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Nursing Students' Satisfaction and Self-Confidence with Simulation-Based Learning and Its Associations with Simulation Design Characteristics and Educational Practices

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Purpose: Clinical simulation is a recent and now most used educational approach in health training programs. Its use for educational purposes in nursing education has gradually become widespread throughout the world. The aim of this study was to assess students' satisfaction and self-confidence with simulation-based learning and to identify the association of simulation design characteristics and educational practices with those outcomes.

Subjects and methods: This study utilized a correlational cross-sectional research design. Using a convenience sample, 110 nursing students were selected. Data were collected based on a questionnaire involving three instruments: the Simulation Design Scale, Educational Practices in Simulation Scale, and Student Satisfaction and Self-Confidence in Learning Scale. Data were analysed using SPSS software, version 26.0. Pearson's correlation coefficients was determined to describe and test the relationships between the different variables.

Results: Nursing students were mostly satisfied with their simulation-based learning activity and felt self-confident: M=21/25 and M=33.8/40, respectively. For simulation design characteristics, only "Support"was correlated with student satisfaction ($r = 0.468$, $p = 0.000$) and it was the factor most correlated with students' self-confidence levels ($r = 0.477$, $p = 0.000$). Furthermore, there were significant correlations between all educational practices and student satisfaction/self-confidence in learning, at a level of $p < 0.01$. "Diverse ways of learning" was the factor most correlated with student satisfaction ($r = 0.858$, $p = 0.000$) and student self-confidence levels ($r = 0.738$, $p = 0.000$).

Conclusion: The current study's findings show that consideration of simulation design elements and the features of all educational practices is necessary for the development of a successful simulation experience and the improvement of student satisfaction and self-confidence.

Keywords: nursing students, satisfaction, self-confidence, simulation-based learning, educational practices, simulation design

Introduction

Improving patient safety is a growing requirement. Thus, the training of health professionals must focus mainly on improving quality of care by integrating scientific and technical advances in both initial and ongoing programs.[1,2]

Therefore, as the goal of health sciences education programs is to impart the knowledge, skills, and attitudes necessary for students to become competent healthcare professionals, they must necessarily benefit from high-quality training, helping them to harmoniously structure their acquired knowledge and guarantee professionalism.[3]

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In this respect, as recommended by the World Health Organization (WHO), nurse educators have responded by incorporating simulation-based learning experiences. The integration of this pedagogical method is one of the alternatives for optimizing the clinical preparation of nursing students, whereby they can safely practice their skills in a controlled and non-threatening learning environment without the risk of harming patients.[4,5]

Many benefits have been found when using simulation in nursing education, enabling students to acquire skills and help them attain improved learning outcomes such as satisfaction, critical thinking, and self-confidence. At this level, it appears necessary to indicate that the fundamental goals of nursing educators refer to students' satisfaction and self-confidence as the main learning outcomes.[6] Nursing students' satisfaction can be defined as the extent to which students can dispense maximum service by maintaining a positive patient-centered attitude and demonstrating their teamwork skills in multi-faceted healthcare settings and it constitutes a major element in the assessment of their acceptance, contentment, and motivation regarding the employed teaching strategy.[7–9] On the other side, learners' self-confidence refers to a person's belief that they can complete what is expected of them, understand the patient care process, make appropriate care decisions without doubt or error. So, in short, it is the degree to which the learner achieves a desired goal.[7,10–12]

In addition, the simulation teaching method provides advantages in the development of teamwork, clinical decision making, time management, self-evaluation, and the communication skills needed to ensure patient safety and care.[13,14]

In this context, a systematic review conducted in 2020 by Alalhareth and Howarth found that simulation is an effective technique in nursing education because it improves student satisfaction. Kaliyaperumal et al (2021) and Demirtas et al (2021) reported high satisfaction scores for nursing students using simulation, with mean scores of 4.60/5 and 23.98/25, respectively.[15–17]

