTRACT

Aim: To determine the degree of satisfaction for each academic year and according to the type of simulation performed (simulated patient actor/advanced simulator) among nursing students after the use of clinical simulation.
Introduction: Clinical simulation is currently being incorporated in a cross-cutting manner throughout undergraduate nursing education. Its implementation requires a novel curricular design and educational changes throughout the academic subjects.
Design: A cross-sectional descriptive study was performed.
Methods: During the academic years 2018–2019 and 2019–2020, 425 students completed the High-Fidelity Simulation Satisfaction Reduced Scale for Students based on 25 questions and six factors, with a total score between 0 and 125. In total, 91 simulation sessions were performed among students who had different degrees of clinical and previous experience with simulation as well as standardized patient versus advanced simulator. A bivariate analysis was performed, comparing the total scores and the different subscales by sex, previous experience, academic year, and simulation methodology. Linear regression was used for both bivariate and multivariate analysis.
Results: The mean scale score was 116.8 (SD=7.44). The factor with the highest score was "F2: feedback or subsequent reflection", with a mean score of 14.71 (SD=0.73) out of 15. Fourth year students scored the highest (mean=119.17; SD=5.28). Students who underwent simulation training with a simulated patient actor presented a higher level of overall satisfaction ($p<0.05$) (Mean=120.31; SD=4.91), compared to students who used an advanced simulator (Mean=118.11; SD=5.75).
Conclusions: Satisfaction with the simulation program was higher in fourth-year students compared to first-year students and was also higher when a simulated patient actor was used compared to an advanced simulator. The most highly valued aspect was the subsequent debriefing or reflective process.

1. Introduction

Simulation is a teaching method that aims to place students in a context that mimics reality, based on similar situations to those they will face in their professional future. The process is developed within a safe environment, without compromising patient safety. According to Gaba, the father of simulation, this is a technique for replacing or augmenting real experiences with guided, fully interactive experiences that evoke the real world (Gaba, 2004).

The International Nursing Association for Clinical Simulation and Learning (INACSL) defines simulation-based learning as any educational strategy that creates learning conditions designed to resemble a real-world situation that students may encounter (Sittner et al., 2015).

As an educational methodology, simulation has always been used in nursing training; however, in recent years it has made a major impact in the field of health sciences education (Urra Medina et al., 2017). With the implementation of the European Higher Education Area and the Bologna plan that unified all educational university systems at the

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European level, there was a change in the understanding of the responsibility of the learning process, with the student as the protagonist and the teacher as the moderator, coordinator, facilitator, and mediator of this process.

Specifically, simulation, used as a methodological strategy, enables the active participation of students and their involvement in the learning process through reflection, since students do not simply assimilate what they receive, rather they analyze, interpret, investigate, and create their own knowledge (Almenara et al., 2015).

Simulation-based learning has been shown to bridge the gap between classroom knowledge and real clinical experience, allowing skills and competencies to be acquired in a safe and controlled manner, adapted to clinical environments (Farra et al., 2015; Smith and Barry, 2013). Several studies have shown the need for simulation-based learning, justifying its use as a teaching-learning method (Abelsson and Bisholt, 2017; Matzumura Kasano et al., 2018).

A recent meta-analysis published by Mulyadi concluded that undergraduate simulation programs are more effective than traditional teaching models (Mulyadi et al., 2021). Other authors have reported that simulation improves nursing students' knowledge acquisition and self-confidence with task performance (Costa et al., 2020; Karataş and Tüzer, 2020). In addition, students report high levels of satisfaction and confidence with simulation, as it enables them to practice techniques and/or procedures without the risk of harming patients, which is a common concern during clinical placements (Merriman et al., 2014).

Nonetheless, a systematic review published by Tamilselvan (Tamilselvan et al., 2023) reports a variety of results in relation to student confidence and satisfaction with the use of high-fidelity simulation. The authors conclude that this discrepancy could be related to three main limitations of simulation-based learning experiences (SBE): a reduced sense of authenticity, technical obstacles, and emotional exhaustion.

