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PERCEIVED INFLUENCE OF LOW-FIDELITY SIMULATION MANIKINS ON NURSING STUDENTS' SELF-CONFIDENCE AND PERCEIVED COMPETENCE: A CROSS-SECTIONAL STUDY AT THE UNIVERSITY OF BENIN

Chukwurah Joan Nkechi[1], Irinyemi Oluwakemi Anna[1]
[1]Faculty of Nursing Sciences, University of Benin, Benin City, Edo State, Nigeria

Correspondence: Chukwurah Joan Nkechi: nkechi.chukwurah@uniben.edu, +234 806 846 7845

Abstract

This descriptive cross-sectional study assessed the perceived influence of low-fidelity manikins on self-confidence and competence among a convenience sample of 218 undergraduate nursing students at the University of Benin, Nigeria. Simulation has become a central strategy in nursing education because it allows students to practice clinical skills in a controlled environment before exposure to real patients. In many resource-limited nursing schools, low-fidelity manikins remain the dominant simulation tools, yet their perceived influence on student confidence and competence requires context specific evaluation. Kolb's experiential learning framework was used in this study. A 24 item structured questionnaire was used to collect data on socio-demographic details; attitude towards simulation based learning, perceived self-confidence, and perceived competence after learning with low-fidelity manikins. Items were presented in modified 4-item Likert scale format. Data were analysed using frequencies, percentages, means, and standard deviations with a response rate of 98.6%. The mean cut-off value was 2.5. Students demonstrated a positive attitude toward simulation-based learning (grand mean = 3.0), but reported low perceived self-confidence (grand mean = 2.3) and low perceived competence (grand mean = 2.2). Nursing students generally accepted simulation based learning, but the exclusive use of low-fidelity manikins appeared insufficient for developing high perceived self-confidence and perceived competence. Nursing programmes in this resource limited settings should retain low-fidelity manikins for basic psychomotor skills while progressively integrating higher-fidelity resources, structured debriefing, and supervised clinical transition activities.

Keywords: Nursing Education, Low-fidelity Simulation, Simulations-Based Learning, Self-Confidence, Perceived Competence, Nursing Students.

Introduction

Simulation is now a major teaching strategy in nursing education because it provides controlled practice opportunities that support skill development, clinical reasoning, and patient safety before students enter complex clinical environments (Roberts et al., 2019; Lioce et al., 2020). In undergraduate nursing education, simulation is valuable because nursing students must integrate theoretical knowledge, psychomotor ability, communication, judgement, and safe care behaviour in real clinical setting (Handeland et al., 2020; Palaganas et al., 2020). Simulation-based learning is an important tool in bridging the theory-practice gap in nursing education (Daneshfar & Moonaghi, 2025).

Low-fidelity manikins are static or minimally responsive models that are often used for repeated practice of basic skills such as positioning, wound dressing, bed bath, catheterisation, airway management, and other procedural tasks. On the other hand, high-fidelity manikins provide more realistic clinical cues, including heart sounds, lung sounds, chest movement, palpable pulses, and programmed physiological responses (Lioce et al., 2020). Higher-fidelity manikins are sometimes not considered superior educational effect than low-fidelity manikin especially in the development of non-technical skill such as satisfaction and self-confidence (Lamé & Dixon-Woods, 2021; Kim & Yoo, 2022; Santana & Magro, 2025).

In low resource settings like Nigeria, nursing education often depends heavily on low-fidelity manikins because high-fidelity simulation requires substantial financial investment, trained personnel, maintenance systems, physical space, and continuous technical support (Massoth et al., 2019). However, a persistent educational concern is whether students who learn mainly with low-fidelity manikins feel confident and competent enough to transfer learned skills into patient care situations (Palaganas et al., 2020; Mahasneh et al., 2021). Self-confidence in this context refers to a nursing student's perception of ability to perform required tasks in clinical practice, while competence refers to the perceived ability to apply knowledge, skill, judgement, and safe behaviour in carrying out clinical procedures (American Nurses Association, 2015; Palaganas et al., 2020).

Prior studies show mixed evidence. Some studies report that high-fidelity simulation produces stronger confidence and perceived readiness than low-fidelity simulation (Mahfouz et al., 2019; Shaaban et al., 2021). Other studies report that low-fidelity simulation can improve procedural skills and support learning when the task is basic, repetitive, and clearly demonstrated (Findik et al., 2019; Joho et al., 2021). These differences suggest that the effect of low-fidelity simulation needs to be assessed within specific educational environments and learner groups.