However, to succeed in this learning experience, simulation must be planned well by the educator, as with any teaching design. In fact, in 2005 and 2007, the researcher Pamela R. Jeffries developed the "Nursing Education Simulation Framework/model", which was conceptualized to guide the educational design of educational interventions assisted by clinical simulation in the field of nursing education.[10]

This framework is composed of three components: simulation design characteristics (objectives, fidelity, problem-solving, student support, and debriefing), educational practices (active learning, feedback, student/faculty interaction, collaboration, high expectations, diverse learning, and time on task), and learners' outcomes (learning, knowledge, skill performance, learner satisfaction, critical thinking, and self-confidence), which should be adhered to by facilitators of nursing simulations to enhance the quality of simulation-based learning and achieve high-level outcomes.[10,11,18]

To evaluate simulation-based education and determine whether it is a successful learning style, students' perceptions are valuable. Therefore, the first step is to examine students' satisfaction with and self-confidence developed by the experience, since it influences both teaching and learning processes and the use of simulation-based learning strategies.[19]

Despite the importance of simulation for educational purposes worldwide, further studies are needed to develop strategies that optimize students' learning outcomes, especially in nursing education. Likewise, there is still a lack of evidence to identify which elements of simulation are associated with nursing students' satisfaction and confidence levels with simulation-based learning as important simulation outcomes. Therefore, the aim of this study was to assess student satisfaction and self-confidence with simulation-based learning and to investigate their associations with simulation design characteristics and educational practices.

Methods

Study Design and Settings

This study used a correlational cross-sectional research design. The study was conducted in the medical faculty's clinical simulation center during the second semester of the 2022/2023 academic year, after approval of the study protocol by the ethics committee of the Faculty of Medicine, Sousse, Tunisia (13/01/2023, Ref: CEFMS 208/2023).

Research Population and Sampling

The study population comprised second-year undergraduate nursing students. A non-probability convenience sampling design was utilized in the current survey to recruit participants. According to Cohen, considering an α of 0.05, power of 0.8, medium effect size, and correlation testing as the highest-needed statistical procedure, the minimum required sample size was 85 nursing students.[20] A further 20% were added because missing data is common in research; hence, the sample size after adding the 20% was 110.

Inclusion/Exclusion Criteria

This study included all volunteer students, having consented, registered in the second year of the applied license training program in nursing sciences at the higher institute of nursing sciences during the academic year 2022/2023. Thus, we excluded participants presenting at least one of the following criteria:

- Students enrolled in the other levels of the nursing training program.
- Students who had not consented.
- Students who were absent during the data collection period.

Assessment Instruments

To fulfill the requirements of the study, standardized questionnaires developed by the National League for Nursing and Laerdal Multisite Project Group were used. These instruments were used in the original version.[21]

Student Satisfaction and Self-Confidence in Learning Scale (SSCLS)

This instrument is a 13-item scale to measure participants' satisfaction with the simulation activity (5 items) and their self-confidence in learning (8 items). It uses a 5-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree. The content validity was established by nine experts in simulation who reviewed the instrument.[22] Reliability was tested using Cronbach's alpha; for satisfaction, $r \pm 0.94$, and for self-confidence, $r \pm 0.87$.[11] In the present work, the reliability test on satisfaction and self-confidence yielded a value of 0.829 for satisfaction and 0.885 for self-confidence.

Educational Practices in Simulation Scale (EPSS)

This is a 16-item instrument with four subscales: active learning (10 items), collaboration (2 items), diverse ways of learning (2 items), and high expectations (2 items). Each item is rated on a five-point scale from 1 (strongly disagree) to 5 (strongly agree). Cronbach's alpha was reported to be 0.86 in studies by Jeffries and Rizzolo,[23] 0.85 in the study by Hur et al,[24] and 0.80 in our current study.