To overcome these obstacles and improve the effectiveness of SBE, it is recommended to improve the fidelity aspects, taking into account the immaturity of the current technology of high-fidelity simulators to simulate situations with high levels of realism (Reader and Cuthbertson, 2012). Moreover, to reduce emotional exhaustion, debriefing sessions should be improved by including peer support to alleviate simulation-related stress (Lee et al., 2020). In addition, student feedback should be gathered using validated surveys to measure these aspects.

For all these reasons, at the XXX School of Nursing, since the 2018–2019 academic year, SBE have been incorporated and integrated to the university nursing curriculum as a transversal methodology. The teaching team involves experts in simulation who analyze together with the rest of the university teachers how to incorporate the SBE in those subjects where they students have difficulties in acquiring the competencies with traditional learning.

Thus, simulated experiences were designed to train different and complementary competencies that were gradually incorporated into the curriculum of these subjects. Currently, in the 2021–2022 academic year, students from the first to the fourth year carry out different simulation-based learning experiences included in different curricular subjects. This implementation has taken place gradually over three academic years, enabling the comparison of differences between courses and of different methodological aspects.

To assess this new methodology, several instruments have been developed to measure student satisfaction in the field of clinical simulation, teamwork and decision making, among others (Franklin et al., 2014; Levett-Jones and Lapkin, 2014; Oh et al., 2015). At present, a high-fidelity simulation satisfaction scale for nursing students (ESSAF), is used, together with a condensed and validated version on students of different academic years and with varying clinical experience (Martínez-Arce et al., 2023).

To date, no studies have been found that compare satisfaction between students of the different academic years of the nursing degree using this summary scale, comparing different levels of experience or using different methodologies, such as the use of simulated patient actor versus advanced simulator.

These findings may facilitate the planning of simulated experiences in different academic years as well as the management of resources, such as simulators or actors.

For these reasons, this study sought to determine the degree of satisfaction of nursing students with high-fidelity clinical simulation for each academic year and according to the type of simulation performed (simulated patient actor/advanced simulator). The secondary objectives were to compare the differences in the degree of satisfaction and the most highly rated aspects according to the students previous experience.

2. Methods

2.1. Design

A cross-sectional descriptive study was employed, according to the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines (File S1). Cross-sectional studies allow researchers to collect data from a large pool of subjects and compare differences between groups (Setia, 2016).

The study population was first and second-year students from the 2018–2019 academic year and first, second, third and fourth-year students of the 2019–2020 academic year.

2.2. Description of the activity

In total, 32 simulation sessions were conducted in the 2018–2019 academic year and 59 sessions took place in the 2019–2020 academic year. These simulation sessions were conducted in high-fidelity simulation scenarios that are extremely realistic and provide a high level of interactivity and realism for the student. Each session involved small groups of 8–10 students, and lasted approximately three to four hours, developing between three and four scenarios. Sessions took place within the different subjects that use this methodology to strengthen and apply theoretical concepts, such as pediatrics, psychiatry, pharmacology, clinical safety, etc.

The integration of high-fidelity simulation into the curriculum was meticulously orchestrated by the academic coordination team and the instructors in charge of the courses, in collaboration with an expert in clinical simulation. This team crafted the simulation modules with careful consideration of the students' prior clinical practice assessments, incident reports or logs of adverse events, and the challenges associated with conducting practical sessions in constrained settings like psychiatric units. To enhance the learning experience, these sessions were video-recorded and streamed live for student viewing.

All simulation sessions were conducted with the same teaching design:

1) Prebriefing or introduction to clinical simulation, which included working on four key aspects to guarantee this participative environment, such as:
   a. Personal comfort
   b. Orientation in the environment
   c. Generating confidence
   d. Creation of a fiction contract
2) Patient presentation and work environment.
3) Three to four simulated clinical scenarios in which all students participated in at least one of the scenarios.
4) A subsequent debriefing after each of the scenarios based on the "Good Judgment Method" (Maestre and Rudolph, 2015).

To carry out the simulation, a main instructor oversaw the immersion into the simulation and coordinated the debriefing, whereas a co-instructor provided support as an expert on the subject to be trained, and for the management of the simulator and video recording systems. When necessary, actors were used to faithfully recreate the real situation.

