

Comparison between Low and High-Fidelity Simulation regarding Nursing Students' Self-confidence, Achievement and Satisfaction

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Abstract

Background: The expanding usage of technology in healthcare education has permitted the creation of simulation as one of the innovative educational methods in healthcare educational programs. Simulation has been valued to have a significant impact in improving the learning environment by using real-life scenarios with different and suitable fidelity types- low, medium or high- to fulfill the intended learning outcomes for undergraduate as well as postgraduate students. **Aim of study:** to compare between low -fidelity simulation and high -fidelity simulation regarding nursing students' self-confidence, achievement and satisfaction. **Research design:** A comparative research design was utilized. **Sample:** A convenient sample of 102 nursing students (51 for each group) was included in the current study. **Setting:** This study was carried out at the learning and simulation laboratories at Nursing Faculty, Modern University for Technology and Information. **Three tools** were utilized for data collection: Tool I: Student Satisfaction and Self-Confidence in Learning to assess the students' self-confidence level with the simulation. Tool II: Adult Cardiopulmonary Resuscitation (CPR) achievement observational checklist to assess nursing students' CPR achievement. Tool III: The Satisfaction with Simulation Experience Scale to measure student satisfaction with simulation. **Results:** revealed that more than three quarters of the studied nursing students had high confidence level for both groups. Meanwhile, less than half of the studied nursing students had competent level for low fidelity group compared to more than three quarters had competent level for high fidelity group. Most of the studied students were satisfied with both low and high fidelity. **Conclusion:** Nursing Students' self-confidence was equal in both low and high fidelity simulation groups. Meanwhile, the nursing Students' achievement in Cardiopulmonary Resuscitation (CPR) was significantly increased with the use of high fidelity simulation compared to low fidelity simulation. Moreover, nursing students' satisfaction was slightly higher in low fidelity simulation compared to high fidelity simulation group. **Recommendation:** Future studies are recommended to: evaluate nursing instructors' perception, knowledge, self-confidence and satisfaction regarding high fidelity simulation as a teaching and evaluating tool.

Keywords: Low and High-Fidelity Simulation, Self-confidence, Nursing students' Achievement, Satisfaction.

Introduction:

Simulation is a pedagogy aimed to motivate, improve, or validate a nursing student's development of nursing skills

besides critical thinking skills. Since simulation has added value in many nursing education programs; Innovative approaches in learning and curricular change recommend using it. The

increased usage of simulation can result in improved knowledge, confidence, and practice skills devoid of endangering patient's health care safety. A variety of simulators are being used to attain specific learning outcomes, ranging from technical to communication and teamwork skills (*Parry & Fey, 2019*).

Simulation in nursing education involves three levels of fidelity. Simulators are labelled as low, moderate and high fidelity reliant on how closely they resemble the real life. Low-fidelity simulators (LFS) are static non-computerized manikins or task- trainers. Moderate-fidelity simulators are simulators that utilize standardized patients or computer program that providing less realism (*Abdulmohsen, 2010 and Aebersold & Tschannen, 2013*).

High fidelity simulation (HFS) includes computerized manikins that mimicking physical findings including breath sounds, heart sounds and pulses throughout the body, it respond to student interventions. It also complains health problems and responds to conversations by the facilitator in the control room via the use of microphone (*Dieckmann, Friis, Lippert & Ostergaard, 2012*).

Low fidelity simulation (LFS) are less realistically imitates the features of a real patient than (HFS).LFS models are frequently used to teach psychomotor skills besides critical thinking. While HFS alone is used to practice cardiac health cares, to develop student clinical judgment skills besides in onsite training for orienting incoming nurses. (*International Nursing Association for Clinical Simulation and Learning, 2013 and Gaberson, Oermann & Shellenbarger, 2015*).

Self-confidence attainment "must be recognized as a central tenet for the design and delivery of undergraduate programs" (*Chesser-Smyth and Long, 2012*). Multiple studies were said to reinforce the link between simulation and the self-confidence improvement. If students experienced clinical skills and learnt to critically think in clinical situations, they are most honourable to have increased self-efficacy (*Rushton, 2015; Venkatasalu et al., 2015*).