Simulation Design Scale (SDS)

This is a 20-item instrument developed to measure constructs from the Jeffries simulation framework. The design characteristics rated by the participant include objectives/information (5 items), participant support (4 items), problem solving (5 items), guided reflection and feedback (2 items), and fidelity (2 items) concerning the simulation activity. All items are rated on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Content validity was established by ten experts during simulation development and testing. Cronbach's alpha was reported to be 0.92 in the study by Jeffries and Rizzolo,[23] 0.88 in the study by Hur et al,[24] and 0.81 in this study.

Data Collection

Data was collected during the second semester of the 2022/2023 academic year, more precisely from January 23 to May 13, 2023. A self-reporting method involving questionnaire completion was also applied. After completing their simulation-based activity, students were asked to sit in a comfortable private room where they could freely and anonymously fill in the questionnaire and return their responses directly to the investigator. Each participant took approximately 10–15 minutes to complete the questionnaire. Before the questionnaire was administered, the researcher

briefed all participants regarding the expectations of the study and explained that their participation was voluntary and would not in any way affect their learning performance. Participants were also informed that their anonymity in answering the questionnaires would be maintained by the researcher. The participants signed an informed consent form before participating in the study.

Data Analysis

Data were analyzed using SPSS software, version 26.0. Before performing the analysis, the data were checked for completeness and assumptions of statistical tests. The normality test of the variables was performed using the Kolmogorov–Smirnov test. Descriptive and inferential statistics were also calculated. Quantitative variables (SSCLS, SDS, and EPSS scores) are presented as means with standard deviations. Pearson's correlation coefficients were used to describe and test the relationships between the variables.

Ethical Considerations

In order to ensure compliance with the ethical rules applying to the research:

- Permission was obtained from the Ethics Committee of the Faculty of Medicine, Sousse, Tunisia.
- Administrative authorization was obtained from the director of the clinical simulation center and permission was granted by the Institute of Nursing Education.
- Students were informed about the significance and aims of the study before participation.They gave written informed consent and they assured that the data would only be used for research purposes and that there would be no penalty or loss of benefits associated with a refusal to take the survey.

- Confidentiality and privacy were maintained. All information was saved on a computer locked with a password only known by the researcher.

Results

Table 1 shows that the average age of the general population was 21.1 ± 1.4 years, with extremes ranging from 20 to 27 years. The present study was conducted among 110 nursing students, of whom 42.7% were male and 57.3% were female.

Table 2 shows that the overall satisfaction score was (M = 21, SD = 3.5), which revealed that participants were mostly satisfied with their simulation-based learning activities. The highest mean score as given to Item 5 (The way my instructor(s) taught the simulation was suitable for the way I learn; M = 4.28, SD = 0.62).

Table 3 shows that the overall mean self-confidence score was high (M = 33.8, SD = 4.7). All items on the confidence scale had a mean score of > 4/5. The highest score was given to Item 7 (I know how to use simulation activities to learn critical aspects of these skills; M = 4.32, SD = 0.67).

Table 1 Distribution of Nursing Students' Demographic Characteristics

Age	
M±SD	21,1±1,3
Min	20
Max	27
Gender	
Male, n (%)	47 (42.7)
Female, n (%)	63 (57.3)

Table 2 Student Satisfaction with Simulation-Based Learning

Satisfaction Items	M	SD
1. The teaching methods used in this simulation were helpful and effective.	4.20	0.68
2. The simulation provided me with a variety of learning materials and activities to promote my learning of the medical surgical curriculum.	4.23	0.72
3. I enjoyed how my instructor taught the simulation.	4.24	0.42
4. The teaching materials used in this simulation were motivating and helped me to learn.	4.22	0.63
5. The way my instructor(s) taught the simulation was suitable for the way I learn.	4.28	0.62
Total	21	3.5