2.3. Data collection

The modified ESSAF scale was used (Martínez-Arce et al., 2023), consisting of 25 items and six factors. These six factors encompass the whole process of clinical simulation training for students, evaluating direct care in several dimensions or factors such as care (F1), subsequent debriefing or reflection (F2), the benefits or impact of the methodology in aspects of previous planning (F3), teamwork and critical thinking (F4), learning, safety, and confidence (F5) and finally, communication with the patient and family (F6). This scale provides a score ranging from 0 to 125 points. The higher the score, the higher the degree of satisfaction. The psychometric assessment of the scale revealed adequate validity and reliability (Cronbach's alpha=0.859).

Sociodemographic variables such as the students' age, sex and academic year were also collected.

At the end of the survey, the students were given a blank space to provide suggestions or recommendations to the faculty about the experience and future simulation experiences.

To facilitate data collection and ensure anonymity, a Google Docs document was generated and self-completed by the students at the end of the simulation practices.

2.4. Data analysis

All calculations were performed using the SPSS 28.0 program. First, descriptive statistics were performed using absolute and relative frequencies, as well as mean and standard deviation. Next, bivariate analysis was performed comparing the total scores and the different subscales by sex, previous experience, academic year, and simulation methodology, using Student-Fisher t-tests and analysis of variance by number of categories, as well as their respective nonparametric Man Whitney U and Kruskall-Wallis tests, respectively. Finally, the mean difference (MD) and the adjusted mean difference (aDM) of scores on the ESSAF scale were estimated with their respective 95% confidence intervals (C95%) for each of the independent variables. Linear regression was used for both bivariate and multivariate analysis. Statistical significance was set at $p \leq 0.05$.

2.5. Ethical considerations

The study was evaluated by the Ethical Committee of the Universidad Autónoma de Madrid, who stated that the project did not contradict ethical standards and did not require evaluation as it was a satisfaction survey.

All participants were informed and provided their consent to participate in the research. All data were treated confidentially in accordance with the Organic Law 3/2018 of 5 December on the Protection of Personal Data and Guarantee of Digital Rights, keeping them strictly confidential and not accessible to unauthorized third parties and the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on Data Protection (GDPR).

The simulation scenarios were recorded for later analysis during the debriefing, all participants were informed of the use of the recordings exclusively for teaching or research and signed their consent to the recording.

3. Results

3.1. Sociodemographic characteristics

Of the total number of students who completed the satisfaction survey (N=425), 88.0% (374) were female and the mean age was 20.11 years (SD=5.34 years) with a median of 19 years (min and max: 18–49), respectively. First-year students represented 34.5% of the sample (147), 29.8% were second-year students (127), 16.7% were third-year students (71) and 18.8% were fourth-year students (80).

In terms of overall satisfaction with the ESSAF scale, a mean score of 116.88 (SD=7.44) was obtained. Of the factors that conformed the scale, the one with the highest average score per item was "F2 debriefing or subsequent reflection". Detailed information is displayed in Table 1.

The next step was to determine the differences according to the simulation methodology, observing statistically significant differences, both overall and in the different factors. In this case, the highest scores corresponded to the methodology where an actor was used (Table 2).

A multivariate analysis was performed on the data using multiple linear regression to control for confounding bias. Only academic year and the type of methodology were statistically associated with the total scores on the ESSAF satisfaction scale. Thus, third-year students showed a lower average satisfaction than first-year students (MD: −4.14; 95%CI: −7.56; −0.72), whereas fourth-year students showed a higher satisfaction compared to first-year students (MD: 2.33; 95%CI: 0.82–4.58). Moreover, students who participated in the simulation with a simulated patient actor (also known as standardized patient) presented a higher level of overall satisfaction than students who experienced the simulation with advanced simulator (MD: 3.55; 95%CI: 1.24–5.85) (Table 3).