Education plays an indispensable role in learning Cardiopulmonary Resuscitation (CPR) skills. Students' achievement - Achievement of CPR skills- can be attained with different educational strategies which used to improve CPR education quality such as direct and indirect techniques e.g. instructor led lectures and workshops, booklets, e-learning, movies and audio-visual software. Simulation is dissimilar to conventional teaching approaches such as lectures which make a passive learner. The simulation-based CPR teaching permits learners to experience stress emergencies, prioritize necessary interventions and actions, besides investigates their selections' consequences without affecting the safety of patients (*Habibli et al., 2020*).

Students' satisfaction with the learning experience has a significant influence on their academic achievement. Satisfaction is defined as the state of well-being besides students' emotional state and opinions about their learning experience, self-confidence, faculty and the learning program as a whole. Building student confidence is highly engaged with satisfaction (*Fatane, 2015*).

Significance of the Study:

Health care and health education facilities are excessively concerned about patient safety. Subsequently incorporating simulation as a pedagogy in health care education curricula has provided a lot regarding error management, competency assessment, and patient safety training issues (*Khan et al., 2011 & Alanzi, 2017*).

Nursing students should be properly prepared in their educational programs to be competent specialists when they graduate as well as they must feel free to make errors without the risk of liability or employment consequences. A positive learning experience like that of HFS contributes to increased student confidence in their abilities, guarantees an active learning and equips them with basic theoretical knowledge and clinical skills (*Gaberson et al, 2015*).

According to the **American Association of Colleges of Nursing (2010)**, there is a great need for the nursing education to be modified to highlight patient's safety and quality of care. Currently nurse educators are using high fidelity simulation to achieve a higher degree of clinical competence that influences the quality of patient care, improves patient' outcomes, and enhances self-confidence. More research would be valued to determine if there are changes in self-confidence, satisfaction and competence - achievement- of undergraduate nursing students with the use of high fidelity simulation.

Aim of the Study:

This study aimed to:

Compare between low -fidelity simulation and high -fidelity simulation regarding nursing students' self-confidence, achievement and satisfaction.

Research Questions

To achieve the aim of this study the following research questions were formulated:

- 1- Is there a difference between nursing students using low fidelity simulation and high-fidelity simulation regarding their self-confidence?
- 2- Is there a difference between the nursing students using low fidelity simulation and high-fidelity simulation regarding their achievement?
- 3- Is there a difference between nursing students using low fidelity simulation and high-fidelity simulation regarding their satisfaction?

Subjects and Methods:

1-Technical Design:

The technical design includes research design, setting, subjects and tools for data collection.

Research design:

A comparative design was utilized to meet the aim of the study.

Setting:

The study was conducted in the learning and simulation laboratories at Nursing Faculty, Modern University for Technology, and Information. Two main nursing skills laboratories were used; the adult skills laboratory and the recovery room laboratory.

Subjects:

A convenient sample was recruited in this study. They were 53 females, and 49 males.

Study tools:

It included the following parts

I. Tool I: Students' self-confidence assessment scale:

The Student Self-Confidence in Learning scale is a scale adapted from the Student Satisfaction and Self-Confidence in Learning Scale developed by *National League for Nursing NLN (2005)*. This scale was used to assess nursing students' self-confidence.

It included two parts as follows:

Part (1): was concerned about the demographic characteristics of the nursing students participated in the study; age, gender, nationality, education level, work experience and residence.

Part (2): included the Student Self-Confidence in Learning scale. It was intended to measure the level of students' self-confidence in learning. Student Satisfaction and Self-Confidence in Learning Scale is a 13 item survey including two subdivision; one concerning satisfaction with training which was omitted by the researcher and one regarding self-confidence in learning. Participants rate their level of agreement with each item on a five-point Likert-type rating scale starting from "strongly agree" to "strongly disagree" (*NLN, 2005*).

For this study, the scale was modified by the researcher via omitting the five satisfaction items of the instrument and using the eight items focusing on self-confidence; to assess students' self-confidence regarding their psychomotor achievement using low fidelity simulation and high fidelity simulation.

❖ Scoring System:

Participants rated their level of agreement with each item on a five-point Likert-type rating scale starting from "strongly agree" to "strongly disagree" (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree) (*NLN, 2006*). Scores are likely to range from 8 to 40 for the overall self confidence in learning. Scores ranging from 31 to 40 indicated higher level of self-confidence. While scores ranging from 20 to 30 indicated moderate level of self-confidence. And scores ranging from 8 to 19 indicated low level of self-confidence.

