

## Effects of Simulation on Nursing Students' Knowledge, Clinical Reasoning, and Self-confidence: A Quasi-experimental Study

Kim, Ji Young<sup>1</sup> · Kim, Eun Jung<sup>2</sup>

<sup>1</sup>College of Nursing, Research Institute of Nursing Science, Chonbuk National University, Jeonju

<sup>2</sup>Division of Nursing, Research Institute of Nursing Science, Hallym University, Chuncheon, Korea

**Purpose:** Knowledge, clinical reasoning, and self-confidence are the basis for undergraduate education, and determine students' level of competence. The purpose of this study was to assess the effects of the addition of a one-time simulation experience to the didactic curriculum on nursing students' knowledge acquisition, clinical reasoning skill, and self-confidence. **Methods:** Using a quasi-experimental crossover design consisted of intervention and wait-list control groups. Participants were non-randomly assigned to the first intervention group (Group A, n=48) or the wait-list control group (Group B, n=46). Knowledge level was assessed through a multiple choice written test, and clinical reasoning skill was measured using a nursing process model-based rubric. Self-confidence was measured using a self-reported questionnaire. **Results:** Results indicated that students in the simulation group scored significantly higher on clinical reasoning skill and related knowledge than those in the didactic lecture group; no difference was found for self-confidence. **Conclusion:** Findings suggest that undergraduate nursing education requires a simulation-based curriculum for clinical reasoning development and knowledge acquisition.

**Key Words:** Decision making, Knowledge, Undergraduate education, Patient simulation

### INTRODUCTION

Nursing knowledge, clinical reasoning, and self-confidence are the basis for undergraduate education and determine the level of competence with which the new graduate enters the workforce. However, it is reported that students lack the basic competence required for graduation. This is thought to originate from the type of educational methods used in nursing. In most nursing colleges in Korea, the theoretical courses are separated from clinical practice and usually exclude education about applying theoretical learning to clinical situations. Most classes focus on merely obtaining nursing knowledge and on memorization. Traditional lecturing classes ruling out the differences in situational cases cannot enhance students' clinical reasoning and self-confidence. Nursing educators are therefore faced with the task of

teaching students critical thinking skills that improve their clinical reasoning and self-confidence. Most learning is naturally accomplished through actions, situations, and cultural contexts [1]. High-fidelity simulation (HFS) allows for the development of students' cognitive, affective, and psychomotor skills in a realistic replication of a health care setting [2]. With the rapid increase of simulation education, there has been a vast increase in the attention paid to its effective use. In other words, the way it is integrated into the nursing curriculum is important. To be effective, HFS must be incorporated into the curriculum and not be seen as a stand-alone educational tool [2]. Until now, the effect has been verified by incorporating the simulation as a part of, or in addition to, clinical practice. Few studies have confirmed how adding simulation to a theoretical class might affect theoretical knowledge, critical thinking, or self-confidence. This

Corresponding author: Kim, Eun Jung

Division of Nursing, Research Institute of Nursing Science, Hallym University, 1 Hallymdaehak-gil, Chuncheon 200-702, Korea.  
Tel: +82-33-248-2725, Fax: +82-33-248-2734, E-mail: [ejerkim@hallym.ac.kr](mailto:ejerkim@hallym.ac.kr)

Received: Jul 16, 2015 / Revised: Oct 1, 2015 / Accepted: Oct 2, 2015

This is an open access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

study aimed to examine the effects of the addition of a one-time simulation experience to the didactic curriculum on nursing students' related knowledge acquisition, clinical reasoning skill, and self-confidence, compared to the traditional curriculum, in which theory learning and field training classes are separated.

## 1. Effects of Simulation in Undergraduate Nursing

The result of simulation education in nursing students can be analyzed through self-confidence, knowledge gain, learner satisfaction, skill acquisition, and critical thinking [3]. Although HFS is becoming more common, outcomes research on its use and effectiveness is inconsistent. In a review article on nursing, the use of HFS was found to increase students' knowledge; however, findings related to confidence building or clinical reasoning are mixed [4].

