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The Impact of Simulation on Pediatric Nursing Students' Knowledge, Self-efficacy, Satisfaction, and Confidence

Dr. Hala Saied[1,2*]
1.King Saud Bin Abdul-Aziz University for Health Science, College of Nursing –Riyadh
2.Cairo University, College of Nursing

Abstract
The simulation technology is rapidly expanding and has been used in several nursing programs around the world and in Saudi Arabia too. The aim of this study was to evaluate the effect of using a simulation based scenarios on the pediatric nursing students' students' knowledge, self-efficacy, satisfaction, and confidence. This study used Bandura's Social Cognitive Learning Theory (1977; 1986) as a theoretical framework.158, third year baccalaureate nursing students enrolled in a pediatric nursing course participated in the study. Data was collected using demographic data profile questionnaire, knowledge questionnaire, Learner Satisfaction and Self Confidence in Learning Questionnaire (NLN, 2009) and the General Self-Efficacy.The simulation activities were conducted in the pediatric nursing lab. The simulation activities consisted of three respiratory problems and one cardiac scenario. High and low fidelity simulators were used. The majority of the students were unmarried (96.84%) and had no previous experience in simulation. There was a significant statistical difference in pre- and posttest knowledge and self-efficacy scores. Students were satisfied with the simulation experience and their self-confident scores were higher after the simulation session. That post simulation self-efficacy was positively correlated with satisfaction (r= .46, P = 0.001) and self-confidence (r= .50, P = 0.001). Satisfaction with simulation was also positively correlated with self-confidence (r = 0.46, P = 0.001). Although the interpretation of the study results is limited due to the short time frame between the pretest and the posttest, this study provides a stepping point for understanding how simulation may affect the pediatric nursing students' knowledge, self-efficacy and confidence.
Keywords: Pediatric nursing education, Simulation, knowledge, self-efficacy, self-confident

Introduction and background

Nursing education today is influenced by rapid changes in health care technology, social, cultural, technological, economic forces and complexity in health care demand. These changes mandate the nursing educator to reshape their curriculum to make sure that the students gained the knowledge and the skills that allow them to deal with the unpredictable challenges of the twenty first century (Ma, 2013;Benner, Sutphen, Leonard, & Day, 2010; Richard , 2009: Gillespie & Peterson, 2009; Warren & Connors, & Weaver, 2007; Feingold, Calaluce & Kallen, 2004). Simulation experiences are an example of a valuable learning strategy that has the potential to prepare the students to deal with this unpredictable challenges and needs.

Simulation is defined in 2005 by the National Council of State Boards of Nursing (NCSBN)as a learning method that learners demonstrated competencies, critical thinking, decision-making and through role-playing or use of devices in an imitated real clinical environment in a fully interactive way (NCSBN, 2005).There are several advantages mentioned in the literature about using simulation in teaching undergraduate nursing students. Some of these advantages are to increase the nursing student's ability to manage a simulated situation when it actually occurs in the real life and to help the students to gain and improve their skills in a safe, non-threatening environment (Hovancsek, 2007). Also, simulation can teach the students how take care of the patients in any setting, such as an intensive care unit or emergency department, where students may have limited access and experience (Van Sell et al., 2006). In addition, simulation can give the chance to the students to know how to deal with rare conditions that many nursing students will not experience prior to graduation (Jeffries, 2007). Using simulation as a teaching strategy also increases learners' satisfaction with learning (Omar, 2016; Alfes, 2011; Blum et al., 2010; Mould et al., 2011; Prescott and Garside, 2009), improves the students' critical thinking skills, knowledge level, and clinical performance (Omar, 2016; Sullivan-Mann, 2009; Bearnson & Wiker, 2005; Liaw et al., 2011)

Pediatric nursing students are providing care for the pediatric patients within the context of their families. Safety is a priority when dealing with this vulnerable groups of population. For the majority of these students, this is their first encounter with a pediatric patients so they had no or minimal experience in providing developmentally appropriate care for a pediatric patient. Simulation has the potential to enhance pediatric nursing education and safeguard the patient's safety. Bultas (2011) incorporating simulations into the pediatric student's clinical experience. The study suggested that incorporating simulation in the pediatric students rotation was beneficial and made the students better prepared to the experience and broadened their overall clinical experiences in a short time. In addition, simulations also provide opportunities for pediatric nursing students to engage in clinical situations that might not be faced in the clinical setting such as caring for critically ill children,

administering hazardous medications, and interacting and communicating with families in sensitive situations (Bultas, 2011).Another advantages of simulation for the pediatric nursing students is too help the students to learn prioritization. Richard (2009) integrated a high fidelity simulated clinical experience into a pediatric nursing course. Students' comments in debriefing reflected an overall positive experience with simulation and recognized simulation as a great way for learning prioritization.