The level of Self-Confidence in Learning was categorized into low, moderate and high as follows:

> 50 % considered a low level of self-confidence.

50 % - 75 % considered a moderate level of self-confidence.

> 75 % considered a high level of self-confidence.

Tool 2: Adult CPR achievement observational checklist:

Adult CPR achievement observational checklist was consistent with the 2015 guidelines for adult CPR by American Heart Association. This tool was used to assess nursing students' achievement related to CPR (*American Heart Association, 2016*).

The adult CPR observational checklist included the following items; verifying the scene's safety, accurate assessment of the victim's responsiveness, calling for help, checking the pulse and respiration, activation of emergency

response system, starting high quality chest compressions (correct rate, depth and chest recoil), opening the airway, giving two rescue breathing using either bag-mask or face mask, Turning on Automated External Defibrillator (AED), accurate attachment of AED pads, delivering the shock and continue chest compressions.

❖ Scoring system:

Adult CPR achievement observational checklist included 12 steps. Every step that was done by the nursing student was given two scores. While that were not done or done incorrectly were given zero score. The total scores of practice was calculated and changed into percentage. The higher scores indicated higher level of practice. Scores are likely to range from 0 to 24 for the overall achievement level. Scores ranging from 19 to 24 indicated a competent level of achievement level. Scores ranging from 11 to 18 indicated an accepted level of achievement. And scores ranging from 0 to 10 indicated poor level of achievement.

The level of practice was categorized into poor, accepted and high based on the statistical analysis as follows:

≥ 50 % considered a poor level of practice.
50 % - 75% considered an accepted level of practice.

>75% considered high level of practice.

Tool 3: Satisfaction with Simulation Experience Scale (SSE):

The Satisfaction with Simulation Experience Scale was precisely intended to measure student satisfaction with simulation. It consisted of 18-items developed by **Levett-Jones et al. (2011)**. In the establishing and testing phase; the scale divided into three subsections,

Debrief and Reflection, Clinical Reasoning, and Clinical Learning.

Debrief and Reflection subsection was 9 items (item 1 to 9) aimed to quantify students' perceptions of the debriefing and reflection of their simulation experiences. Clinical reasoning subsection was 5 items (item 10 to 14) expected to measure students' satisfaction with simulation to improve their clinical reasoning skills, and the Clinical Learning subsection was a 4 items (item 15 to 18) aimed to evaluate students' perceptions of simulation in developing their clinical learning skills.

❖ Scoring System:

Responders rated their level of agreement on a 5-point Likert-type rating scale with each item ranging from (1 = strongly disagree, 2 = disagree, 3 = unsure, 4 = agree, 5 = strongly agree). Scores were likely to range from 18 to 90 for the overall Satisfaction with Simulation Experience Scale (SSES); 9 to 45 for D&R subsection; 5 to 25 for CR subsection; and 4 to 20 for CL subsection. Scores ranging from 69 to 90 indicated higher level of Satisfaction with Simulation. Scores ranging from 45 to 68 indicated a moderate level of Satisfaction with Simulation. Scores ranging from 18 to 44 indicated higher level of Satisfaction with Simulation.

The level of Satisfaction with Simulation with learning was categorized into low, moderate, and high based on the statistical analysis as follows:

> 50 % considered a low level of Satisfaction with Simulation.

50 % - 75 % considered a moderate level of Satisfaction with Simulation.

> 75 % considered a high level of Satisfaction with Simulation.

2. Operational design:

The operational design includes preparatory phase, content validity, reliability, pilot study, ethical consideration and field work.

Preparatory Phase:

This phase included the reviewing of related literature and theoretical knowledge of various aspects of the study to modify the tools for data collection.

Validity of the study tool:

Validity was tested through a jury of (9) experts from Medical Surgical Nursing Department, Ain Shams University and Modern University for Technology and Information, (5) professor, (2) assistant professors and (2) lecturer. The experts reviewed tools for clarity, relevance, comprehensiveness, simplicity and applicability, minor modifications was done.

Reliability of the study tool:

Testing reliability of proposed tools was done statistically by alpha Cronbach test for the following:

1-Student Satisfaction and Self-confidence in Learning with Cronbach's alpha was at 0.87 for Self-confidence subscale by study of (Jeffries and Rizzolo, 2006).