Through simulation experiences, students are provided with a hands-on opportunity in a safe environment where they can care for patients and make clinical decisions. The acquisition of nursing knowledge about specific disease processes is an important basis for undergraduate education [5]. However, although there have been many studies on the effects of simulation, evaluation of its effect on knowledge acquisition in students is rare [6]. Furthermore, as the measurement of the effect is based on students' self-reporting, rather than direct measurement of knowledge acquisition, a more objective and reasonable measurement is required.

Clinical reasoning is the ability to assess patient problems or needs and to analyze data accurately in the context of a patient's situation [7]. Clinical reasoning in nursing is viewed as a problem-solving activity, beginning with the assessment and nursing diagnosis, proceeding with planning and implementing nursing interventions directed toward the resolution of the diagnosed problems, and culminating in the evaluation of the effectiveness of the interventions [8]. These skills are taught through the application of the nursing process model, which is the scientific basis for nursing [9]-thus, clinical reasoning skills necessary for practice may be better acquired through experience [10]. However, there is a lack of unequivocal evidence on the effectiveness of HFS use in the teaching of clinical reasoning skills to undergraduate nursing students [11].

Self-confidence has been shown to be an important variable for undergraduate students. Students who show high self-confidence are more likely to succeed in clinical practice, show better results in exams, and use clinical

skills more effectively [12,13]. As competency is very much related to self-confidence, a participant's self-reported confidence is often assumed to represent their competency [14]. Experiences of different scenarios can build up competence and self-confidence in students through acknowledgment of clinically meaningful patterns and predictable outcomes [15]. However, the effect of HFS experience on self-confidence is not consistent. A number of findings appear to show that HFS improves nursing students' confidence [16,17], but the results from other experimental studies show no statistically significant differences in mean scores of self-confidence. Alinier et al., [18] found that intermediate-fidelity simulation is a useful training technique, but that students' perception of confidence was very similar between simulation and control groups. Brown and Chronister [15] found that self-confidence measures showed no significant differences between a treatment group that engaged in weekly HFS and a control group that received only didactic instruction on electrocardiograms. The randomized controlled trial of Chang et al., [19] showed that simulation education of new nurses in the intensive care unit was effective in improving their emergency performances, but not in increasing their self-confidence. In a review study by Yuan et al., [20] students demonstrated increased confidence when delivering patient care after practicing with an HFS in qualitative or descriptive studies, but significant results were not observed in similar experimental studies.

## 2. The Research Questions

The research questions for this study are as follows:

- Research question 1: Does the one-time simulation experience to the didactic curriculum result in improved nursing students' related knowledge acquisition?
- Research question 2: Does the one-time simulation experience to the didactic curriculum result in improved nursing students' clinical reasoning skill?
- Research question 3: Does the one-time simulation experience to the didactic curriculum result in improved nursing students' self-confidence?

## METHODS

### 1. Study Design

A quasi-experimental design with a control group was used to test the effects of the simulation exercise, in

conjunction with a traditional didactic lecture course, on students' knowledge, clinical reasoning skill, and self-confidence with a specific patient. The study featured a wait-list control group with crossover (Figure 1).

## 2. Setting and Participants

The study was conducted at a university in South Korea. Data were collected from March to May 2012. Junior nursing students enrolled in the medical surgical nursing course were eligible for inclusion, and all agreed to participate (N=94). In the curriculum for junior students, the didactic and clinical course was separated the first 12 weeks made up a didactic course, and the following 6 weeks a clinical course. A simulation session was added to the didactic classes only for participants in the simulation group. None of the students had previous experience with simulation.

## 3. Ethical Consideration

This study was approved by the university institutional review boards (EU-12-02). The purpose and procedures were explained to the students, and all of them gave informed consent prior to baseline assessment.

## 4. Measures

Three important variables were selected as the focus of this study: knowledge, clinical reasoning skills, and self-confidence. Self-confidence was measured before the didactic course and after the simulation session, while knowledge level and clinical reasoning skill were assessed after the simulation session.

