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The effects of pediatric nursing simulation practice education on nursing students' study crafting, critical thinking disposition, and clinical competence

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Abstract

This study is a one-group pre-post experimental design aimed at investigating the effects of pediatric nursing simulation education on nursing students' study crafting, critical thinking disposition, and clinical competency. It also explored the correlations among these variables and the factors influencing clinical competency. Data were collected from fourth-year nursing students at a university in one region using structured questionnaires before and after the simulation. Data analysis was performed using SPSS/WIN 24.0. A paired t-test was used to compare differences before and after the education, while a t-test and ANOVA were used to examine differences in variables based on the participants' general characteristics. The Pearson correlation coefficient was used to analyze correlations between variables, and multiple regression was used to identify the factors influencing clinical competency. Post-hoc analysis was conducted using Scheffé's test. The study results showed that study crafting, critical thinking disposition, and clinical competency improved after the simulation education. Study crafting had a significant and strong positive correlation with critical thinking disposition and clinical competency. Critical thinking disposition also had a significant and strong positive correlation with clinical competency. Study crafting was identified as a significant factor influencing clinical competency, and the model's explanatory power was 76.3%. Therefore, to cultivate nursing students' clinical competency, diverse teaching strategies for simulation education are required to enhance study crafting within the curriculum.

Keywords: Study crafting, Critical thinking disposition, Clinical competency, Simulation, Nursing students

I. Introduction

1.1 Necessity of research

Recently, nursing education institutions have been increasingly expanding simulation practice education by establishing in-school practice environments like clinical settings [1]. Simulation practice is an effective educational method that allows nursing students to perform nursing interventions and receive feedback in simulated clinical situations that are difficult to experience during clinical practicums. It also provides opportunities for repeated learning in a safely constructed practice environment [2,3], thereby enhancing understanding and adaptation to clinical settings [4]. The Korean Accreditation Board of Nursing Education (KABONE) also recognizes simulation practice as a method to acquire clinical knowledge and nursing skills and to promote critical thinking, acknowledging it as a part of the clinical practicum education hours [5].

Prior research on simulation education using patient model simulators and standardized patients has reported improvements in nursing students' critical thinking disposition [3,6], Clinical Competence [3,6,7,8], communication confidence [6], communication skills [7], nursing performance confidence [6], problem-solving skills [9], learning satisfaction [9], self-leadership [10], and self-efficacy [10]. Conversely, some studies have shown no significant effects on critical thinking disposition [7,8,11] and Clinical Competence [12], necessitating further verification.

Simulation practice education can enhance critical thinking through the process of analyzing and reflecting on the appropriateness of performed nursing care during debriefing sessions following scenario enactment. Particularly in pediatric nursing, critical thinking is required to provide nursing care considering the characteristics of various developmental stages from newborns to adolescents, making simulation practice essential [13]. Studies have shown that pediatric nursing simulation practice improves critical thinking disposition [6] and enhances clinical performance by accumulating clinical judgment experience through nursing care for

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diverse individuals and situations [14]. Therefore, research on the effectiveness of simulation education is needed to explore strategies for strengthening the competencies of nursing students.

Furthermore, study crafting is a competency required for nurses who need to continuously acquire new knowledge and information to solve patients' health problems in the rapidly changing healthcare environment. Academic crafting is a learner-centered learning strategy derived from job crafting, where students actively modify their learning experiences to find meaning in their studies and increase engagement [15]. This means not simply passively performing given tasks but actively restructuring learning content, methods, and relationships according to their interests, strengths, and needs. However, prior research on this topic is scarce. Apart from a study that confirmed a significant improvement by applying the microlearning method [16] and a study that found no effect through education using documentaries [17] for nursing students, and a study confirming improved academic crafting through simulation education [18,34], it was difficult to find relevant research in nursing. Therefore, this study aims to investigate the effects of pediatric nursing simulation practice education on changes in academic crafting, critical thinking disposition, and clinical performance to provide foundational data for simulation practice education.

1.2 Purpose of research

This study was conducted to examine the relationships among study crafting, critical thinking disposition, and clinical performance, and the effects of simulation education on fourth-year nursing students enrolled in a simulation practice course. The specific objectives of this study are as follows:

First, to identify the levels of study crafting, critical thinking disposition, and clinical performance after simulation education.