Self-efficacy, confidence and satisfaction

Self-efficacy is defined by Bandura (1994) as the belief in one's ability to do the actions required to reach a specific goal and to manage prospective situations. Success build a good self-efficacy, while failure undermine it. There are several methods mentioned in the literature that enhance the nursing student's self-efficacy and simulation is one of them (Dunn, Osborne, & Link, 2014; Kuznar, 2009; Ruiz, Smith, van Zuilen, Williams, & Mintzer, 2006). Several nursing studies show an increase in self-efficacy in nursing students after participating in high-fidelity human patient simulation (HPS) (Lin, 2016; Khalaila, 2013; Beyea, von Reyn, & Slattery, 2007; Bantz et al., 2007; Bremner et al., 2006; Eaves & Flagg, 2001; Henneman & Cunningham, 2005; Kuznar, 2007; Lasater, 2007; Leigh, 2008; Reilly & Spratt, 2007; Schoening et al., 2006; Alinear , Gordon, Hunt, 2004).

Dunn, Osborne, and Link (2014) study explored the effect of High Fidelity Simulation (HFS) training on baccalaureate nursing students' sense of efficacy for both patients' physical care and communication. They noted a significant increase in post-test nurse efficacy for patient communication and physical patient care. More recently, Linn (2016) examined the effectiveness of simulation-based learning on the fundamental of nursing student's self-efficacy and performance. One group pretest-posttest design was used. The results reveled a significant relationship between students' self-efficacy, anxiety level and their nursing competencies performance. Also higher self-efficacy associated with lower anxiety levels towards nursing skills assessment.

When studying self-efficacy Bandura (2006) suggested measuring self-efficacy in degrees of confidence, because of this suggestion, self-efficacy is reported by some researchers as level of confidence. Nursing students were found to have lack of confidence and high anxiety level when working with a real patient in the clinical setting (White, 2009). HFS provides an opportunity for nursing students to practice nursing skills in a safe environment helps to improve the sense of confidence and ultimately eliminate the sense of fear and anxiety (Bandura, 1977; Megel etal., 2012; Omar, 2016). Several studies indicated that the self-confidence and the clinical skills of the undergraduate nursing is improved after participating in high-fidelity simulations (Leigh, 2008; Kuznar, 2007; Lasater, 2007; Reilly & Spratt, 2007; Bearnson & Wiker, 2005). A descriptive study carried out by Khalaila (2013) explored the effectiveness of simulations in reducing anxiety and promoting self-confidence, caring ability, and satisfaction with simulation of a 61 second-year nursing students at their first clinical practice. Data were collected at 2 time points T1 before the first clinical and simulations practice, and T2 four months later. The result implied that the student's anxiety scores decreased after participating in the study.

Another study done by Megel etal. (2012) further supported that HFS could reduce the pediatric nursing students anxiety and increase their confidence before going to the clinical areas and doing their hospitalized child assessment for the first time. This study employed a quasi- mixed methods research design using a sample of accelerated and traditional BSN pediatric nursing student. Three survey instruments including self-confidence, and satisfaction with the learning and State anxiety (STAI). The results indicated that anxiety scores were significantly lower in the intervention group.

Jefferies & Rizzolo (2006) conducted a multi-site, multi-methods study. The objectives of the research were to examine design and implement simulation as a teaching modality and also to assess the learning outcomes using simulation. The participants were 403 baccalaureate and associate degree nursing students. The data were collected using several questionnaires such as Simulation Design Scale (SDS), Self-Confidence in Learning, Self-Perceived Judgment Performance Scale and the Educational Practices in Simulation Scale (EPSS). Results showed that the students who used high-fidelity patient simulator had a better sense of reality and more opportunities to problem solve and make decisions than did the paper/pencil case study simulation. The researchers concluded that involvement of the students in simulation provided them with an opportunity to apply knowledge in a safe non-threatening environment.

Another study by MacDowall (2006) examined the perceived confidence of 23 medical students regarding their comptences in some psychomotor nursing skills using simulationmedical students' perceived confidence regarding their competence in a variety of psychomotor skills using HPS. The results indicated significant increase in the student's confidence level after participated in simulation experience. McLaughlin, Moutray, & Muldoon, (2008) recruited 96 senior Bachelor of Science in nursing (BSN) students enrolled in the pediatric nursing course to participate in their study. Students participated in the clinical scenario as a part of their clinical time. The student completed the socio-demographic, knowledge survey, self confidence in nursing survey pretest

Lambton, O'Neill, Dudum (2008) enrolled 60 baccalaureate nursing in their study. Three open-ended questions were asked. A 10-question evaluation form using a 4-point scale was given to the students, along with

an opportunity to reflect on their experience in journals. The authors reported high means in the domains of skill acquisition, communication techniques, and overall confidence in the ability to perform in a similar clinical challenge.