Table 3 Students' Self-Confidence with Simulation-Based Learning

Self-Confidence Items	M	SD
1. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	4.24	0.72
2. I am confident that this simulation covered critical content necessary for the mastery of the medical surgical curriculum.	4.22	0.75
3. I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting.	4.24	0.68
4. My instructors used helpful resources to teach the simulation.	4.19	0.63
5. It is my responsibility as the student to learn what I need to know from this simulation activity.	4.31	0.61
6. I know how to get help when I do not understand the concepts covered in the simulation.	4.00	0.9
7. I know how to use simulation activities to learn critical aspects of these skills.	4.32	0.67
8. It is the instructor's responsibility to tell me what I need to learn from the simulation activity content during class time.	4.25	0.68
Total	33.8	4.7

Table 4 Correlation Between Nursing Students' Perceptions of Educational Practices, Simulation Design and Student Satisfaction/Self-Confidence in Learning

Variables	Simulation Design Scale	Educational Practices In Simulation Scale	Students' Satisfaction in Learning	Students' Self Confidence in Learning
Students' satisfaction in learning	0.325*	0.798*	1	
Students' self-confidence in learning	0.536*	0.717*	0.684*	1

Notes: *Correlation is significant at the $p < 0.01$ level (2-tailed).

Table 4 shows that both the simulation design scale and educational practices on the simulation scale were positively correlated with student satisfaction and self-confidence in learning. Similarly, a significant correlation was observed between student satisfaction and self-confidence in learning ($r = 0.684$, $p < 0.01$).

Table 5 shows that, for simulation design characteristics, only "Support"was moderately correlated with student satisfaction ($r = 0.468$, $p = 0.000$), "Objectives and information" and "Support" were moderately correlated with students' self-confidence level, and "Fidelity (realism)" indicated a low correlation with student self-confidence.

Furthermore, there were significant correlations between all elements of educational practices and students' satisfaction and self-confidence with simulation-based learning, at a level of $p < 0.01$. « "Diverse ways of learning"» was the most highly correlated with student's satisfaction ($r = 858$)and self-confidence level ($r = 738$).

Table 5 Correlation Between Students' Perceptions of Simulation Design Characteristics and Educational Practices with Students' Satisfaction and Self-Confidence with Simulation-Based Learning

Simulation Design Characteristics	Students' Satisfaction		Students' Self-Confidence	
	r	*p*	*r*	*p*
Objectives and information	−0.019	0.852	0.450*	0.000
Support	0.468*	0.000	0.477*	0.000
Problem solving	0.146	0.144	0.190	0.059
Feedback/guided reflection	−0.113	0.260	−0.100	0.323
Fidelity (realism)	0.177	0.077	0.269*	0.007
Educational practices				
Active learning	0.356*	0.000	0.403*	0.000
Collaboration	0.685*	0.000	0.439*	0.000
Diverse ways of learning	0.858*	0.000	0.738*	0.000
High Expectations	0.802*	0.000	0.525*	0.000

Notes: *Correlation is significant at the $p < 0.01$ level (2-tailed).

Discussion

To prepare students for future clinical practice, simulations have been incorporated into nursing education programs as an innovative teaching strategy. In the present study we aimed to assess student satisfaction and self-confidence with simulation-based learning and to investigate their associations with simulation design characteristics and educational practices. The findings of this study can help educators to choose the most suitable policies for this teaching method to optimize student progress and improve simulation experiences among nursing students.

Thus, as student satisfaction and self-confidence are important outcomes in education, the first step to consider in the evaluation of simulation-based education is to examine their self-confidence and satisfaction with their experience.

In the current study, nursing students showed overall satisfaction after their simulation experience, and felt self-confident. This finding was in agreement with others mentioned in the nursing literature on nursing students, which supported that simulation is an effective technique in nursing education because it improves student satisfaction and should be integrated into nursing educational programs.[16,17,22,25,26]

Similarly, Martins and Pinho reported that students were satisfied with the simulation because they found improvements in collaboration and communication skills. In a study by Zapko et al, nursing students stated that they were satisfied with the simulation experience because it helped them achieve their learning outcomes.[27,28]