Second, to determine the differences in study crafting, critical thinking disposition, and clinical performance before and after simulation education.

Third, to examine the correlations among study crafting, critical thinking disposition, and clinical performance after simulation education.

Fourth, to identify the factors influencing clinical performance after simulation education.

II. Research Methods

1. Research design

This study employed a one-group pretest-posttest design to investigate the effects of pediatric nursing simulation practice education on nursing students' study crafting, critical thinking disposition, and clinical performance [Figure 1].

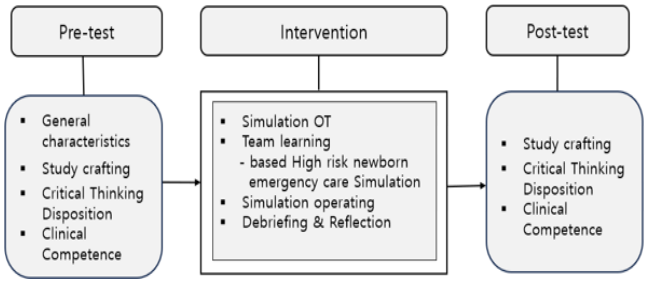

Figure 1. Design of the research

2. Research participants

The participants in this study were fourth-year nursing students who took the simulation practice course at a university in Jeollanam-do Province (J). Before the simulation class, the purpose and methods of the study were explained, and a pre-survey was conducted using a structured questionnaire for students who agreed to participate in the research. The required minimum sample size was calculated as 74 using G*Power 3.1.9 with an effect size of .15, a significance level of .05, and a power of .95. The sample size of 96 in this study was therefore sufficient.

3. Research instruments

3.1 Study crafting

Study crafting was measured using the scale modified and validated for university students by Choi and Shin [21], which was adapted from the job crafting scale developed by Slemp and Vella-Brodrick [19] and validated in Korean by Im et al. [20]. The study crafting instrument consists of 14 items across three sub-domains: task crafting (4 items), cognitive crafting (5 items), and relational crafting (5 items). Each item is measured on a 5-point Likert scale, with

higher scores indicating higher levels of study crafting. In the study by Choi and Shin [21], Cronbach's α was .89, and in this study, Cronbach's α was .94.

3.2 Critical thinking disposition

Critical Thinking Disposition was measured using the instrument developed by Yoon [22]. This instrument comprises 27 items across seven sub-domains: prudence (4 items), intellectual eagerness/curiosity (5 items), confidence (4 items), systematicity (3 items), intellectual fairness (4 items), healthy skepticism (4 items), and objectivity (3 items). Each item is rated on a 5-point Likert scale, ranging from 1(not at all') to 5 (very much). Two negatively worded items were reverse scored. The total score ranges from a minimum of 27 to a maximum of 135. In the original development of the instrument, Cronbach's α was .84, and in this study, Cronbach's α was .95.

3.3 Clinical competence

Clinical Competence was measured using the instrument developed by Lee et al. [24] based on Schwirian's SIX-Dimension Scale [23] and subsequently modified and supplemented by Choi [25,37] and further revised by Park and Ji [3,35]. This instrument consists of 15 items across three dimensions: nursing process (5 items), nursing skills (5 items), and education and collaboration (5 items). Each item is rated on a 5-point Likert scale, ranging from 1(very poor) to 5(very good). In the study by Park and Ji [3], Cronbach's α was .94, and in this study, Cronbach's α was .97.

4. Simulation operation process

The simulation practice was conducted with 5 sections, each consisting of 20 students. The 6 allotted hours for pediatric nursing simulation were organized into 4 teams of 5 students each per section. The 6-hour simulation class proceeded in the order of orientation, team-based pre-learning, simulation enactment, debriefing, and evaluation. Simulation practice guidelines were prepared for both instructors and students and distributed to students before the class. The pediatric simulation scenario was adapted and supplemented by the primary investigator from the high-risk newborn emergency nursing care scenario module of the Simulation Practice Standard published by the Korean Accreditation Board of Nursing Education [26], and its content validity was reviewed by one nursing professor with over 10 years of simulation education experience and one nurse working in a pediatric hospital.