Knowledge score was measured a week after the simulation sessions, using a 10-item multiple-choice written

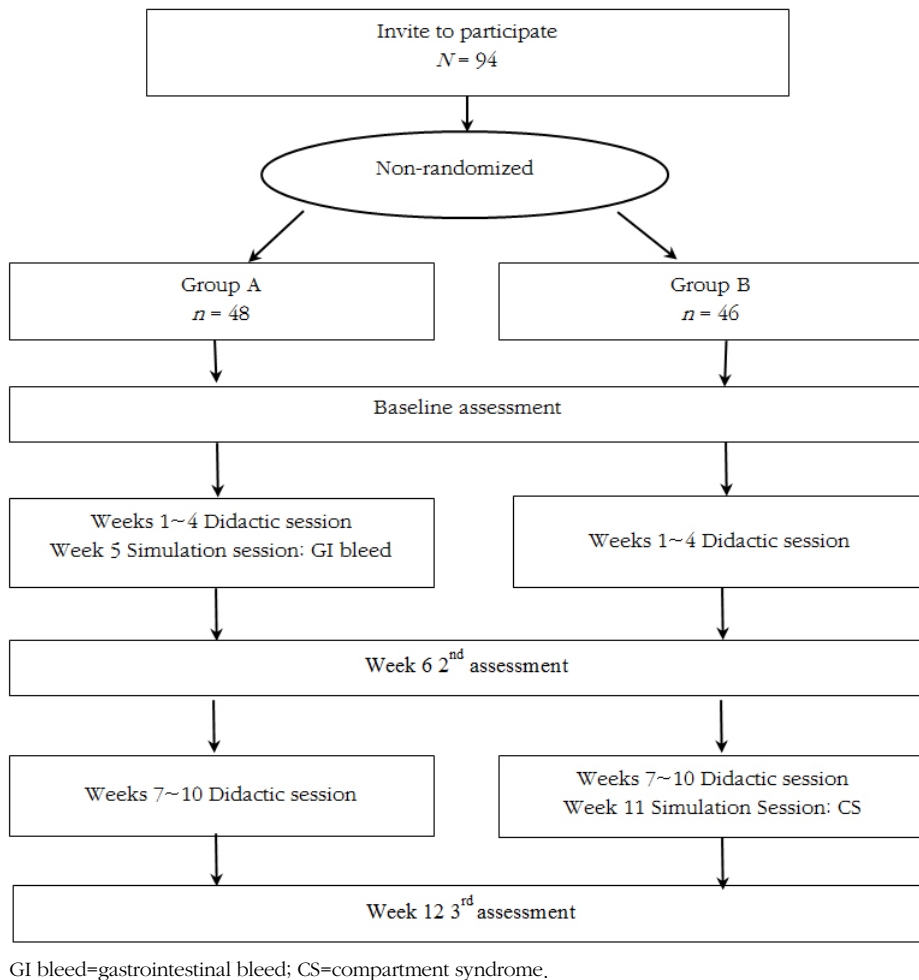


Figure 1. Flowchart of the study.

exam which covered topics on gastrointestinal (GI) bleed and compartment syndrome (CS). GI bleed and CS were taught during the didactic class, but the control group did not experience the simulation after these sessions. The items measured content related to the students' application of basic knowledge in a practice situation and their understanding of the specific patient's state encountered in the case scenarios that featured in the didactic and simulation scenarios (GI bleed or CS). The items were chosen from a test bank and modified by faculty members. The knowledge score was determined by calculating the number of correct answers to these 10 items. Validity was established by 2 faculty experts. As a measure of reliability, the Kuder-Richardson formula 20 was calculated. The reliability was .74 and .71 for GI bleed and CS, respectively.