The item on which the students reported the highest satisfaction scores indicated that the participants agreed that the way their instructor(s) taught the simulation was suitable for the way they learned (M = 4.28, SD = 0.62). In this context, a systematic review focusing on the learning outcomes of simulation-based education concluded that this method contributes to nursing students' learning in different ways and recommended its integration in the pre-licensure nursing curriculum as it improves self-efficacy, resulting in higher levels of satisfaction among nursing students, and aids in psychomotor skill development.[29]

On the same note, the participants also agreed that they were confident that they were developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting (M = 4.24, SD = 0.68). In this regard, Hart, Spira, and Moreno, stated that nursing students showed high levels of self-confidence in their abilities to recognize patient deterioration events and errors, perform an effective intervention, and participate as an effective team member.[30] Also, Larue et al concluded that simulation facilitates learning and reinforces self-confidence, which enables students to utilise their skills in a clinical setting.[31]

However, our study found that students' satisfaction and self-confidence in learning were positively correlated (r = 0.684), which suggests that when participants felt satisfied, their level of self-confidence in learning was higher. This result is consistent with the findings of Kaliyaperumal et al (2021), who found a strong positive relationship between self-confidence and satisfaction scores (r = 0.821, p <0.05).[16]

However, exploring the elements associated with student satisfaction and self-confidence seems to be essential for advancing the overall aspects of simulation learning and is crucial for the development of effective simulation-based activities in nursing education. In this context, our study found evidence of a relationship between simulation design characteristics, educational practices, and nursing students' confidence and satisfaction levels. Supporting previous findings, these positive correlations suggest that, if well employed, simulation design characteristics and educational practices help improve educational outcomes.[32]

In fact, simulation designs were described in Jeffries' simulation framework as one of the main factors in nursing students' optimal simulation experiences.[18] Again, it is underlined in the literature that the achievement of expected learning outcomes when using simulation in nursing education is significantly affected by simulation design characteristics.[33,34] Thus, our results indicated that students' support needs were positively associated with both student satisfaction and self-confidence. Similarly, Guinea et al (2019) highlighted that the presence of sufficient support and interaction between students and their teachers during simulation increases the self-confidence of students in terms of running the activity.[35] In addition, this study revealed that setting clear objectives and providing relevant information is an important element of boosting students' self-confidence. According to Lioce et al (2015), in any simulation activity, educators can help students achieve specific objectives without knowing all of the challenges they will encounter in the scenarios. This means that to allow students to perform during a simulation successfully, prior to the beginning of the simulation session, specific performance objectives should never be available to learners.[36]

Based on Jeffries' simulation theory, regarding the situation presented during a simulation scenario, participants must be encouraged to identify an issue, develop solutions, and prioritize steps in their nursing process in order to set patient goals on the basis of exploring all possibilities. However, in the present study, problem solving was not associated with nursing students' satisfaction and self-confidence levels. This study's finding is consistent with that of a study carried out in Norway.[27] The positive association between problem solving and student satisfaction was identified by many studies conducted in various countries, interested in the same objectives as those explored in Ethiopia, the USA and Singapore.[37–39] In the same context, studies conducted in Finland and Germany proved that problem-based learning combined with simulation-based education helps students solve various cases.[40,41] Again, several authors emphasized that nursing students' problem-solving skills improved significantly with simulation training.[42]

Consistent with previous findings, this study also revealed that student satisfaction and self-confidence are positively correlated with the use of multifaceted educational best practices in simulations.[28,43] According to our results, simulation instructors' provision of diverse ways of learning seems to have the most important effect on developing student self-confidence and satisfaction. This strong association aligns with the findings of previous studies and suggests that creating and implementing various learning styles and diverse teaching strategies in nursing simulations are essential to help students think critically and reflect on their experiences even in the same simulation scenario.[28]

In terms of collaboration, simulation constitutes a learning modality that encourages students to work collaboratively with their peers and allows them to learn from others' ways of doing things and their observations. Our results indicate that collaboration contributes to both student satisfaction and self-confidence in the simulation activity. Similar studies conducted in Salem, USA, Korea, and Australia stated that communication and team activity (collaboration) were significantly associated with student satisfaction during simulation-based learning.[28,38,44,45] This result is congruent with the finding of Alebachew Abat et al that students who worked with their peers collaboratively were 2.09 times (AOR = 2.09, 95% CI: 1.17–3.73) more likely to be satisfied with simulation-based learning than those who worked alone.[37]