Before the class, students were provided with the scenario in advance and instructed to prepare pre-knowledge through team-based learning activities and submit a report. They were also asked to anticipate potential situations in the given scenario, assign roles for problem-solving for the patient, and prepare to perform key skills and appropriate nursing interventions.

During the orientation session before the main simulation class, an introduction to the simulator, simulation operation methods, preparation of supplies, usage of equipment, and medication administration were explained. The submission of team-based pre-learning activity reports was also checked to assess the preparedness for the class.

The simulation enactment took 10-15 minutes per team, with an additional 5 minutes for preparation time. After all, four teams completed their simulations, recorded videos were played back for each team to watch and conduct debriefing. The time spent watching the debriefing video and completing the debriefing activity sheet was approximately 20-25 minutes per team. During debriefing, each team and individual took turns presenting the strengths, weaknesses, and areas for improvement in the nursing interventions they performed, and they were instructed to record these reflections in a reflection journal. In the final evaluation session for each section, the teams were evaluated with slight modifications to the original scenario.

5. Data collection and analysis

5.1 Data collection

Data were collected from fourth-year nursing students at a university in Jeollanam-do Province (J) from November 25th to December 13th, 2024. Before the survey, the purpose of the study was explained, and it was clarified that the collected data would be anonymized and that participants could withdraw at

any time during the survey if they wished. Surveys were administered to students who consented to participate in the study, and the heads of the five sections were asked to collect the questionnaires to encourage voluntary participation. A pre-survey was conducted before the simulation class, and a post-survey was administered after the simulation practice was completed. Completing the questionnaire took approximately 20 minutes. Out of 100 questionnaires collected, 96 completed questionnaires were analyzed, excluding 4 incomplete ones.

5.2 Data analysis

The data collected were analyzed using the SPSS/WIN 24.0 Program.

Descriptive statistics, including means and standard deviations, were used to describe the general characteristics of the participants and the levels of their academic crafting, critical thinking disposition, and clinical performance. Paired t-tests were used to determine the differences in academic crafting, critical thinking disposition, and clinical performance before and after the simulation education. Pearson's correlation coefficients were used to analyze the correlations among academic crafting, critical thinking disposition, and clinical performance after the education. Multiple regression analysis was used to identify the factors influencing clinical performance after education.

III. Results

1. General characteristics of subjects

The study participants included 62 females (64.6%) and 34 males (35.4%). Regarding religion, 20 participants (20.8%) reported having one, while 76 (79.2%) reported having none. The age distribution was as follows: 76 participants (79.2%) were 20-24 years old, 13 (13.5%) were 25-29 years old, 4 (4.2%) were 30-34 years old, and 3 (3.1%) were 35 years or older. Regarding personality, 26 participants (27.1%) described themselves as very positive, 59 (61.5%) as positive, 10 (10.4%) as negative, and 1 (1.0%) as very negative. Their views on the nursing profession were positive for 90 participants (93.8%) and negative for 6 (6.3%). The motivations for applying to the nursing program were good job prospects for 56 participants (58.3%), aptitude for the field for 22 (22.9%), based on high school grades for 2 (2.1%), recommendation from parents or others for 12 (12.5%), and to serve others for 4 (4.2%) [Table 1].

[Table 1] General characteristics of the Subjects (N=96)

Characteristics	Categories	n	%
Sex	Female	62	64.6
	Men	34	35.4
Religion	Yes	20	20.8
	No	76	79.2
Age	20-24	76	79.2
	25-29	13	13.5
	30-34	4	4.2
	35이상	3	3.1
Personality	Very optimistic	26	27.1
	Optimistic	59	61.5
	Pessimistic	10	10.4
	Very pessimistic	1	1.0
Thinking for nursing professionalism	Optimistic	90	93.8
	Pessimistic	6	6.2
Application motivation	Employment guarantee	56	58.3

	Aptitude	22	22.9
	High school record	2	2.1
	Recommendation of parents or others	12	12.5
	service to others	4	4.2

2. Differences in study crafting, critical thinking disposition, and clinical competence of the Subjects Before and After Simulation Class

The levels of before and after the simulation class are as follows. Following the class, study crafting significantly increased from a mean of 4.03 to 4.90 (t=6.608, p<.001). Similarly, critical thinking disposition significantly increased from a mean of 3.97 to 4.37 after the class (t=5.061, p<.001). Clinical competence also showed a significant increase from a mean of 4.15 before the class to 4.58 after the class (t=4.951, p<.001) [Table 2].

