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Factors influencing clinical reasoning competence in nursing students

Jinju Kim[1], Gyun-Young Kang[2*]
[1,2]Kyungdong University College of Nursing, Wonju-Si, Gangwon-do, Korea; mental74@kduniv.ac.kr (G.Y.K).

Abstract: This study is a descriptive survey research aimed at identifying the factors influencing clinical reasoning competence among nursing students. The participants were 553 third-year students from nursing programs at three universities located in the K region of South Korea. The collected data were analyzed using the SPSS 23.0 program, employing Pearson's correlation coefficient and multiple regression analysis. According to the research results, the factors affecting the participants' clinical reasoning competence were found to be communication skills ($\beta = 0.23$, $p = 0.000$), problem-solving processes ($\beta = 0.50$, $p = 0.000$), and self-efficacy ($\beta = 0.10$, $p = 0.008$). Therefore, it is necessary to assess the effectiveness of various educational programs and teaching methods for improving clinical reasoning competence. The study suggests developing and researching programs focused on enhancing communication skills, self-efficacy, and problem-solving processes to improve clinical reasoning competence among nursing students.

Keywords: *Clinical reasoning competence, Communication skills, Nursing students, Problem-Solving processes, Self-Efficacy.*

1. Introduction

As core technologies of the Fourth Industrial Revolution rapidly apply to the medical field, the healthcare ecosystem is expanding and transforming into a patient-centered, personalized lifelong health management system [1]. In response to the rapid changes in the healthcare environment, not only current healthcare professionals but also the next generation of healthcare workers need education and training to fully develop the competencies expected of them in practice [2].

Clinical reasoning is a dynamic thinking process in nursing practice where nurses gather patient information, analyze it based on professional nursing knowledge, and logically evaluate it to make rational decisions to solve nursing problems [3, 4]. A nurse's clinical reasoning competence enables accurate decision-making in nursing practice, improves the quality of nursing, and positively influences patient outcomes [5]. A lack of clinical reasoning competence in complex clinical situations can seriously impact patient treatment and prognosis, making it essential to emphasize clinical reasoning in nursing education from the undergraduate level [6].

Self-efficacy, the personal belief in one's ability to successfully perform tasks, is reported to be a critical factor influencing the choice and persistence of actions [7]. Nursing students with high self-efficacy are significantly more likely to use emotional regulation, positive interpretation, and proactive coping strategies [8]. It has been suggested that self-efficacy should be considered a priority for improving clinical performance [9]. Additionally, self-efficacy has been shown to partially mediate job satisfaction [10].

Problem-solving refers to the logical and creative ability to recognize the difference between the current state of a problem and the goal to be achieved, analyze the cause, and find the optimal solution [11]. The higher the problem-solving ability of nursing students, the better their clinical performance [12]. Problem-solving ability improves through continuous and systematic education, enhanced through autonomous processes such as discovering and identifying real problems and selecting learning topics

* Correspondence: mental74@kduniv.ac.kr

[13].

Research on clinical reasoning in nursing students suggests that communication skills are critical for developing clinical reasoning competence [14], and factors such as problem-solving ability, clinical decision-making ability, clinical practice experience [15], and academic self-efficacy [6] have been identified as influencing the development of clinical reasoning competence. However, there has been little research examining clinical reasoning competence alongside communication ability, self-efficacy, and problem-solving processes simultaneously. This study aims to identify factors influencing the clinical reasoning competence of nursing students to provide foundational data for enhancing their clinical reasoning skills.

2. Research Method

2.1. Research Design

This study is a descriptive survey research aimed at identifying the effects of communication skills, self-efficacy, and problem-solving processes on the clinical reasoning competence of nursing students.

2.2. Research Subjects

The subjects of this study were third-year students enrolled in the nursing departments of three universities located in region K, who agreed to participate in the study. The sample size was calculated using GPower 3.1.9 software, selecting eight independent variables, with a minimum sample size of 160 based on a bilateral test, effect size of .15, significance level of .05, and power of .95 for regression analysis. After excluding 23 incomplete responses from the 576 collected, 553 responses were used for the final analysis.

2.3. Research Tools

In this study, communication competence was measured using the Global Interpersonal Communication Competence Scale (GICC-15), which was modified and supplemented by adding 7 concepts from Hur [17] to the 8 communication competence concepts presented by Rubin [16]. The scale consists of 15 items, scored on a 5-point Likert scale, with higher scores indicating higher communication competence. Cronbach's α was .72 in Hur's [17] study and .83 in this study.

Self-efficacy was measured using the Korean Adaptation of the General Self-Efficacy Scale, which was developed by Schwarzer & Jerusalem [18] and adapted by Lee, Schwarzer & Jerusalem [19]. It consists of 10 items on a 4-point Likert scale, with higher scores indicating higher self-efficacy. Cronbach's α was .75 in the tool's development study by Lee, Schwarzer & Jerusalem [19] and .70 in this study.

The problem-solving process was measured using a tool developed by Lee, Park & Choi [20]. The tool consists of 30 items on a 5-point Likert scale, with higher scores indicating higher problem-solving process performance. Cronbach's α was .93 in the tool's development study by Lee, Park & Choi [20] and .93 in this study.