The present study also found a significant positive correlation between active learning and students' self-confidence and satisfaction. In this context, Olaussen, Heggdal, and Tvedt (2020) demonstrated that, during simulation activities, participants are motivated to engage themselves actively, use their whole body and mobilise their psychological, intellectual and interactional skills.[27] This finding has been supported by multiple studies conducted in Saudi Arabia, Norway, the USA, and Australia.[16,27,38,45]

Finally, our findings point to the advantageous effect of considering educational practices and simulation design characteristics to optimize the achievement of expected learning outcomes. Therefore, simulation educators must ensure that all elements are effectively employed when planning simulation sessions.

The main strength of the present survey was that the assessment of nursing students' self-confidence and satisfaction levels was performed using a reliable instrument developed by the National League for Nursing. Again, the findings can inform nurse educators on how to create more successful simulation experiences among nursing students and improve their satisfaction and self-confidence with simulation-based learning. Despite these strengths, several limitations that may decrease the generalizability of the findings were encountered. First, the sample was obtained using a non-probability convenience sampling method, and was limited to a single regional university in Tunisia. Second, this study employed a cross-sectional research design; therefore, it was difficult to report causal relationships between the variables. Third, this study only assessed students' self-confidence and satisfaction as learning outcomes of simulation-based learning.

Therefore, further studies are recommended, using other study designs, taking into account the other simulation-based learning outcomes (knowledge, skill performance, and critical thinking).

Conclusion

In this study, simulation was found to be an effective teaching strategy that contributed to improving students' self-confidence and satisfaction with the learning activity. Participants mentioned that the way their instructor taught the simulation was adapted to their way of learning and that they knew how to use simulation activities to acquire the essential aspects of those skills. Moreover,"Support","Collaboration","Diverse ways of learning", and"High expectations" were the main factors found to be significantly associated with students' satisfaction with simulation-based learning. This study concludes that special consideration must be given to the aforementioned elements when increasing students' self-confidence levels via simulation activities. So, in order to boost students' satisfaction and self-confidence, nurse educators should pay attention to the simulation design characteristics and elements of all educational practices as crucial tools for achieving success in any simulation-based learning.

Meanwhile, as it offers valuable information for policymakers, findings of the current study are relevant in supporting the use of simulation-based learning in nursing education. More precisely, given the result of the present study, to create a more successful Tunisian education system, simulation must be fully integrated into the curriculum of all nursing education schools as a suitable approach for novice learners in our context.

Thus, the ministry of education should ensure that nurse educators know how to design, practice, and debrief following simulation-based activities so that learners achieve the expected learning outcomes. Thus, comprehensive and effective training programs in different specialties should be made available to these educators.

The findings of this research could also be utilized to persuade nurse educators that simulation is an essential educational tool in nursing education, which could lead to minimizing errors in future clinical practice and subsequently improving the quality of patient care. In addition, strengthening simulation-based learning practices among nursing students would help to create a highly qualified clinical nursing care workforce as a result of enhancing students' skills, knowledge, critical thinking, and clinical judgment.

Finally, the results of the current study have important implications for nursing education. Deans and directors of nursing programs can consider assessing student satisfaction and self-confidence with simulation-based learning and their association with simulation design characteristics and educational practices. These would then act as a source of useful insights and a solid baseline for developing and executing educational programs, thus helping to close the gap between nursing theory and practice and speed student nurses' transition to a professional career.

Ethics Statement

Ethical approval was obtained from the ethics committee of the Faculty of Medicine, Sousse, Tunisia (13/01/2023, Ref: CEFMS 208/2023).

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Disclosure

The authors declare no conflicts of interest in this work.

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