2-Adult CPR achievement observational checklist reliability with Cronbach's alpha was at 0.87.

3-Satisfaction with Simulation Experience Scale (SSE) has been recognized by its authors with Cronbach's

alpha was at 0.77 (Levett-Jones et al., 2011).

Pilot Study:

A Pilot study was carried out on 10 (10%) of students under study to test the clarity, applicability, feasibility and relevance of the tools used.

Ethical considerations:

The ethical research considerations in this study included the research approval that was obtained from scientific research ethical committee in faculty of nursing at Ain Shams University. Before starting the study, an approval for study conducting was obtained from the dean of Faculty of Nursing / Modern University for Technology and Information. The researcher has explained the objective and aim of the study to the students included in the study, clarified maintaining anonymity and confidentiality of the subject data as well.

After data collection, every group of students had a re-demonstration for the same procedure (CPR) using the other simulation method to assure justice between students. Study tools were distributed for each student and confidentiality of each subject was granted throughout the data collection process.

Field work:

The researcher has explained the objective and aim of the study to the students included in the study. Participants were recruited in (Fall 2017) from students enrolling Critical Care and Emergency Nursing Practice course. It was known from the academic record for all the enrolled students to Critical Care Nursing - Practice that they were new

students not repeaters. Consent was obtained before the beginning of the simulation practice session.

As regards to the action plan for the Critical Care and Emergency Nursing practice course; every nursing practice procedure was demonstrated by instructors and re-demonstrated by students at the same day. Critical Care and Emergency Nursing practice course has 11 procedures to be practiced on a weekly basis. Each one was taught in the assigned practice day.

On the assigned simulation day and before proceeding to the simulation labs; student attended a short lecture in form of Microsoft PowerPoint Presentation of the AHA 2015 BLS guidelines for CPR. Which included; Definition of CPR, Chain of survival, When to start CPR and when to stop, What are high quality CPR components, How to use the pocket mask and the bag valve mask and How to utilize the Automated external Defibrillator (AED). Then the 102 students were randomly divided into two groups by researcher and colleagues.

Half of students (51 students) were taken to a 4 hour session at the adult simulation skills lab to have the Cardiopulmonary resuscitation (CPR) procedure demonstrated by the researcher on low fidelity simulator. The low fidelity simulator used in this study was "Little Anne CPR Adult Training Manikin" (Laerdal), in a regular hospital ward room setting.

Whilst the other half (51 student) were taken also to a 4 hour session at the recovery room skills lab to have the Cardiopulmonary resuscitation (CPR) procedure demonstrated by the researcher's colleagues on high fidelity

simulator. The high fidelity simulator used was the patient simulator SimMan "HAL® S3000 Wireless and Tetherless Prehospital and Nursing Patient Simulator" (Gaumard). This simulator displays palpable pulses, spontaneous breathing, cyanosis, blood pressure that can be measured, pupil reaction and other manikin voices.

Then students of both groups were asked to re-demonstrate the CPR procedure at their different assigned group (Low fidelity and High fidelity). Then Student's achievement (Documented Re-demonstration) was then measured by their assigned instructor (either the researcher on the low fidelity simulator or her colleagues on the high fidelity simulator) using tool 2; Adult CPR achievement observational checklist while they are performing the CPR procedure.

Students were requested post simulation to complete two tools; the Student Self-Confidence assessment scale and the Students' Satisfaction with Simulation Experience Scale (SSE). A copy of each tool was distributed to students by the researcher and they were given 15 minutes to complete it. The researcher was available to respond to any questions the students had. The tools were collected after completion by the course instructor and researcher. The results remained confidential.

To ensure equality and justice in learning opportunities among students; One week later on the assigned practice day shifting happened between both groups. Students who were assigned to practice CPR on the low fidelity simulator (Little Anne CPR Adult Training Manikin) were reassigned to practice CPR on the high fidelity

simulator (SimMan). While students who practiced CPR on (SimMan) were given the chance to try performing CPR on (Little Anne CPR Adult Training Manikin).

4- Administrative design

An official letter was issued from the researcher to the dean of Faculty of Nursing / Modern University for Technology and Information informing her aim of the study and asking her agreement to start the study. Another official letter was issued to the Critical care and emergency nursing Practice course leader as well before conducting the study.