Clinical reasoning competence was measured using the Nurses Clinical Reasoning Scale (NSCRS) developed by Liou et al. [21] and translated into Korean by Jung & Han [22] to fit the Korean context. The scale consists of 15 items, scored on a 5-point Likert scale, with higher scores indicating higher clinical reasoning competence. Cronbach's α was .94 in Liou et al. [21] and .94 in this study.

2.4. Data Collection

Data collection for this study was conducted from May 1, 2022, to May 21, 2022, using online questionnaires distributed to each student. Before data collection, the purpose and methods of the study were thoroughly explained to the research participants, and the study was conducted only with those who agreed to participate.

2.5. Data Analysis

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The collected data were analyzed using SPSS 23.0. Descriptive statistics were used to analyze the general characteristics, communication skills, self-efficacy, problem-solving processes, and clinical reasoning competence of the subjects. Differences in communication skills, self-efficacy, problem-solving processes, and clinical reasoning competence according to the subjects' general characteristics were analyzed using t-tests and ANOVA, with post hoc tests conducted using the Scheffe method. Pearson correlation coefficients were used to examine the relationships between communication skills, self-efficacy, problem-solving processes, and clinical reasoning competence. Multiple regression analysis was conducted to identify factors influencing clinical reasoning competence.

2.6. Ethical Considerations

To protect the rights and ethical considerations of the research participants, the necessity, purpose, and methods of the study were thoroughly explained before data collection. Participation in the study was voluntary, and the anonymity and confidentiality of the participants were guaranteed. It was also explained that participants could withdraw from the study at any time without any disadvantage. The collected data were coded and anonymized, used only for research purposes, and stored on a USB in a locked cabinet for three years before being deleted and discarded.

3. Research Results

3.1. Communication Skills, Self-Efficacy, Problem-Solving Processes, and Clinical Reasoning Competence by General Characteristics of the Subjects

The general characteristics of the subjects and the communication skills, self-efficacy, problem-solving processes, and clinical reasoning competence according to their general characteristics are shown in Table 1.

Clinical reasoning competence differed significantly by gender (t=-1.98 p=0.048), with females having higher communication skills than males. Communication skills differed significantly by age (F=2.70 p=0.045), but there were no significant differences in self-efficacy, problem-solving processes, or clinical reasoning competence by age. There were no significant differences in communication skills, self-efficacy, problem-solving processes, or clinical reasoning competence by religion. Communication skills (F=9.71 p=0.000), self-efficacy (F=30.57 p=0.000), problem-solving processes (F=9.68 p=0.000), and clinical reasoning competence (F=9.90 p=0.000) all differed significantly by major satisfaction, with the high satisfaction group showing higher communication skills, self-efficacy, problem-solving processes, and clinical reasoning competence than the low satisfaction group.

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Table 1.
Communication skills, self-efficacy, problem-solving processes, and clinical reasoning competence by general characteristics of the subjects (N=553).

Characteristics		N (%)	Communication skills		Self-Efficacy		Problem-Solving processes		Clinical reasoning competence	
			Mean ± SD	t/F(*p*) Scheffe	Mean ± SD	t/F(*p*) Scheffe	Mean ± SD	t/F(*p*) Scheffe	Mean ± SD	t/F(*p*) Scheffe
Gender	Male	91(16.5)	3.788±0.521	-1.16	3.147±0.520	-0.59	3.644±0.498	-1.94	3.539±0.605	-1.98
	Female	462(83.5)	3.846±0.425	(0.248)	3.180±0.473	(0.554)	3.746±0.453	(0.053)	3.666±0.548	(0.048*)
Age	21-25	517(93.5)	3.849±0.439		3.177±0.484		3.734±0.461		3.652±0.552	
	26-30	20(3.6)	3.590±0.419	2.70	3.185±0.394	0.66	3.575±0.460	2.03	3.447±0.579	2.01
	31-35	6(1.1)	3.622±0.449	(0.045*)	2.900±0.587	(0.577)	3.472±0.314	(0.109)	3.322±0.519	(0.111)
	36<	10(1.8)	3.840±0.484		3.180±0.421		3.930±0.483		3.853±0.788	
Religion	Christianity	120(21.7)	3.838±0.451		3.184±0.489		3.709±0.460		3.690±0.577	
	Buddhism	32(5.8)	3.844±0.415		3.278±0.351		3.838±0.518		3.702±0.584	
	Catholicism	38(6.9)	3.875±0.374	0.24	3.253±0.413	0.98	3.781±0.453	0.91	3.758±0.513	1.55
	other	7(1.3)	3.962±0.405	(0.913)	3.000±0.653	(0.416)	3.895±0.276	(0.461)	3.933±0.924	(0.186)
	No religious	356(64.4)	3.829±0.450		3.157±0.490		3.717±0.460		3.607±0.545	
Major satisfaction	Satisfaction[a]	382(19.2)	3.886±0.429	9.71	3.267±0.431	30.57	3.785±0.444	9.68	3.704±0.542	9.90
	Moderation[b]	125(50.1)	3.760±0.441	(0.000***)	3.032±0.472	(0.000***)	3.621±0.482	(0.000***)	3.572±0.542	(0.000***)
	Dissatisfaction[c]	45(22.6)	3.627±0.468	a>c	2.782±0.602	a>c	3.555±0.465	a>c	3.347±0.634	a>c

Note: $p<0.001^{***}$, $p<0.01^{**}$, $p<0.05^{*}$).