The University of Benin provides an important setting for this investigation because undergraduate nursing students are exposed to simulation-based learning within the Department of Nursing Science, where low fidelity manikins are commonly used for practical skill teaching. The present article therefore reports findings from a study on the perceived effect of low-fidelity simulation manikins on self- confidence and competence among nursing students in the University of Benin, Edo State, Nigeria.

The study was anchored on Kolb's Experiential Learning Theory, which explains learning as a process in which knowledge is created through the transformation of experience (Kolb, 1984). The theory consists of four connected stages, namely concrete experience, reflective observation, abstract conceptualisation, and active experimentation (Kolb, 1984). In simulation-based nursing education, students first encounter clinical ideas through classroom teaching and demonstration, then practise the procedure on manikins, observe their own performance through feedback, and refine future action through repeated practice and debriefing (Fowler, 2008; Palaganas et al., 2020). This theory fits the study because low-fidelity manikins provide a practical learning experience through which students can connect theory with clinical action, although the level of realism may affect confidence and perceived competence.

The objectives of the study were to a) determine the attitude of undergraduate nursing students towards simulation-based learning, b) assess the perceived influence of low-fidelity manikins on self-confidence, and c) assess the perceived effect of low-fidelity manikins on self-competence among undergraduate nursing students in the University of Benin.

Methodology

Research design and setting

A descriptive cross-sectional survey design was used. This design is appropriate given the aim of assessing students' perception about low-fidelity manikin at a single point in time without manipulation of variables. The study was conducted in the Department of Nursing Science, School of Basic Medical Sciences, University of Benin, Edo State, Nigeria. The Department trains undergraduate nursing students through classroom instruction, clinical skills practice in the clinical laboratory, and clinical exposure in the clinical area. The undergraduate program is a five-year pre-registration nursing program

Population and Sampling

The target population comprised third, fourth and fifth year undergraduate nursing students in the Department of Nursing Science. These students had already been exposed to both simulation-based teaching with low-fidelity manikins and clinical experience in the hospitals. The total population was 405 students. The sample size was calculated using Taro Yamane's formula, with 10% added for attrition, giving a minimum sample size of 221 students.

Where,
n= required sample
N= population under study = 405
e = margin of error which is 0.05 at 95% confidence level
1 = constant

$$n = \frac{405}{1 + 405(0.05)^2}$$

n= 201
10% attrition= 20
Therefore the minimum sample size is 221

Convenience sampling technique was used because the students were not always available at the same time due to lectures, laboratory activities, and clinical postings. Although 221 questionnaires were administered, 218 were properly completed and included in the final analysis, representing a 98.6% response rate.

Eligibility criteria

Respondents were third, fourth, and fifth year undergraduate nursing students who were available and willing to participate. Students who were in first and second year of the program, and those who declined consent were excluded.

Instrument for data collection

Data were collected using a 24 item self-structured questionnaire developed in line with the study objectives and existing literature (Shaaban et al., 2021; Kim & Yoo, 2022; Santana & Magro, 2025) on perceived effect of low-fidelity manikin on self-confidence and self-competence. The instrument had four sections. Section A assessed socio-demographic variables. Section B assessed attitude toward simulation-based learning using 7 items on a 4-point rating scale. Section C assessed perceived effect of low-fidelity manikins on self-confidence using 7 items, while Section D assessed perceived effect of low-fidelity manikins on self-competence using 6 items. A mean cutoff value of 2.5 was used to classify attitude and good or poor, and to classify perceived self-confidence and self-competence as high or low.

Validity and reliability of instrument

The questionnaire was face and content validated through expert judgement of two experienced nurses. Adjustments were made as required. Reliability was assessed through a pilot among 22 nursing undergraduates at Benson Idahosa University, Benin City who did not participate in the study. The questionnaire was further edited after the exercise. The Cronbach alpha reliability coefficient was 0.80, which indicated acceptable internal consistency.

Method of data collection

Data were collected through direct questionnaire administration after the purpose of the study was explained to participants. Questionnaires were retrieved immediately after completion. Data collection occurred over a period of 1 week in March 2024.

Method of data analysis

Data were analysed using the Statistical Package for Social Sciences, version 24. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise respondent characteristics and items responses. Results were presented in tables and charts.