Statistical design

Data entry and analysis were organized, categorized, analyzed using a personal computer using SPSS (statistical program for social science). Data were presented using descriptive statistics in the form of frequencies and percentages; description of qualitative variables as mean, SD and range, Statistical significant was considered as follows:

- High significant (HS) $p < 0.001$
- Significant (S) $P \leq 0.05$
- No significant (NS) $P > 0.05$

Results:

Table (1): reveals that 80.4% and 82.4% were between 20 to ≤ 25 for low and high-fidelity group with means and standard deviations 22.84 ± 2.86 and 22.76 ± 2.73 respectively. 49% and 54.9% were females. 92.2%, 94.1% of low and high-fidelity group was Egyptian. 74.5%, 76.5% of students graduated from secondary school. 54.9%, 49% had a

work. Lastly, 78.4%, 82.4% of two groups were from rural areas with no statistically significant relation between demographic characteristics and type of fidelity.

Figure (1): reveals of 82.4% the studied nursing students had high confidence level for both group low and high-fidelity group. While 17.6% had moderate confidence level for both group low and high-fidelity group with no statistically significance difference between low and high fidelity groups.

Figure (2): shows that 47.1% of the studied students had high level for low fidelity group compared to 84.3% had competent level for high fidelity group.

Figure (3): clarifies that 98%, 92.2% respectively of the studied nursing students had high satisfaction level for both low and high-fidelity simulation groups with no statistically significance difference between low and high fidelity groups.

Table (2): reveals that 82.4% had high confidence level for both group (low and high-fidelity group). As well as less than one half 47.1% of the studied low fidelity group had competent achievement level. On the other hand, more than three quarters 84.3% of the studied high-fidelity group had competent level. Lastly nearly all sample 98% of the studied low fidelity group had high satisfaction level but most of the studied high-fidelity group 92.2% had high satisfaction level. On the other hand, there was highly statistically significant relation between achievement level and type of fidelity (low or high).

Table (3): shows that there was statistically significance difference between low and high-fidelity group regarding achievement level ($t=3.09$, $P=0.003^*$). In contrast, there was no statistically significance difference between low and high fidelity group regarding confidence level and satisfaction level ($t=1.46$, $P=0.14^*$ & $t=0.23$, $P=0.81$ respectively).

Table (4): reveals that there was no correlation between achievement level, self-confidence level and satisfaction level among low fidelity simulation group ($R=0.07$, $R=0.13$, $R=0.06$ respectively).

Table (5): reveals that there was no correlation between achievement level, self-confidence level and satisfaction level among high fidelity simulation group ($R=0.22$, $R=0.07$, $R=0.24$ respectively).

Table (1): Frequency and percentage distribution of demographic characteristics of the studied nursing students ($n=102$).

Items	Groups				χ^2 P
	Low fidelity (n=51)		High fidelity (n=51)		
	N	%	N	%	
Age					
20 to ≤ 25	41	80.4	42	82.4	$\chi^2=0.24$
>25 to 30	10	19.6	9	17.6	$P=0.61$
Mean ± SD	22.84 ± 2.86		22.76 ± 2.73		
Gender					
Male	26	51.0	23	45.1	$\chi^2=0.35$
Female	25	49.0	28	54.9	$P=0.55$
Nationality					
Egyptian	47	92.2	48	94.1	$\chi^2=0.15$
Nigerian	4	7.8	3	5.9	$P=0.69$
Education					
Secondary school	38	74.5	39	76.5	$\chi^2=0.05$
Technical institute	13	25.5	12	23.5	$P=0.81$
Work					
Had a work	28	54.9	25	49.0	$\chi^2=0.35$
Had not a work	23	45.1	26	51.0	$P=0.55$
Residence					
Urban	11	21.6	9	17.6	$\chi^2=0.24$
Rural	40	78.4	42	82.4	$P=0.61$