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3.2. Relationships between Communication Skills, Self-Efficacy, Problem-Solving Processes, and Clinical Reasoning Competence

The relationships between communication skills, self-efficacy, problem-solving processes, and clinical reasoning competence are shown in Table 2. Clinical reasoning competence was significantly positively correlated with communication skills (r=0.61 p=0.000), self-efficacy (r=0.48 p=0.000), and problem-solving processes (r=0.70 p=0.000).

Table 2.
Correlations of communication skills, self-efficacy, problem-solving processes, and clinical reasoning competence (N=553).

Variables	Communication skills	Self-Efficacy	Problem-Solving processes	Clinical reasoning competence
Communication skills	1			
Self-Efficacy	0.57 (0.000***,)	1		
Problem-Solving processes	0.67 (0.000***,)	0.51 (0.000***,)	1	
Clinical reasoning competence	0.61 (0.000***,)	0.48 (0.000***,)	0.70 (0.000***,)	1

Note: $p < 0.001^{***}, p < 0.01^{**}, p < 0.05^{*}$.

3.3. Effects of Communication Skills, Self-Efficacy, and Problem-Solving Processes on Clinical Reasoning Competence

Multiple regression analysis was conducted to identify the effects of communication skills, self-efficacy, and problem-solving processes on clinical reasoning competence, and the results are shown in Table 3.

The regression model for clinical reasoning competence was significant (F=103.64, p=0.000), with an R^2 of 0.532, indicating 53.2% explanatory power. Factors influencing clinical reasoning competence were communication skills (β=0.23 p=0.000), problem-solving processes (β=0.50 p=0.000), and self-efficacy (β=0.10 p=0.008). Gender, age, and major satisfaction were not statistically significant.

Table 3.
Influencing of communication skills, self-efficacy, and problem-solving processes on clinical reasoning competence (N=553).

Variables	Clinical reasoning competence		
	β	t	*p*
Gender	0.03	1.04	0.297
Age	0.01	0.31	0.754
Major satisfaction	-0.01	-0.16	0.872
Communication skills	0.23	5.34	0.000
Self-Efficacy	0.10	2.68	0.008
Problem-Solving processes	0.50	12.26	0.000
R^2=0.532 F=103.644 *p*=0.000			

4. Conclusion and Discussion

This study aimed to identify the effects of communication skills, self-efficacy, and problem-solving processes on the clinical reasoning competence of nursing students to provide foundational data for

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enhancing their clinical reasoning skills.

The study results indicated that communication skills, problem-solving processes, and self-efficacy were the factors influencing clinical reasoning competence in nursing students. These findings are consistent with previous studies by Hahn & Chun [15], which identified problem-solving ability and clinical decision-making ability as factors influencing clinical reasoning competence, and by Hong [23], which reported that problem clarification, planning and execution, and self-regulation efficacy, as sub-factors of problem-solving ability, influenced clinical reasoning competence.

Based on these results, this study provides a foundation for the development of curricula and teaching-learning methods to enhance the clinical reasoning competence of nursing students. Additionally, it highlights the need for the development of various curricular and extracurricular programs to enhance problem-solving ability, communication skills, and self-efficacy, which can improve clinical reasoning competence. Clinical reasoning competence, which involves gathering patient information, analyzing it based on professional nursing knowledge, and logically evaluating it to make rational decisions to solve nursing problems [3, 4], is an essential competence that nursing students must acquire during their clinical practice and as nurses.

In other words, clinical reasoning competence is a skill that nursing students must develop during their university education. To achieve this, it is crucial to incorporate curricula that enhance critical thinking skills and to implement systematic education and guidance by instructors in simulation and clinical practice courses to translate this knowledge into clinical reasoning. Kim & Na [24] stated that integrated simulation practice education is an effective method for improving clinical reasoning competence and clinical performance, and it is necessary to enhance communication skills, learning confidence, and clinical reasoning competence to improve clinical performance. Additionally, education using holographic standardized patients (HSP) was also suggested as an opportunity to enhance clinical reasoning competence [25]. The changing healthcare environment limits the opportunities for nursing students to develop clinical performance skills, such as providing direct nursing care during clinical practice. To address these limitations, it is necessary to develop curricula and teaching models that allow for repeated practice in various clinical situations and enhance clinical reasoning and practical skills.

Future research should focus on verifying the effectiveness of various curricula and teaching methods aimed at improving clinical reasoning competence and developing programs and research on interventions to enhance communication skills, self-efficacy, and problem-solving processes to improve the clinical reasoning competence of nursing students.

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