Next, the degree of satisfaction for the four academic years was evaluated, obtaining a statistically significant association in the six factors and globally among the four academic years ($p \leq 0.05$). The highest score was observed in fourth-year students (119.17), followed by first-year students (118.57), with the lowest scores in second-year students (115.9) and third-year students (112.52) (Table 4) (Fig. 1).

Finally, satisfaction scores were compared according to previous simulation experience, showing statistically significant differences in four of the six factors (Table 5). Specifically, students with no previous

Table 1
Characteristics of the sample.

Variables	Total n (%)	Total Mean (SD)	
Sex			
Female	374 (88.0%)		
Male	51 (12.0%)		
Age		20.1 (5.34)	
18–20 years	278 (65.4%)		
21–23 years	100 (23.5%)		
24–30 years	19 (4.5%)		
Over 30 years	16 (3.8%)		
Experience with simulation			
No	298 (70.1)		
Yes	127 (29.9)		
Academic year			
First year	147 (34.6)		
Second year	127 (29.9)		
Third year	71 (16.7)		
Fourth year	80 (18.8)		
Methodology			
Advanced simulator	153 (36.0)		
Simulated patient	74 (17.4)		
Combined	198 (46.6)		
ESSAF Scale		116.88 (7.44)	**Mean score per item**
F1: Impact of simulation on care		28.11 (2.12)	4.68
F2: Benefits of feedback on the simulation		14.71 (0.73)	4.90
F3: Benefits of pre-planning		18.67 (1.44)	4.67
F4: Benefits on teamwork and critical thinking		18.66 (1.72)	4.66
F5: Benefits on learning, safety, and confidence		28.02 (2.36)	4.67
F6: Benefits on Patient and family communication		8.70 (1.40)	4.35

Table 2
ESAFF scores and subscales as a function of simulation methodology. Bivariate analysis.

FACTORS (N° of Items)	Advanced simulator (N=153) Mean (SD) Median (RIQ)	**Actor** (N=72) Mean (SD) Median (RIQ)	**Combination** (N=198) Mean (SD) Median (RIQ)	p-Value **P_{Anova}** P_{K-W}
F1. Impact of simulation on care (6)	28.61 (1.66) 29 (2)	28.54 (1.74) 29 (2)	27.53 (2.39) 28 (4)	**<0.001** **<0.001**
F2 Benefits of feedback on the simulation (3)	14.76 (0.63) 15 (0)	14.87 (0.37) 15 (2)	14.62 (0.89) 15 (0)	**0.024** 0.113
F3 Benefits of pre-planning (4)	18.80 (1.32) 19 (2)	19.17 (1.17) 20 (1)	18.39 (1.56) 19 (2)	**<0.001** **<0.001**
F4 Benefits on teamwork and critical thinking (4)	18.83 (1.55) 19 (2)	19.26 (1.09) 20 (1)	18.30 (1.94) 19 (3)	**<0.001** **<0.001**
F5 Benefits on learning, safety, and confidence (6)	28.58 (1.64) 29 (2)	29.14 (1.41) 30 (1)	27.19 (2.77) 28 (4)	**<0.001** **<0.001**
F6 Benefits on Patient and family communication (2)	8.48 (1.47) 9 (2)	9.33 (1.03) 10 (1)	8.65 (1.39) 9 (2)	**<0.001** **<0.001**
Total ESSAF	118.11 (5.75) 120 (8.50)	120.31 (4.91) 121 (5.75)	114.69 (8.61) 117 (13)	**<0.001** **<0.001**

Table 3
Mean differences (MD) between student profile and methodology used on ESAFF scores. Bivariate and Multivariate analysis.