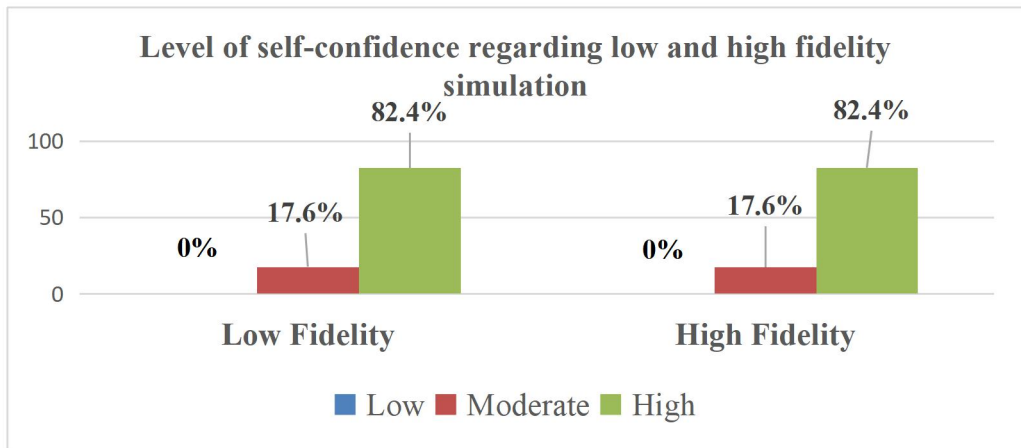


Figure (1): Percentage distribution of confidence levels regarding low and high-fidelity simulation among the studied nursing students (n= 51).

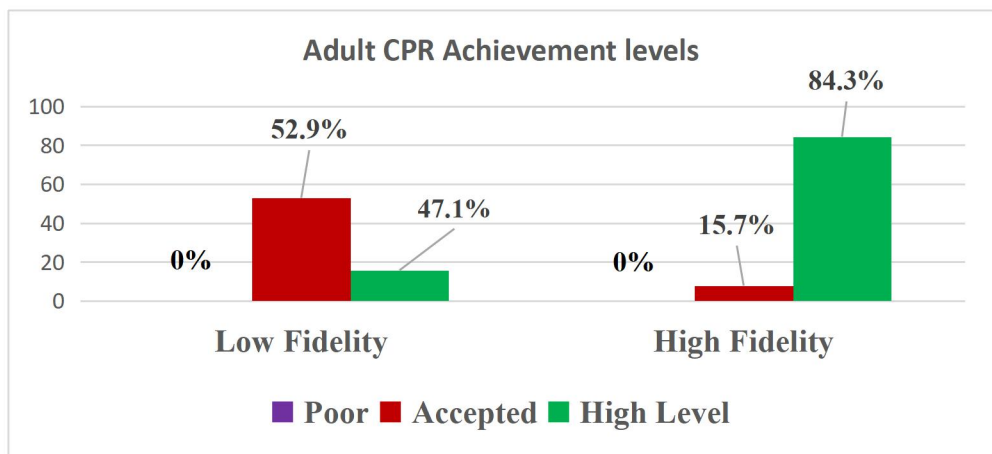


Figure (2): Percentage distribution of adult CPR achievement levels regarding low and high fidelity among the Studied Sample (n=51).

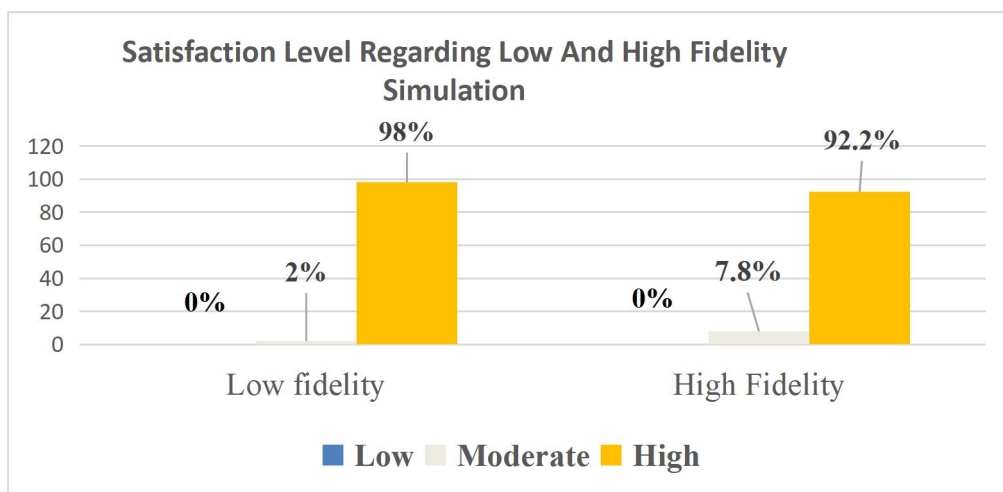


Figure (3): Percentage distribution of satisfaction with simulation experience regarding low and high-fidelity simulation among the studied nursing students (n=51).