[Table 2]. Differences in study crafting, critical thinking disposition, and clinical competence of the Subjects (N=96)

Variables	M±SD		paired-t	*p*
	Pre-test	Post-test		
Study crafting	4.03±0.69	4.90±0.60	6.608	<.001
Critical Thinking Disposition	3.97±0.51	4.37±0.52	5.061	<.001
Clinical Competence	4.15±0.62	4.58±0.56	4.951	<.001

3. Correlation among study crafting, critical thinking disposition, and clinical competence of the subjects

The analysis of the correlations among the subjects' study crafting, critical thinking disposition, clinical competence revealed that Study crafting had a significant strong positive correlation with critical thinking disposition (r=.797, p<.001) and clinical competence (r=.842, p<.001). Additionally, critical thinking disposition showed a significant strong positive correlation with clinical competence (r=.818, p<.001) [Table 3].

[Table 3]. Correlation among study crafting, critical thinking disposition, and clinical competence of the Subjects(N=96)

Variables	Study crafting r*(p)*	*Critical Thinking Disposition r(p)*	Clinical Competence r*(p)*
Study Crafting	1		
Critical Thinking Disposition	.797(<.001)	1	
Clinical Competence	.842(<.001)	.818(<.001)	1

4. Factors influencing clinical competence of the subjects after simulation class

The analysis of the factors influencing the subjects' clinical competence showed that only academic crafting (β=.401, t=4.852, p<.001) had a significant effect. The multicollinearity among the independent variables was checked, and the variance inflation factor (VIF) was 2.742, which is less than the general cutoff of 10, indicating no multicollinearity issues. The tolerance limit was .365, which is greater than 0.1. Residual analysis showed a Durbin-Watson statistic of 1.812, close to 2, indicating no autocorrelation issues in the residuals, thus satisfying the assumptions of regression analysis. The regression model was statistically significant

(F=153.750, p<.001), and the explanatory power of the model was 76.3% [Table 4].

[Table 4]. Factors influencing clinical competence of the Subjects after simulation class (N=96)

Variables	B	SE	β	t*(p)*	Tolerance	VIF
Constant	4.912	3.694		1.330(.187)		
Study crafting	0.243	0.05	0.401	4.852(<.001)	0.365	2.742
F*(p)* =153.750(<.001), R2=.768, Adj R2=.763, Durbin-Watson=1.812						

IV. Discussion

This study aimed to determine the effects of pediatric nursing simulation practice education on study crafting, critical thinking disposition, clinical competence of fourth-year nursing students. The results indicated that study crafting, critical thinking disposition and clinical competence all improved after the simulation education, and study crafting was identified as a significant influencing factor on clinical competence after the education.

The mean score for study crafting among the study participants significantly increased from 4.03 before the education to 4.90 after the education. This aligns with the findings of Jun, Jeong & Kim [18], who reported a significant increase in study crafting from a pre-education mean of 3.69 to a post-education mean of 3.86 in third-year nursing students using simulation. However, the pre- and post-education mean scores in our study were notably higher, suggesting a need to investigate whether this difference is due to individual characteristics of the participants or regional factors. We were unable to compare our findings with other studies examining the effect of simulation on study crafting, as only one other such study was found. In contrast, Park and Kim [27] found a significant improvement in study crafting when applying a nursing management education application using smartphones to nursing students, with scores increasing from 40.8 (equivalent to a mean of 2.91) before intervention to 49.7 (equivalent to a mean of 3.55) after intervention. However, studies by Kang et al. [16,36], who applied a microlearning method to second-year nursing students, and by Park [17], who studied 84 nursing students taking an introduction to nursing course using documentaries, found no significant differences. Further research is needed to verify the effects of simulation on study crafting.