Clinical reasoning skill was measured using a rubric developed through literature review and faculty consensus. The rubric addressed 4 phases: collecting data, diagnosing, prioritizing the problem, and planning. These phases directly related to the phases of the nursing process. The rubric described 3 levels of development for each phase the possible scoring ranged from 2 to 10 (Table 1). Rubric validity was determined through a review by 3 nursing faculty. One week after the simulation experience provided for the simulation group only, both the intervention and control groups were given a case similar to the scenario. Participants had to use this case to

collect data, make a nursing diagnosis, prioritize the problem, and establish a care plan. A faculty member, who did not know which group each student had been assigned to assessed the clinical reasoning skill using the rubric. Cronbach's coefficient  $\alpha$  was used as the measure of internal consistency reliability. The reliability of clinical reasoning for GI bleed and CS was .72 and .70, respectively.

Self-confidence was measured with a modified version of the scale originally developed by Hicks et al., [5] The questionnaire comprised 11 items with a 5-point Likert scale (1=strongly disagree, 5=strongly agree) and assessed confidence on 8 domains as follows: (1) recognizing a problem or change in patient conditions, (2) performing assessments of patient conditions, (3) interpreting the data, (4) identifying the intervention for patient conditions, (5) evaluating the effectiveness for patient conditions, (6) communication, (7) patient safety, and (8) role of team members. The Cronbach's  $\alpha$ s of the scale were .85 for pretest and .92 for posttest in the GI bleed scenario, and .70 for pretest and .86 for posttest in the CS scenario.

## 5. Procedures

As shown in Figure 1, students were non-randomly assigned to the first intervention (Group A, n=48) or wait-list control group (Group B, n=46). The participants

**Table 1.** Rubric for Evaluating the Clinical Reasoning Skill

Categories	Score and description		
Collecting data	3 Appropriately collects the subjective and objective data related to the patient's condition	2 Collects the most obvious data, missing some important information	1 Confuses the patient's condition and disorganizes the data
Diagnosing	2 Analyzes and synthesizes the data; describes the diagnosis relevant to data	1 Analyzes and synthesizes the data; describes the diagnosis but less relevant to data	0 Has difficulty analyzing and synthesizing the data; describes the diagnosis but not relevant to data
Prioritizing problem	2 Focuses on the most relevant and important data to patient's condition	1 Focuses on data relevant to patient's condition but less important or not priority	0 Has difficulty with prioritizing; data not relevant to patient's condition
Planning	3 Selects nursing interventions to resolve the problem; appropriately planned interventions based on relevant patient data	2 Selects nursing interventions to resolve the problem; less appropriately planned interventions based on most obvious data	1 Selects a single intervention, addressing a likely solution, but it may be vague, confusing, and/or incomplete

were recruited from two classes that had same curriculum at one university. To avoid cross-contamination of information between groups, A and B group students were recruited from different classes. Students in the first intervention group were the control group in the second intervention phase the inverse rule was applied for students in the first control group.

We measured participant's demographic data, grade point average (GPA) and baseline self-confidence in taking care of GI bleed patient for both groups. Both groups received didactic lectures on hepatobiliary disorders for 4 weeks (8 hours in total). Students in the first intervention group (Group A) then received 2 hours of simulation of a GI bleed due to esophageal varices rupture, while the wait-list control group (Group B) received no intervention. A second assessment of both groups was conducted one week later. Post-intervention knowledge, clinical reasoning, and self-confidence in taking care of GI bleed patient, and pre-intervention self-confidence in taking care of CS patient were measured. After this second round of assessment, both group-received didactic lectures on musculoskeletal disorders for 4 weeks (8 hours in total). The control group (Group B) then crossed over and received 2 hours of simulation of CS due to tibia-fibular fracture while the first intervention group (Group A) received no intervention. A third assessment of both groups was conducted one week later. Post-intervention knowledge, clinical reasoning, and self-confidence in taking care of CS patient were measured. Both groups were oriented for manikin use and given the opportunity to assess the simulator for 40 minutes before intervention.