Table (2): Frequency and percentage distribution of nursing students' self-confidence, achievement and satisfaction regarding low and high-fidelity simulation (n=102).

Items	Low fidelity group (n=51)		High fidelity group (n=51)		χ^2 P
	N	%	N	%	
Confidence level					
Low	0	0.0	0	0.0	$\chi^2 = 0.000$ P = 1.00
Moderate	9	17.6	9	17.6	
High	42	82.4	42	82.4	
Achievement level					
Poor	0	0.0	0	0.0	$\chi^2 = 15.70$ P = 0.0.000**
Accepted	27	52.9	8	15.7	
Competent	24	47.1	43	84.3	
Satisfaction level					
Low	0	0.0	0	0.0	$\chi^2 = 1.89$ P = 0.16
Moderate	1	2.0	4	7.8	
High	50	98.0	47	92.2	

Table (3): Relation between low fidelity simulation and high fidelity simulation regarding students' self-confidence, achievement and satisfaction.

Items	Simulation Technique		T. test	P value	Sig.
	Low fidelity Mean \pm SD	High fidelity Mean \pm SD			
Self-Confidence level	35.37 \pm 3.62	34.23 \pm 4.19	1.46	0.14	N.S
Achievement level	21.17 \pm 1.70	22.07 \pm 1.19	3.09	0.003*	S.
Satisfaction level	77.09 \pm 6.94	76.72 \pm 9.04	0.23	0.81	N.S

Table (4): Correlation between Achievement level, Confidence level and Satisfaction level among low fidelity simulation group.

Items	R	P value	Sig.
Achievement level & Self-Confidence level	0.07	0.58	N.S
Achievement level & Satisfaction level	0.13	0.35	N.S
Self-Confidence level & Satisfaction level	0.06	0.64	N.S

Table (5): Correlation between Achievement level, Confidence level and Satisfaction level among high fidelity simulation group.

Items	R	P value	Sig.
Achievement level & Self-Confidence level	0.22	0.11	N.S
Achievement level & Satisfaction level	0.07	0.60	N.S
Self-Confidence level & Satisfaction level	0.24	0.08	N.S

Discussion:

Simulation is appreciated for its capability in offering realistic, context-rich experiential learning, and evaluation of different patient care situations in a safe environment. Simulation is designed to optimize transference of knowledge to practice (*Richardson & Claman, 2014*).

The current study was carried out aiming at comparing between low - fidelity simulation and high -fidelity simulation regarding nursing students' self-confidence, achievement and satisfaction.

The first part regarding the demographic data of the studied nursing

students under the present study, the results revealed that more than three quarters of studied students were between 20 to ≤ 25 for low and high fidelity group with means and standard deviations 22.84 ± 2.86 and 22.76 ± 2.73 . This finding is consistent with *Fatane, (2015)*, who conducted a study about “Undergraduate Nursing Students’ Satisfaction with Low- and High-Fidelity Simulation” and reported that the mean age of the nursing students under the study 25.94 ± 5.65 .

The second part concerning the total level of students’ self-confidence regarding low and high-fidelity simulation, the findings of the current study revealed that more than three quarters of the studied students had high confidence level for both groups low and high-fidelity simulation. This might be due to lack of experience for high fidelity simulation activities. As this was the first time for those students to practice clinical courses using high fidelity manikins. This finding agrees with *Herron, (2019)* who conducted a study entitled “Effect of case study versus video simulation on nursing students' satisfaction, self-confidence, and knowledge: A quasi-experimental study” which reported that there was not a statistically significant difference between self-confidence scores for the Case Study Group and Video Simulation Group.