Students who participate in simulated experience conveys their satisfaction with simulated clinical experience. Omar (2016) conducted a descriptive study to explore the satisfaction and self-confidence of a 117 bachelor of science in nursing (BSN) students after clinical simulation experience using a self-reported questionnaire. Results indicated an increase in overall satisfaction and confidence scores after clinical simulation experience. Cantrell, Meakim, & Cash, 2008 was also conducted a study to evaluate the learning experience of three pediatric simulations. Students found the simulations well designed and realistic. Student's satisfaction and self-confidence in learning scores were high. These results indicate that students in the pediatric courses valued well designed simulation learning experiences.

Little literature has been published to date on the use of simulation-based learning in pediatric nursing in Saudi Arabia. There are several initiatives intended for improving the quality of health services and the quality of nursing education in the country of Saudi Arabia, such as establishment of quality assurance and implementation of internationally recognized accreditation standards. The question arises about if baccalaureate nursing programs are preparing nurses for the new health care perspectives. The aim of this study was to evaluate the effect of using a simulation based scenarios on the pediatric nursing students' students' knowledge, self-efficacy, satisfaction, and confidence. This study used Bandura's Social Cognitive Learning Theory (1977) as a theoretical framework.

Methods

Study design:

A descriptive one group pre-test/post-test design was employed to answer the following research questions

1. What are the difference in the pediatric student's self-efficacy mean scores before and after simulation?
2. Are pediatric nursing students satisfied and self-confident with their learning after completing clinical simulations session?
3. What are the relationship between self-efficacy, self-confidence and satisfaction of pediatric nursing students?

Sample and Setting:

This study was conducted at the College of Nursing, pediatric simulation lab in Saudi Arabia

The pediatric lab contains low- and moderate-fidelity infant and child simulators. One high fidelity infant manikin and a medium fidelity child manikin were used to conduct the study. A convenience sample of 158 third year baccalaureate nursing students enrolled in a pediatric nursing course were participated in the study. The average age of the participants was 20-25 years. The sample closely approximated the demographics of the university and of the regions in which the university at large recruits students. The sample characteristics are summarized in Table 1.

Procedure

The study was approved by the Research Unit Committee of the college at which the research took place. Participants were assured that they have the right to withdraw at any time without academic consequence. Strict confidentiality was maintained. The nursing college in which the data were collected lately invested in both high- and low-fidelity simulation labs including pediatric nursing lab. To assess the impact of simulation training on student learning and to improve instruction, data are being collected on students as part of the teaching and learning process of the nursing care of children and their families' course. Students were asked to respond to a pre-test questionnaire which included socio-demographic data questionnaire, knowledge and self-efficacy, before experiencing any simulation training. A variety of clinical scenarios about child who have respiratory problems such as asthma, bronchitis, bronchiolitis and a child with cardiac congenital heart disease scenarios were presented in the high-fidelity and low fidelity manikins. The scenarios were written by pediatric nursing instructors. Before beginning the simulation sessions, all students attended an orientation session on the simulators and the equipment in the pediatric nursing lab at the college. Next, each student was given a small cart with the "child" history, medications, oxygen saturation, blood pressure and pulse and other important informations. Some of the participants acted as nurses in the hospitals while others acted as mothers. A 20 minute debriefing session in the lab was conducted after each case to clarify any concerns and give feedback to the participants.

Instruments: Data was collected by using four set of questionnaires: 1) The Socio-demographic Data, 2) knowledge questionnaire, 3) General Self Efficacy scale (GSE), 3) Satisfaction with Learning and Self-confidence in Learning questionnaire (SCL).

The Socio-demographic Data Questionnaire was designed by the researchers. It covers participant's personal information such as age, education, marital status, previous experience in simulation

Knowledge questionnaire*:* Participant's knowledge acquisition and retention was assessed with written multiple choice questions exam before and after clinical simulation experience. The exam questions covered topics on respiratory system including asthma, bronchitis and bronchiolitis. The pre and post simulation experience scores were used as a proxy measure of the participant's knowledge. The pre and posttests exams were equivalent in content and graded by the researchers. Students were awarded one point for each correct answer using a standardized grading rubric.