Ethical consideration

Ethical approval was obtained from the Research Ethics Committee, College of Medical Sciences, University of Benin with the reference number CMS/REC/2023/479. Permission was also obtained from the Head of Department of the Department of Nursing Science. Participation was voluntary, written informed consent was obtained, and respondents were assured of anonymity and confidentiality. No personally identifiable information was collected. Data were used strictly for academic research purposes.

Results

Out of 221 distributed questionnaires, 218 were returned and found valid for analysis, resulting in a response rate of 98.6%.

Table 1**:** Socio-demographic characteristics of respondents (n = 218)

Variables	Frequency (n = 218)	Percent (%)
Gender		
Male	31	14.2
Female	187	85.8
Age		
Less than 20 years	12	5.5
21–25 years	152	69.7
Above 25 years	54	24.8
Level		
300L	67	30.8
400L	86	39.4
500L	65	29.8

Ethnicity		
Igbo	32	14.6
Yoruba	54	24.8
Hausa	18	8.3
Others	114	52.3

Table 1 show that the majority of the respondents were female. More than half of respondents fall within the 21-25 years age range.

Table 2**:** Attitude of nursing students toward simulation-based learning (n=218)

Variables	Strongly Agree n (%)	Agree n (%)	Disagree n (%)	Strongly Disagree n (%)	Mean	Remark
Simulation-based learning is sufficient for nursing education.	94 (43.1)	83 (38.1)	17 (7.8)	24 (11.0)	3.1	Positive
Simulation-based learning experience is enjoyable.	71 (32.6)	80 (36.7)	43 (19.7)	24 (11.0)	2.9	Positive
Simulation-based learning is a waste of time.	18 (8.3)	41 (18.8)	59 (27.1)	100 (45.8)	3.1	Positive
Simulation-based learning should be recommended to other students in other departments.	56 (25.7)	121 (55.5)	24 (11.0)	17 (7.8)	3	Positive
Simulation-based learning training is boring.	23 (10.6)	38 (17.4)	87 (39.9)	70 (32.1)	2.9	Positive
Simulation-based learning has influenced my decision-making abilities in real clinical settings.	65 (29.8)	75 (34.4)	46 (21.1)	32 (14.7)	2.8	Positive
Simulation-based learning events reflect what I encounter in real clinical settings.	102 (46.8)	68 (31.2)	23 (10.6)	25 (11.4)	3.1	Positive
Grand mean					**3.0**	

Note: The mean cutoff value was 2.5. Mean scores above 2.5 indicate a good attitude towards simulation-based learning. Negatively worded items were reverse-coded prior to analysis.

Table 2 presents data on attitude towards simulation-based learning among nursing students. The grand mean of 3.0 indicates an overall positive attitude towards the use of simulation-based learning in nursing education among the respondents.

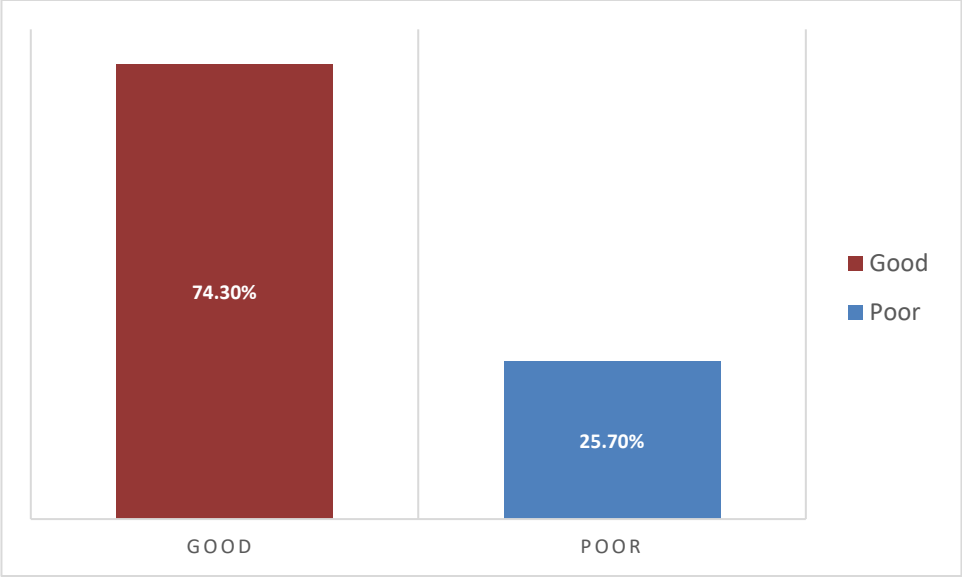


Figure 1**:** Bar chart showing the attitude of nursing students toward simulation-based learning

The above chart indicates that many respondents have positive attitude toward simulation-based learning in nursing education.