The third part regarding students’ achievement using low and high fidelity simulation, the findings of the recent study discovered that more than three quarters of the studied students in high fidelity group had competent level of practice. While less than half of the studied students in low fidelity group had competent level of practice. This might be due to the more realism found in high fidelity simulator (SimMan). As there was a palpable pulse felt in addition to the

observed chest movement which made the students to effectively assess the patient and provided them with an easily diagnosis for cardiac arrest. This finding agrees with *Ahmad & Aqel, (2019)*, whose study “Simulation in Teaching Nursing Students Cardiopulmonary Resuscitation Through” showed that the interventional group (Trained via High Fidelity Simulators) has greater CPR skills than the control group (Trained via static Manikins).

The fourth part concerning Students’ satisfaction regarding low and high-fidelity simulation, the present study’s results revealed that most of the studied students were satisfied with low and high fidelity simulation. From the investigator point of view this might be due to students’ unawareness with different simulation types as they never trained with High Fidelity Simulators before this experience. In addition to, the high sophisticated technology found in high fidelity simulators compared to low fidelity simulators like alarms, sounds and lights when abnormal ranges or readings arises. The unfamiliarity to such technology may increase the level of anxiety for students and may lead into students’ confusion to deal with.

The recent study is inconsistent with the study of *Howard, (2017)* “Comparison of Satisfaction, Self-Confidence, and Engagement of Baccalaureate Nursing Students Using Defined Observational Roles and Expectations Versus Traditional Role Assignments in High Fidelity Simulation and Debriefing”. The results of her study were significant. It revealed that students assigned to a defined observational roles and expectations (students assigned to a certain task in the simulation activity) displayed a higher level of satisfaction

than students assigned to traditional role (only observes for the simulation activity) did.

The fifth part regarding the relationships between the study variables; the current study revealed that, there was statistically significance between students' age and students' achievement for low fidelity simulation group. This finding contradicted with *Younis & Al-Metazidy, (2016)*, whose study "Effectiveness of High Fidelity Simulation versus Traditional Clinical Teaching Strategies on Undergraduate Nursing Students' Achievement" showed that score for total practice this reflected no significant difference was observed in relation to age and the total practice for group I (using traditional dolls).

The current study showed that, there was statistically significance between students' educational level and students' achievement for low fidelity simulation group. This finding contradicted with *Johnson, (2017)* whose study "The relationship of fidelity on simulation achievement" reported that educational preparation as one of the demographic factors did not have an association with achievement for both high and low fidelity simulation groups.

The current study revealed that, there was statistically significance between students' work experience and students' achievement for low fidelity simulation group. This finding disagrees with *Massoth, et al, (2019)* who conducted a study about "High-fidelity is not superior to low-fidelity simulation but leads to overconfidence in medical students" which reported that there was no significant differences in previously worked with or for emergency services as one of demographic data were observed.

Current study's results revealed that there is no correlation between achievement level, confidence level and satisfaction level among low and high fidelity simulation groups. This finding is inconsistent with *Fong, (2013)* who conducted a study about "Nursing students' satisfaction and self-confidence towards high-fidelity simulation and its relationship with the development of critical thinking in Hong Kong" which showed a moderate positive relationship between the students' satisfaction, self-confidence in learning and development of critical thinking.

Conclusion:

Based on the findings of the current study, it can be concluded that, Nursing Students' self-confidence was equal in both low and high-fidelity simulation groups. Meanwhile, the nursing Students' achievement in Cardiopulmonary Resuscitation (CPR) was significantly increased with the use of high-fidelity simulation compared to low fidelity simulation. Moreover, nursing students' satisfaction was slightly higher in low fidelity simulation compared to high fidelity simulation group. Besides, there was statistically significance between students' age, educational level, work experience and students' achievement for low fidelity simulation group. Furthermore, the current study's results revealed that there is no correlation between self-confidence level, achievement level and satisfaction level among low and high-fidelity simulation groups.

Recommendations:Recommendations in nursing education:

- 1- An orientation program should be done for nursing students to familiarize them with the different types of simulators and learning environment especially high-fidelity simulation (HFS).

Recommendations for further research:

1. Replication of the study on a larger sample from different universities in Egypt.
2. Future studies are recommended to:
 - Evaluate nursing instructors' perception, knowledge, self-confidence and satisfaction regarding high fidelity simulation as a teaching and evaluating tool.
 - Evaluate nursing students' perception and knowledge regarding high fidelity simulation.
 - Examine usage of High Fidelity Simulation with additional nursing courses to measure intended learning outcomes.

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