	Bivariate analysis Multivariate analysis			**Bivariate analysis Multivariate analysis**		
Variables	**DM**	**IC95%**	**p-value**	**DM**	**IC95%**	**p-value**
Sex						
Male vs Female	-0.36	-3.93; 0.47	0.123	−1.87	-3.97; 0.22	0.079
Age	-0.04	-0.17; 0.10	0.559	-0.01	-0.14; 0.11	0.827
Simulation experience	**−4.08**	**-5.59; −2.58**	**<0.001**	-0.17	-2.65; 2.32	0.896
Academic year						
Second year vs. first year	**-2.72**	**-4.42; −1.03**	**0.002**	-0.97	-3.28; 1.35	0.411
Third year vs. first year	**-6.09**	**-7.56; −4.07**	**<0.001**	**-4.14**	**-7.56; −0.72**	**0.018**
Fourth year vs. first year	0.55	0.82; 2.50	0.575	**2.33**	**0.82; 4.58**	**0.042**
Methodology						
Advanced simulator vs. actor	**4.14**	**2.28; 5.99**	**<0.001**	**3.55**	**1.24; 5.85**	**0.003**

experience presented higher scores than those with previous experience ($p \leq 0.05$). Table 5 also shows the analysis according to sex, showing statistically significant differences in factors F4 and F6. In this case, women presented higher average scores than men.

4. Discussion

One of our objectives was to compare the use of a simulated patient actor versus advanced simulator among first-year students performing the same scenarios, same teaching structure and teaching staff. The overall score was higher with a simulated patient actor and we observed an increase in almost all subscales. This is consistent with previous studies (Knutson de Presno et al., 2021; Ma et al., 2023), although we can highlight the significant increase in the critical thinking subscale where a recent meta-analysis shows inconsistent findings on the impact of high-fidelity simulation to improve this competency in nursing students (Li et al., 2022).

For all these reasons, we can reflect the importance of incorporating simulated patient actor to increase student satisfaction, reserving advanced simulators for scenarios where techniques or procedures cannot be performed on actors. This is even more relevant considering the current evidence, which states that nursing students achieve the same level of knowledge using simulated patient actor or advanced simulator (Karataş and Tüzer, 2020).

The difference in scores between the different courses analyzed is striking, with a statistically significant association in all but one of the factors. When comparing the results by academic year, we found the highest scores in the first and last year students, which appears relevant as these are the courses with the greatest difference in terms of previously acquired competencies and knowledge when it comes to understanding the reality of the nursing profession. We have not found studies comparing the impact of high-fidelity simulation across academic courses at the same institution.

One possible explanation for this high level of satisfaction among senior students may be because this was their first simulation experience performed during their undergraduate studies. These students have not had the opportunity to learn about this methodology and the fact that it is so highly valued by senior students reflects the need to incorporate it into the undergraduate curriculum as soon as possible. Simulation methodologies have shown a higher degree of satisfaction when compared to traditional methods (Guerrero et al., 2022; Raman, 2021).

Fourth-year students who already had significant clinical experience highlighted the usefulness of simulation for the application of care or pre-planning, which were the least valued factors by first-year students. Therefore, simulation experiences among more experienced students should be oriented towards acquiring competencies in this area, which complements previous reports on the usefulness of this approach for the acquisition of competencies in the management of critical situations or decision-making among senior students (Endacott et al., 2010).

A comparison of the satisfaction of students with or without previous experience with simulation, regardless of the academic year, shows a significant decrease in four of the six factors, possibly because the initial impact of the first experience is no longer generated. Consequently, it is not essential to work on maximum fidelity in the first simulated experiences, however, it is necessary to maintain a certain degree of innovation, creativity, and high realism in future simulated experiences if we want to maintain a high degree of student satisfaction (Tamilselvan et al., 2023).

Only one factor in the scale failed to show significant changes in relation to the academic year: the simulation debriefing factor or satisfaction with the post-scenario debriefing. Even in the group with no previous simulation experience, this factor received the highest score which contrasts with previous publications regarding students' first experiences with simulation, where the practical part of the simulation received the highest scores (i.e., the scenario itself), compared to the debriefing or reflection (Luctkar-Flude et al., 2012).

This high score may be related to the teachers' debriefing style and experience. Thus, one of the aspects that generates the most anxiety and fear among students regarding the simulated experiences is related to the evaluation and debriefing among teachers (Nielsen and Harder, 2013), however, "Good Judgment Method" (Maestre and Rudolph, 2015) used by the school's teaching staff has proven to be highly effective and valued by all students regardless of their previous simulation or clinical experience. In addition, conducting debriefing in small groups of no more than 10 students, seated in a circle next to teachers, facilitates the peer support described in the literature and addresses the need to improve debriefing to increase student satisfaction and confidence (Lee et al., 2020).