Self-efficacy*:* Students' self-efficacy was measured using the General Self Efficacy scale (GSE) (Schwarzer & Jerusalem, 1995). The GSE is a 10-item scale designed to assess self-perception about one's ability to cope with a variety of difficult situations in life. The General Self-Efficacy Scale scores range from 10–40, with 40 indicating the highest possible score. The average time to complete the scale is 4 minutes. Reliability of the scale has been established in samples from 23 nations with Cronbach's ranging from .76 to .90, with the majority in the high 0.80s (Jerusalem & Schwarzer, 1995).

Satisfaction with Learning and Self-confidence in Learning (SCL): Student's satisfaction and self-confidence in learning were measured using a 13-item, 5-point Likert-scale developed by the National League for Nursing (Jeffries, 2005). The instrument is divided into two subscales which are designed to measure student satisfaction (five items) and self-confidence (eight items) respectively in learning through simulation. Scores may range from 5 to 25 for the satisfaction subscale and 8 to 40 for self-confidence subscale, with higher scores indicating greater satisfaction. The content validity of the instrument was established by nine clinical experts (Jeffries and Rizzolo, 2006). The values of Cronbach's alpha has been reported as 0.94 for satisfaction subscale and 0.87 for self-confidence subscale.

Data Analysis

Data were analyzed using the Statistical Package for Social Science (SPSS) software version 20. A *p*-value of 0.05 was considered statistically significant. The researchers used descriptive statistics such as percentages, means, standard deviations and frequencies to describe the data.

Pearson *r* (interval/ratio data), and dependent sample t-test were used to determine the relationship between the study variables and pre-post test scores.

Results

Since two batches of students (2013 and 2014) were enrolled in the study, the two batches were checked to figure out if there were any differences between the two batches. No statistical difference were identified between the two batches, so they combined together in the analysis.

Sample characteristics

All the participants were female and their age ranged from 21 to 26 years old with a mean of 22.05 (±.975) years. All of them were level 7 students (third year students). The majority of the students were unmarried (96.84%) and had no previous experience in simulation

Table 1: Frequency Distribution of the Socio- demographic Characteristics of the Sample (N=158)

Variable	N(%)
Age	
Marital status	
Married	5 (3.16)
Unmarried	153 (96.84)
Level	
Level 7	158 (100)
Past simulation experience	
Yes	15 (9.49)
No	143 (90.51)

Knowledge about the simulated patients

One of the objectives of this study was to assess the effect of the simulation on the student's self-efficacy. The student's knowledge level was assessed before and after simulation. There was a significant difference between the pretest and posttest knowledge scores. The overall mean of the pre-test knowledge score M = 6.5 (SD = 4.7) t=17.14, p=000 was higher than the post test scores M = 8.2 (SD = 3.8), t=26.9, p=000

Self-efficacy

Another purpose of this study was to see the effect of the simulation on the student's self efficacy. A descriptive

statistical procedure was used to examine the mean scores and standard deviation of the pretest and posttest results for the general self-efficacy scale. Paired t-tests were used to compare the differences between the mean total scores before and after the simulation sessions. The results revealed that the pretest total scores (M = 34.41, SD = 4.45) were significantly higher than the posttest total score of the self-efficacy subscale (M = 30.30, SD = 5.45). The differences in pretest and posttest mean scores was statistically significant (t = 7.66, df = 157, p < .001). This results indicates that the total self-efficacy of the students were lower after the simulation session.

Table 2. Student Reports of General Self-efficacy before and after simulation (N=158)

Item	**Pre-simulation (Mean/SD)**	**Post-simulation (Mean/SD)**
1- I can always manage to solve difficult problems if I try hard enough	3.8924(.89290)	3.1709(.76710)
2- If someone opposes me, I can find the means and ways to get what I want.	3.6709(.81735)	3.0443(.70796)
3- It is easy for me to stick to my aims and accomplish my goals.	3.7911(.85253)	3.0886(.72604)
4- I am confident that I could deal efficiently with unexpected events.	3.1772(.95450)	2.8354(.78894)
5- Thanks to my resourcefulness, I know how to handle unexpected situations.	3.2532(.91649)	2.9367(.73739)
6- I can solve most problems if I invest the necessary effort.	3.8987(.79960)	3.2152(.66142)
7- I can remain calm when facing difficulties because I can rely on my coping abilities.	3.4494(1.09746)	3.0696(.74967)
8- When I am confronted with a problem, I can usually find several solutions.	3.6203 (.85665)	2.9684 (.75224)
9- If I am in trouble, I can usually think of a solution.	3.7595 (.98673)	3.0316 (.69043)
10- I can usually handle whatever comes my way.	3.3671 (.97976)	2.8165 (.72127)
Overall satisfaction	M = 34.41 (4.45)	M = 30.30 (5.45)

Perception of Satisfaction and self confidence

The second purpose of this study is to determine the student's perception of satisfaction and self-confidence after the simulated experience. The overall mean for the satisfaction subscale was 4.43 (SD = 0.51) and the overall mean for the self-confidence subscale was M = 4.41 (SD = 0.39) suggests that the majority of the students were satisfied and self-confident in their abilities to provide care for the pediatric patient after the simulated experience.