## 6. The Simulation Intervention

The intervention was designed to help students acquire the knowledge and delineate clinical reasoning skills needed to respond to scenarios. Two scenarios were chosen from the medical surgical nursing course topics: GI bleed due to esophageal varices rupture and compartment syndrome (CS) due to tibia-fibular fracture.

The GI bleed scenario included nursing care of a patient with liver cirrhosis who had started to vomit blood (hematemesis), and the CS scenario included nursing care of a patient with a tibia-fibular fracture with a cast who had started to complain of extreme leg pain. The students were asked to recognize the situation, assess the patient, and begin to provide primary intervention in each of these scenarios. Validation of the GI bleed scenario was determined by a review of 3 expert nurses in

the medical unit, and 4 expert nurses in the orthopedic unit validated the CS scenario. The intervention group attended a 2-hour simulation session with a high-fidelity SimMan<sup>®</sup>. Each team consisted of 3~4 students participating in the scenario, and the running time was around 15 minutes. At the end of the scenario session, a faculty member conducted a debriefing. In the debriefing session, the faculty member guided the students to reflect on their experience in terms of what they had done well in, what they had not done well in, and what they had learned from the experience.

## 7. Data Analysis

$\chi^2$  test and independent samples t-tests were used to compare demographic characteristics of the experimental and control groups, and their pretest baseline measurements on self-confidence for the GI bleed and CS patient care. The effects of the intervention were tested with independent samples t-tests. Data were analyzed using SPSS/WIN 18.0 (SPSS, Inc., Chicago, IL), and the level of significance was set at .05 (all comparisons were two-tailed).

# RESULTS

## 1. Demographic Characteristics and Homogeneity Test

Table 2 presents the participants' demographic characteristics. There were no significant differences found in gender, age, grade point average, or major satisfaction between the 2 groups. Regarding the baseline measures, there were no significant differences between the 2 groups in self-confidence for GI bleed or CS patient care.

## 2. Knowledge Acquisition, Clinical Reasoning, and Self-confidence

Table 3 provides the research outcomes. Following the GI bleed simulation intervention, the difference in GI bleed knowledge scores for the intervention group A ( $M=6.84$ ,  $SD=1.93$ ) and control group A ( $M=5.70$ ,  $SD=2.38$ ) was statistically significant ( $t=2.55$ ,  $p=.012$ ). Similarly, the clinical reasoning scores for intervention group A ( $M=6.34$ ,  $SD=1.88$ ) and control group B ( $M=5.22$ ,  $SD=1.94$ ) were significantly different ( $t=2.83$ ,  $p=.006$ ). There was no significant difference between groups for self-confidence ( $t=-0.81$ ,  $p=.418$ ).

Following crossover and the second simulation intervention, the difference in CS knowledge scores for the intervention group B ( $M=7.30$ ,  $SD=1.99$ ) and control group A ( $M=6.29$ ,  $SD=2.64$ ) was statistically significant ( $t=-2.11$ ,  $p=.038$ ). Similarly, the clinical reasoning scores for intervention group B ( $M=7.57$ ,  $SD=1.67$ ) and control group A ( $M=6.29$ ,  $SD=1.76$ ) were significantly different ( $t=-3.60$ ,  $p=.001$ ). There was no significant difference in self-confidence between groups ( $t=1.10$ ,  $p=.276$ ).

## DISCUSSION

This study was conducted to examine whether one simulation experience in conjunction with the traditional lecture class could affect the acquisition of related knowledge, clinical reasoning, and self-confidence in nursing students with no clinical experience.