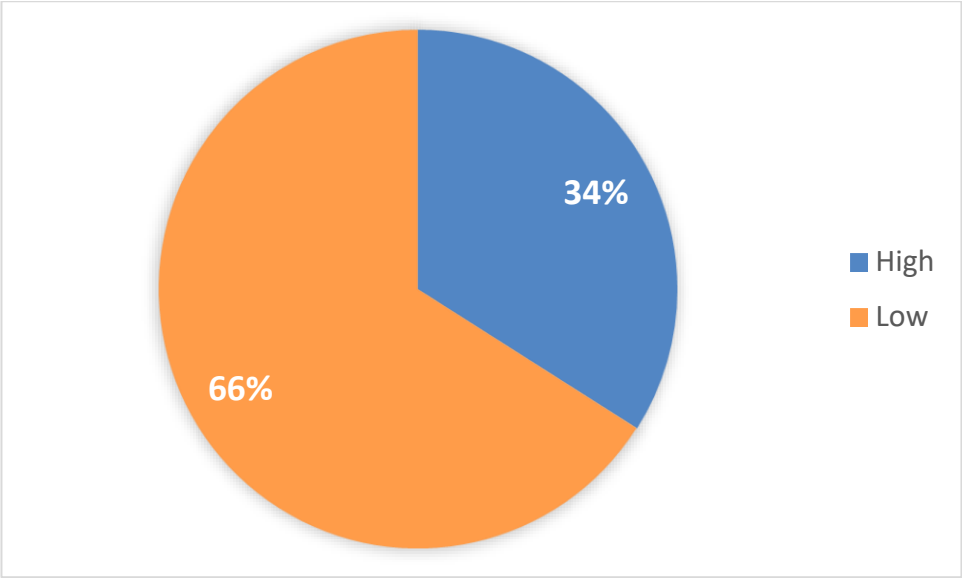
Table 3: Reported influence of teaching with low-fidelity manikins on the perceived self-confidence of nursing students (n=218)

Items	**Strongly agree n(%)**	**Agree n(%)**	**Disagree n(%)**	**Strongly disagree n(%)**	**Mean**	**Remark**
I am confident that I can carry out procedures taught using SBL manikins relating to medical surgical courses.	42 (19.3)	12 (5.5)	76 (34.8)	88 (40.4)	2.0	Low
I am confident that I am developing skills required to perform necessary tasks.	37 (16.9)	23 (10.6)	69 (31.7)	89 (40.8)	2.0	Low
Participating in SBL with manikins improves my confidence in performing nursing skills.	41 (18.8)	54 (24.8)	78 (35.8)	45 (20.6)	2.4	Low
I am confident in my ability to independently make a clinical decision.	17 (7.8)	33 (15.1)	101 (46.4)	67 (30.7)	2.0	Low
I am confident that I am obtaining knowledge with SBL using manikins.	31 (14.2)	46 (21.1)	67 (30.8)	74 (33.9)	2.2	Low
I am confident in my ability to ensure safety when carrying out procedures in an actual clinical setting.	40 (18.3)	27 (12.4)	95 (43.6)	56 (25.7)	2.2	Low

Items	Strongly agree n(%)	Agree n(%)	Disagree n(%)	Strongly disagree n(%)	Mean	Remark
I am confident in my ability to work with other nurses and healthcare professionals.	67 (30.7)	49 (22.5)	80 (36.7)	22 (10.1)	2.7	High
			Grand mean		**2.3**	

Note: The mean cutoff value was 2.5. Mean scores above 2.5 indicate a high perceived self-confidence. SBL = Simulation-based learning

Table 3 indicates a low perception of self-confidence in relation to learning clinical skills with low fidelity manikins with a grand mean value below the critical point.