The critical thinking disposition of the participants also significantly improved, with the mean score increasing from 3.97 before the education to 4.37 after the education. This is consistent with the findings of Min [6], who reported a significant improvement in critical thinking disposition from 98.93 (equivalent to a mean of 3.66) to 101.86 (equivalent to a mean of 3.77) after applying a febrile child scenario. Similar significant improvements were reported by Joo [28] with fourth-year students using high-risk delivery simulation (3.73 to 4.16), by Kwon and Kim [10] with third-year students using high-risk maternal simulation (3.60 to 3.71), by Lim [29] with fourth-year students using simulation-based handover education (3.39 to 3.75), by Kwon [30] with fourth-year students using PBL-based simulation integrated education (3.65 to 4.21), and by Park and Park [31] with second-year students using escape room game simulation education (103.49 (equivalent to a mean of 3.83) to 109.86 (equivalent to a mean of 4.06)). Additionally, a study applying virtual reality simulation education to fourth-year students showed a significant improvement in the experimental group compared to the control group. Conversely, studies by Kim and Lee [7] using diabetes simulation with standardized patients for fourth-year students, Lee [8] using simulation-based practice education for fourth-year students, Kim and Kim [9] using problem-based learning simulation for fourth-year students, Kim and Lee [11] using simulation for third-year students, and Kim, Ha, Park [32] using blended action learning-based virtual simulation for third-year students did not show significant results.

In this study, the clinical competence of the participants significantly improved from a pre-education mean of 4.15 to a post-education mean of 4.58 out of 5. This is consistent with the significant improvement reported by Lee [8], who used the same

instrument with fourth-year students in simulation-based practice education (3.54 to 3.86), although the mean scores differed. While direct comparison is difficult due to different instruments, Kim's study [33] using high-risk newborn nursing simulation for third-year students (2.70 to 3.45) and Kim and Lee's study[7] using diabetes simulation with standardized patients (3.74 to 3.85) also showed significant improvements. Furthermore, Kim, Ha, Park's study[32] using a blended action learning-based virtual simulation program also found a significant improvement in the experimental group's clinical competence from 3.69 to 4.11. However, Park's study[12], which used the same instrument for pediatric nursing simulation with fourth-year students, reported a decrease in clinical performance from 63.4 (equivalent to a mean of 4.23) to 60.7 (equivalent to a mean of 4.05), suggesting the need for further research to confirm these findings.

The correlation analysis after the simulation practice education showed a strong positive correlation between study crafting and both critical thinking disposition and clinical competence. Critical thinking disposition and clinical competence also showed a significant positive correlation. This partially aligns with Lee's study [8], which found a significant positive correlation between critical thinking disposition and clinical competence in fourth-year students after simulation-based practice education. Furthermore, study crafting was identified as an influencing factor on clinical competence after simulation practice. As most prior studies focused on pre- and post-education differences, we could not find preceding research that also examined influencing factors to compare with our results. Future repeated studies are necessary to verify the effects of various variables and should be applied in simulation education.

In conclusion, this study demonstrates that pediatric nursing simulation practice education led to improvements in study crafting, critical thinking disposition, and clinical competence among nursing students. Moreover, study crafting was identified as a significant influencing factor on their clinical competence. Therefore, to enhance nursing students' clinical competence, it is necessary to explore methods to promote study crafting within the nursing curriculum and to further activate simulation education as an effective educational approach that contributes to the improvement of nursing students' study crafting, critical thinking disposition, and clinical competence.

V. Conclusion

This study was conducted to provide foundational data for simulation education by examining the effects of pediatric nursing simulation practice education on study crafting, critical thinking disposition, and clinical competence. of fourth-year nursing students. The findings confirmed that pediatric nursing simulation practice education improved nursing students' study crafting, critical thinking disposition, and clinical competence. Furthermore, higher levels of study crafting, critical thinking disposition were associated with better clinical competence among nursing students. This study is significant in that it reaffirmed the importance of actively utilizing simulation practice education by demonstrating its positive impact on nursing students' study crafting, critical thinking disposition, and clinical competence. Based on the findings of this study, the following suggestions are made for simulation practice education for nursing students:

First, there is a need for repeated studies in simulation practice education for other subjects to compare the differences in study crafting, critical thinking disposition, and clinical competence, which were the variables measured in this study.

Second, given that this study employed a one-group pretest-posttest design, future research should utilize a non-equivalent control group pretest-posttest design for replication and to further strengthen the evidence.

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