Our findings demonstrated that knowledge and clinical

reasoning with regard to a specific patient case was significantly higher in students who participated in a simulation of this case scenario than in those who did not. In our study, the experience of one-time simulation along with the lecture class had an effect on students' cognitive ability, which comprises knowledge acquisition and clinical reasoning. Rather than assuming this effect was a simple result of additional simulation participation, this finding could be interpreted instead as a more effective way to increase students' cognitive ability through simulation experiences, compared to a one-way theoretical lecture. The effect of simulation on knowledge revealed in this study matches the findings of previous research. In the study of Gates et al., [6] the content-specific examination scores in the simulation intervention group were significantly higher than in the control group. In their study, second semester nursing students were required to participate in 15 hours of high fi-

**Table 2.** Homogeneity of the Participants' Characteristics between the Groups (N=94)

Characteristics	Categories	Group A (n=48)	Group B (n=46)	$\chi^2$ or t	p
		n (%) or M $\pm$ SD	n (%) or M $\pm$ SD		
Gender	Male	6 (12.5)	5 (10.9)	0.06	.806
	Female	42 (87.5)	41 (89.1)		
Age (year)		21.06 $\pm$ 1.80	20.98 $\pm$ 1.35	0.26	.799
Satisfaction for nursing major		3.60 $\pm$ 0.71	3.50 $\pm$ 0.86	0.64	.523
Grade point average (GPA)		3.59 $\pm$ 0.46	3.53 $\pm$ 0.43	0.64	.523
Self-confidence for GI bleed		33.09 $\pm$ 5.44	32.60 $\pm$ 5.75	0.46	.679
Self-confidence for CS		33.90 $\pm$ 5.60	33.33 $\pm$ 7.54	0.41	.682

GI bleed=gastrointestinal bleed; CS=compartment syndrome.

**Table 3.** Comparison of Knowledge, Clinical Reasoning, and Self-confidence between the Groups (N=94)

Variables	Categories	Group (n)	M $\pm$ SD	t	p
Knowledge for GI bleed	Simulation/lecture Lecture only	A (48)	6.83 $\pm$ 1.93	2.55	.012
		B (46)	5.70 $\pm$ 2.38		
Clinical reasoning for GI bleed	Simulation/lecture Lecture only	A (48)	6.34 $\pm$ 1.88	2.83	.006
		B (46)	5.22 $\pm$ 1.94		
Self-confidence for GI bleed	Simulation/lecture Lecture only	A (48)	37.56 $\pm$ 6.03	-0.81	.418
		B (46)	38.50 $\pm$ 5.09		
Knowledge for CS	Simulation/lecture Lecture only	B (46)	7.30 $\pm$ 1.99	-2.11	.038
		A (48)	6.29 $\pm$ 2.64		
Clinical reasoning for CS	Simulation/lecture Lecture only	B (46)	7.57 $\pm$ 1.67	-3.60	.001
		A (48)	6.29 $\pm$ 1.76		
Self-confidence for CS	Simulation/lecture Lecture only	B (46)	38.13 $\pm$ 6.55	1.10	.276
		A (48)	39.53 $\pm$ 5.76		

GI bleed=gastrointestinal bleed; CS=compartment syndrome.

delity simulated learning and were tested for their related knowledge with 10 questions. Clinical reasoning was measured through the nursing process model-based rubric evaluating the students' reasoning ability for the given cases; the scores for clinical reasoning were significantly higher in the intervention group than in the control group.

Several studies have shown that simulation improves critical thinking [3]. In the present study, the faculty member facilitated the students to connect theoretical knowledge and problem solving in debriefing session. This may have helped third-year students with no clinical experience to strengthen their reasoning skills, encouraging them to analyze and synthesize theoretical knowledge by providing them with the opportunity of contextually bound clinical judgment through simulation experiences [8]. Furthermore, the rubric we designed is considered to help evaluate more sensitive changes in clinical reasoning skills. In a study by Meyer et al., [21] clinical judgment scores of students who attended simulation over two weeks were not statistically improved as a result of simulation. They suggested that gains in clinical judgment could have been evaluated with a more sensitive measurement tool.

Our study demonstrates that integrating a one-time simulation into the didactic curriculum has significant effects on knowledge and clinical reasoning scores. While there is still a lack of evidence for how much HFS is needed in the nursing curriculum for greatest effectiveness, our findings suggest that participation has a positive effect on students' cognitive ability.