Pearson correlation among study variables

Table 3 shows the Pearson product moment correlations between the study variables measures pre and post simulation experience. That post simulation self-efficacy was positively correlated with satisfaction (r= .46, P = 0.001) and self-confidence (r=. .50, P = 0.001). Satisfaction with simulation was also positively correlated with self-confidence (r = 0.46, P = 0.001).

Table 3 Pearson correlations among study variables (N = 158).

Variable	1	2	3	4
1.Self efficacy pre	1.00 P = 0.001			
2.Self efficacy post	0.086 P= .283	1.00		
3.Satisfaction with simulation	-.031	0.461 P = 0.001	1.00	
4.Self confidence	-.085	.505 P = 0.001	.756 P = 0.001	1.00

Discussion

The primary purpose of this study was to evaluate the effect of using a simulation based scenarios on the pediatric nursing students' knowledge, self-efficacy, satisfaction, and confidence. The findings demonstrated that knowledge regarding a specific pediatric diseases were significantly higher after participating in the simulated experience. The effect of simulation the pediatric student's knowledge that revealed in this study matches the findings of previous research. In the study of Young and Jung (2015) results indicated that students in the

simulation group scored significantly higher than in the didactic lecture group. Also Omar (2016) indicted that the learning by simulation enabled the students to improve and retain knowledge regarding patient's signs and symptoms.

The findings also indicated that the total self-efficacy of the students were lower after the simulation session. This results is similar to a study done by Cardoza and Hood (2012) but contradicting other findings by other scholars, who found increase in the student's self-efficacy scores after participation in simulated experience (Line, 2016; Khalaila, 2013). This results may be related to the students' unrealistic evaluation of their clinical abilities before engaging in a simulated pediatric scenario. These students are coming to the pediatric nursing course after they finished their adult nursing rotations. They might thought that the knowledge base they acquired in previous courses are transferable from adult to pediatric situations. Also, the measure that we used to measure the students self-efficacy was a measure of general self-efficacy and not specific to simulation per say. When we used the measure that ask the students a specific questions related to the simulated experience their self-confidence scores were high.

In this study students were satisfied with the high fidelity simulated pediatric scenario experience as a teaching method which was indicated by a mean score of 4.43 (SD = 0.51) on the satisfaction subscale. This result is congruent with other studies that noted that students feel positively about HFS scenarios involving medical (Abdo & Ravert, 2006) surgical (Bearnson & Wiker, 2005), and critical care scenarios (Henneman & Cunningham, 2005). The student's self-confidence scores were high after the simulated experience. This finding was consistent with the results of previous studies such as Prescott and Garside (2009) who explored the experiences of simulation among 45 second year diploma nursing students. The findings showed widespread agreement that simulation is a productive learning strategy and builds confidence. After the simulation, 49% of students agreed and 49% strongly agreed that their confidence had increased. The finding of higher student confidence level after a simulation was also found in a quasi-experimental study conducted by Scherer, Bruce, and Runkawatt (2007). The researchers compared confidence scores of advanced nurse practitioner students who participated in the simulation experience and those who were in the control group during a cardiac event. All 23 participants had previously viewed a power point presentation and did pre-test on the simulation exercise. The experimental group (n=13) participated in a simulation exercise while the control group (n=10) received case study presentation with differential diagnosis and plan of care exercise. Post-test confidence scores improved in both groups. Confidence scores were higher in the control group; however, this could be due to the fact that students in the control group did not have to demonstrate hands-on skills as did students in the simulation group (Scherer et al., 2007).

LIMITATIONS A limitation of this study is the use of convenience sample; the results may differ with a larger group and random assignment that would be more predictive in changes before and after simulation because of the simulation and not by chance. Also, the results of this study cannot be generalized because it was conducted within one pediatric nursing course at a single college.

CONCLUSION

The results of this study identify human simulation as an effective teaching and learning modality in teaching pediatric nursing students. This study provides a stepping point for understanding how simulation may affect the students' knowledge, self-efficacy and confidence.

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