Table 4
ESSAF scores and subscales according to academic year. Bivariate analysis.

Factors (no. of items)	Year 1 Mean (SD) Median (RI)	Year 2 Mean (SD) Median (RI)	Year 3 Mean (SD) Median (RI)	Year 4 Mean (SD) Median (RI)	p-Value **P_{Anova}** P_{K-W}
F1. Impact of simulation on care (6)	28.37(1.75) 29 (3)	27.97 (2.11) 29 (3)	26.76 (2.69) 27 (4)	29.03(1.47) 30 (2)	**<0.001** **<0.001**
F2 Benefits of feedback on the simulation (3)	14.84(0.47) 15 (5)	14.68 (0.77) 15 (5)	14.53 (1.05) 15 (5)	14.70 (0.70) 15 (5)	**0.017** 0.077
F3 Benefits of pre-planning (4)	18.75 (1.38) 19 (2)	18.61 (1.40) 19 (2)	17.98 (1.75) 18 (2)	19.24 (1.02) 20 (1)	**<0.001** **<0.001**
F4 Benefits on teamwork and critical thinking (4)	18.86 (1.52) 19 (2)	18.61 (1.79) 19 (2)	17.76 (2.10) 18 (2)	19.16 (1.27) 20 (1)	**<0.001** **<0.001**
F5 Benefits on learning, safety, and confidence (6)	28.77 (1.56) 29 (2)	27.50 (2.52) 28 (4)	26.65 (3.13) 27 (5)	28.70 (1.65) 30 (2)	**<0.001** **<0.001**
F6 Benefits on Patient and family communication (2)	8.98 (1.20) 9 (2)	8.53 (1.42) 9 (2)	8.84 (1.32) 9 (2)	8.34 (1.65) 9 (3)	**0.003** **0.013**
Total ESSAF	118.62 (5.75) 120 (8)	115.89 (7.92). 118 (10)	112.53 (9.41) 114 (14)	119.17 (5.28) 120 (6)	**<0.001** **<0.001**

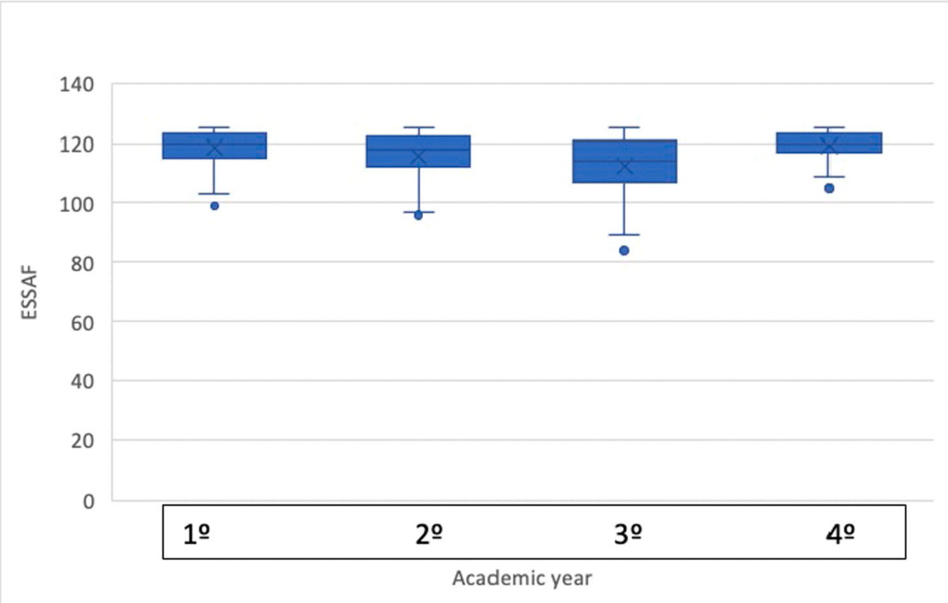

Fig. 1. Academic Year.