There were no significant differences in self-confidence between experimental and control groups after the GI bleed and CS simulations. In fact, self-confidence levels were higher in the control group who had received only the didactic sessions. First time simulation experience in students with no prior clinical practice may cause performance anxiety, resulting in poor confidence. We suggest that students in the simulation group found it difficult to make decisions in scenario situations, which may have influenced their confidence in their ability to take care of the patients. In our additional analysis, most of the students who participated in the simulation perceived that they had not performed successfully and described their dissatisfaction with their performance. There is, however, evidence for a relationship between confidence level and the ability to undertake complex skills [22].

In a study by Baillie and Curzio [23], students' confidence levels were enhanced because of their ability to

repeat skills during simulation. Thus, of the variables that can affect students' self-confidence, repetitive practice is considered an important factor in improving both self-confidence and clinical performance. Bandura's emphasis that one's mastery experiences are the most influential source of self-efficacy or confidence information [24] has important implications for the mastery learning model of academic achievement.

### Limitations

This study has several limitations that need to be considered when interpreting the results. First, the results cannot be generalized because this study was conducted within one medical-surgical nursing course at a single school, and a convenience sample was used. Second, although we developed a scoring rubric in order to minimize inconsistent scoring, the fact that only one faculty member assessed the clinical reasoning scores may have resulted in a lack of reliability for this measure. The faculty evaluator did not participate in the simulation session and scored using a blinded method. Third, the nature of the regular curriculum meant that we could not examine whether the groups were homogenous for baseline scores of knowledge and clinical reasoning; instead, we compared the grade point average of both groups for homogeneity. Future research would ideally measure and compare pre and posttest performance on these measures. Fourth, we crossed over the control group to the second experimental treatment immediately after the intervention group completed the experiment because we had to follow a scheduled curriculum and concerned about dropouts of participants. Future studies should wait to cross-over the control group until the first experiment does not affect the second experiment.

## CONCLUSION

This study shows that adding simulation sessions to traditional lecture classes is an effective instructional pedagogy to increase nursing students' cognitive ability. Scores for related knowledge and clinical reasoning using a nursing process model-based rubric were significantly higher in the group that experienced a simulation along with the theoretical course prior to clinical practice than in the group that participated only in the theoretical lecture. However, there was no significant difference in self-confidence scores. Since self-confidence is an important variable in simulation education, more

work is needed to identify predictors of self-confidence, and to find strategies that can elevate students' self-confidence.