Items	Always	Sometimes	Rarely	Never	Mean	Remark
Learning with low-fidelity manikins align with the theoretical knowledge taught	21 (9.6)	55 (25.2)	67 (30.8)	75 (34.4)	2.1	Low
Working on real patients is almost the same as working on low-fidelity manikins	65 (29.8)	43 (19.7)	87 (39.9)	23 (10.6)	2.7	High
I give safe and quality healthcare after learning with low-fidelity manikins	41 (18.8)	11 (5.0)	90 (41.3)	76 (34.9)	2.1	Low
I am able to carry out procedures learned during practical with low-fidelity manikins	34 (15.6)	40 (18.3)	77 (35.4)	67 (30.7)	2.2	Low

Items	Always	Sometimes	Rarely	Never	Mean	Remark
I was able to use equipment effectively after using them on low-fidelity manikins	10 (4.6)	33 (15.1)	100 (45.9)	75 (34.4)	1.9	Low
I was able to communicate effectively with patient after learning with low fidelity manikins	32 (14.7)	44 (20.2)	66 (30.0)	76 (34.9)	2.1	Low
			Grand mean		**2.2**	

Figure 2: Pie chart showing the influence of teaching with low-fidelity manikins on the perceived self-confidence of nursing students

The pie chart suggests that the use of low-fidelity manikins may be less effective in enhancing students' self-confidence.

Table 4: The influence of teaching with low-fidelity manikins on the perceived self-competence of nursing students (n=218)

Note: The mean cutoff value was 2.5. Mean scores above 2.5 indicate a high perceived self-competence.

The result above indicates that overall respondents perceived simulation-based learning with low-fidelity manikins as ineffective in increasing their self-competence (grand mean = 2.2) except that "working on real patients feels the same as working with low-fidelity manikins" (mean = 2.7).

Discussion

The findings show that nursing students in the University of Benin generally had a positive attitude toward simulation based learning. This result is consistent with Abdullah et al. (2019), who reported positive attitudes among nursing students exposed to simulation technology, and with Kaur and Barde (2021), who also found favourable attitudes toward simulation based teaching. The positive attitude in the present study suggests that students recognise simulation as a useful learning approach, even when the available tools are limited in realism.

However, the study also found that low-fidelity manikins were associated with low perceived self-confidence among most respondents. This finding supports Mahfouz et al. (2019), who found that nursing students felt more confident after high fidelity simulation than after low-fidelity simulation. It also aligns with Massoth et al. (2019), where many students in the low-fidelity group felt disadvantaged after training compared with those exposed to high-fidelity simulation. In the present study, the low confidence score may reflect the limited ability of low-fidelity manikins to reproduce clinical cues such as patient speech, respiratory sounds, cardiac sounds, pain responses, anxiety, and changing physiological conditions.

The low perceived competence reported by most respondents is also important. Although low-fidelity manikins are useful for basic procedural repetition, many students did not perceive them as sufficient for developing independent clinical performance. This finding partly contrasts with Findik et al. (2019), who reported that low-fidelity simulation improved students' opinions of their ability to provide stoma care, and Joho et al.

(2021), who found improvement in selected clinical skills after low-fidelity simulation training. The difference may be explained by the nature of the procedures, the structure of the simulation, and the level of guided feedback. Low-fidelity manikins may support narrow procedural skill acquisition better than broader clinical competence that requires judgement, communication, prioritisation, and response to changing patient conditions.

The contrast between the positive attitude toward simulation-based learning and low self-confidence suggests that liking simulation does not automatically translate into self-confidence. This is a critical educational finding. Students may accept simulation as enjoyable, useful, and relevant, yet still feel underprepared if the simulation tools do not provide sufficient realism, scenario depth, supervised repetition, and structured debriefing. This interpretation agrees with Palaganas et al. (2020), who emphasised that simulation learning outcomes depend on the quality of design, learner engagement, feedback, and transfer to practice.

The study therefore reinforces a balanced view of simulation fidelity. Low-fidelity manikins should not be dismissed because they remain practical, affordable, reusable, and useful for early psychomotor skill practice. At the same time, they should not be the only simulation resource used when the learning objective requires clinical reasoning, inter-professional communication, emergency response, or realistic patient interaction. A staged model may be more appropriate, where students begin with low-fidelity task practice, progress to medium- or high-fidelity scenarios when resources permit, and consolidate learning through clinical supervision and debriefing. In all these, the importance of adequate clinical exposure cannot be overemphasized as this may also boost the self-confidence of students.

Conclusion

This study found that undergraduate nursing students in the University of Benin had a generally good attitude toward simulation-based learning, but most students reported perceived low self-confidence and low self-competence after learning with low-fidelity manikins. The findings suggest that low-fidelity manikins remain useful for foundational skills, but their exclusive use may not be sufficient to prepare students for the complex demands of real clinical practice. Nursing education should therefore combine low-fidelity simulation with structured debriefing, richer clinical scenarios, supervised practice, and progressive access to higher fidelity simulation technology.

Declaration of Interests

The authors have no conflict of interest to declare

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