Table 5
ESSAF scores and subscales as a function of previous experience with simulation in the previous year and gender. Bivariate analysis.

FACTORS (No. of Items)	**No previous experience (N=298) Mean (SD) Median (RI)**	**With previous experience (N=127) Mean (SD) Median (RI)**	**p-Value $P_{t\ Student}$ P_{UMW}**	**Female Mean (SD) Median (RI)**	**Male Mean (SD) Median (RI)**	**p-Value $P_{t\ Student}$ P_{UMW}**
F1. Impact of simulation on care (6)	28.44 (1.82) 29 (2)	27.31(2.51) 28 (4)	**<0.001** **<0.001**	28.13 (2.12) 29 (3)	27.94 (2.10) 29 (3)	0.508 0.342
F2 Benefits of feedback on the simulation (3)	14.76 (0.65) 15 (15)	14.60 (0.90) 15 (15)	0.076 0.063	14.73 (0.73) 15 (0)	14.62 (0.81) 15 (0.25)	0.356 0.161
F3 Benefits of pre-planning (4)	18.84 (1.30) 19 (2)	18.26 (1.65) 19 (2)	**<0.001** **0.001**	18.72 (1.44) 19 (2)	18.32 (1.45) 12 (1.25)	0.092 **0.043**
F4 Benefits on teamwork and critical thinking (4)	18.86 (1.55) 19 (2)	18.16 (1.98) 19 (2)	**<0.001** **<0.001**	18.70 (1.67) 19 (2)	18.34 (2.06) 19 (3)	0.241 0.364
F5 Benefits on learning, safety, and confidence (6)	28.49 (1.81) 29 (2)	26.91 (3.02) 29 (2)	**<0.001** **<0.001**	28.04 (2.33) 29 (3)	27.88 (2.60) 29 (3.25)	0.560 0.720
F6 Benefits on Patient and family communication (2)	8.67 (1.41) 9 (2)	8.76 (1.36) 9 (2)	0.553 0.559	8.76 (1.40) 9 (2)	8.26 (1.35) 8 (3)	**0.015** **0.005**
Total ESSAF	118.11 (6.25) 120 (8)	114.0 (9.09). 118 (10)	**<0.001** **<0.001**	117.10 (7.40) 119 (10)	115.36 (7.72). 117.5 (10.25)	0.123 0.084

4.1. Strengths and limitations

Regarding the strengths of this study, it is noteworthy that it was conducted over several years, and this longitudinal approach has allowed us to demonstrate how satisfaction with high-fidelity simulation experiences evolves throughout academic training. Furthermore, it has enabled us to identify the need for innovation and to seek out more complex scenarios in order to meet students' expectations throughout their education.

Concerning the limitations of this work, all simulation groups had a similar number of participants, however we were unable to compare how the number of participants affects satisfaction and learning outcomes. This is an important matter since one of the challenges of incorporating this methodology in university teaching programs is the management of high volumes of students. It would be interesting to know if there are differences in the assessment of the factors depending on the size of the group.

The same occurs in relation to feedback or debriefing, all the simulation experts had similar training and experience, and we were unable to compare different styles or different degrees of experience of the instructor and analyze the impact of these factors on student satisfaction.

Additionally, another significant limitation is our lack of understanding regarding the reasons students have expressed lower satisfaction levels over the course of their academic studies. We hypothesize that this decline may be attributed to a lack of innovation capable of engaging students' interest, though this cannot be conclusively determined. Ideally, future research should employ a mixed-methods approach that includes a qualitative component to delve deeper into the motivational factors.

5. Conclusions

The use of simulated patient actor in high-fidelity simulation scenarios received greater student satisfaction scores than the use of advanced simulator. Moreover, nursing students' satisfaction with simulation decreases as learning experiences are carried out with this methodology, which makes it necessary to design stimulating and varied SBE throughout the nursing curriculum to maintain a high level of student interest and involvement. Finally, we have observed that the debriefing style based on good judgment is highly valued by students of all academic courses with or without previous experience.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.nepr.2024.103972.

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