## REFERENCES

- Brown JS, Collins A, Duguid S. Situated cognition and the culture of learning. *Educational Researcher*. 1989;18(1):32-42. <http://dx.doi.org/10.3102/0013189X018001032>
- Wotton K, Davis J, Button D, Kelton M. Third-year undergraduate nursing student's perceptions of high-fidelity simulation. *Journal of Nursing Education*. 2010;49(11):632-9. <http://dx.doi.org/10.3928/01484834-20100831-01>
- Jeffries PR. A framework for designing, implementing, and evaluating simulations used as teaching strategies in nursing. *Nursing Education Perspectives*. 2005;26(2):96-103.
- Weaver A. High-fidelity patient simulation in nursing education: an integrative review. *Nursing Education Perspectives*. 2011;32(1):37-40. <http://dx.doi.org/10.5480/1536-5026-32.1.37>
- Hicks F, Coke L, Li S. The effect of high-fidelity simulation on nursing students' knowledge and performance: a pilot study 2009 [cited 2014 April 7]. Available from: [https://www.ncsbn.org/09\\_SimulationStudy\\_Vol40\\_web\\_wi\\_th\\_cover.pdf](https://www.ncsbn.org/09_SimulationStudy_Vol40_web_wi_th_cover.pdf)
- Gates MG, Parr MB, Hughen JE. Enhancing nursing knowledge using high-fidelity simulation. *Journal of Nursing Education*. 2012;51(1):9-15. <http://dx.doi.org/10.3928/01484834-20111116-01>
- Murphy JI. Using focused reflection and articulation to promote clinical reasoning: an evidence-based teaching strategy. *Nursing Education Perspectives*. 2004;25(5):226-31.
- Tanner CA. Thinking like a nurse: a research-based model of clinical judgment in nursing. *Journal of Nursing Education*. 2006;45(6):204-11.
- Burns HK, O'Donnell J, Artman J. High-fidelity simulation in teaching problem solving to 1st-year nursing students: a novel use of the nursing process. *Clinical Simulation in Nursing*. 2010;6(3):e87-e95. <http://dx.doi.org/10.1016/j.ecns.2009.07.005>
- Lisko S, O'Dell V. Integration of theory and practice: experiential learning theory and nursing education. *Nursing Education Perspectives*. 2010;31(2):106-8.
- Lapkin S, Levett-Jones T, Bellchambers H, Fernandez R. Effectiveness of patient simulation manikins in teaching clinical reasoning skills to undergraduate nursing students: a systematic review. *Clinical Simulation in Nursing*. 2010;6(6):e207-22. <http://dx.doi.org/10.1016/j.ecns.2010.05.005>
- Lundberg KM. Promoting self-confidence in clinical nursing students. *Nurse Educator*. 2008;33(2):86-9. <http://dx.doi.org/10.1097/01.NNE.0000299512.78270.d0>
- Clark MC, Owen SV, Tholcken MA. Measuring student perceptions of clinical competence. *Journal of Nursing Education*. 2004;43(12):548-54.
- Cant RP, Cooper SJ. Simulation-based learning in nurse education: systematic review. *Journal of Advanced Nursing*. 2010;66(1):3-15. <http://dx.doi.org/10.1111/j.1365-2648.2009.05240.x>
- Brown D, Chronister C. The effect of simulation learning on critical thinking and self-confidence when incorporated into an electrocardiogram nursing course. *Clinical Simulation in Nursing*. 2009;5(1):e45-52. <http://dx.doi.org/10.1016/j.ecns.2008.11.001>
- Bambini D, Washburn J, Perkins R. Outcomes of clinical simulation for novice nursing students: communication, confidence, clinical judgment. *Nursing Education Perspectives*. 2009;30(2):79-82.
- Smith S, Roehrs C. High fidelity simulation: factors correlated with nursing student satisfaction and self-confidence. *Nursing Education Perspectives*. 2009;30(2):74-8.
- Alinier G, Hunt B, Gordon R, Harwood C. Effectiveness of intermediate-fidelity simulation training technology in undergraduate nursing education. *Journal of Advanced Nursing*. 2006;54(3):359-69. <http://dx.doi.org/10.1111/j.1365-2648.2006.03810.x>
- Chang S, Kwon E, Kwon YO, Kwon HK. The effects of simulation training for new graduate critical care nurses on knowledge, self-efficacy, and performance ability of emergency situations at intensive care unit. *Journal of Korean Academic Adult Nursing*. 2010;22(4):375-83.
- Yuan HB, Williams BA, Fang JB. The contribution of high-fidelity simulation to nursing students' confidence and competence: a systematic review. *International Nursing Review*. 2012;59(1):26-33. <http://dx.doi.org/10.1111/j.1466-7657.2011.00964.x>
- Meyer MN, Connors H, Hou O, Gajewski B. The effect of simulation on clinical performance: a junior nursing student clinical comparison study. *Simulation in Healthcare*. 2011;6(5):269-77. <http://dx.doi.org/10.1097/SIH.0b013e318223a048>.
- Rhodes ML, Curran C. Use of the human patient simulator to teach clinical judgment skills in a baccalaureate nursing program. *CIN: Computers, Informatics, Nursing*. 2005;23(5):256-62.
- Baillie L, Curzio J. Students' and facilitators' perceptions of simulation in practice learning. *Nurse Education in Practice*. 2009;9(5):297-306. <http://dx.doi.org/10.1016/j.nepr.2008.08.007>
- Bandura A. Social foundations of thought and action: a social cognitive theory. Englewood Cliffs, NJ: Prentice Hall; 1986.