Moderating Effects of Information Literacy Ability in The Relationship Between Resilience and Nursing Management Competency of Nurse Managers in Small and Medium-Sized Hospitals

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KEYWORDS

Information Literacy Ability, Nurse Managers, Nursing Management Competency, Resilience.

ABSTRACT

This study aimed to explore ways to improve the nursing management competency of nurse managers in small and medium-sized hospitals and examine the relationship between variables based on information literacy ability in the structural model linking the resilience of nurse managers and nursing management competency. The data was collected from November 6, 2023, to December 6, 2023, using cluster sampling in four cities with similar urban settings, and surveys were conducted with the consent of nurse managers working in small to medium-sized hospitals with 100 to 300 beds. A total of 207 collected data points were analyzed using the moderating effect technique of structural equation modeling. The hypothesis testing results revealed that nurse managers in small and medium-sized hospitals partially affect on nursing management competency. Furthermore, it was observed that the impact of nurse managers' resilience on nursing management competency varies based on their level of information literacy ability. Therefore, it is recommended that combined training in interpersonal skills and information literacy is offered to develop a competency improvement program for nurse managers in small and medium-sized hospitals.

1. Introduction

According to a report on the scale of healthcare institutions in South Korea, small and medium-sized hospitals with less than 300 beds account for 97% of all healthcare institutions [1]. Small and medium-sized hospitals occupy a pivotal position in the Korean healthcare system. During the COVID-19 pandemic, small and medium-sized hospitals have converted entire wards or parts of wards to negative pressure to prevent spreading infectious diseases [2]. Moreover, where the local population is rapidly declining, the medical institutions that support the local medical system are small and medium-sized hospitals. Nurse managers in small and medium-sized hospitals demonstrate nursing competency across a wide range of administrative and practical management tasks, including planning, organizing, human resource management, directing, and controlling, in a unique environment distinct from large hospitals. Most are experiencing difficulties due to insufficient educational preparation for nursing management competence [3]. According to phenomenological research on nurse managers in small and medium-sized hospitals, they are plagued by a sense of overwhelming responsibility for the entire hospital and feel burdened with the difficulty of nurse recruitment on their own [4]. It has been found that nurse managers in small and medium-sized hospitals need help in personnel management, nursing ethics, customer orientation, information management, and patient safety management [5].For nurse managers in small and medium-sized hospitals to be effective leaders of nursing organizations in specialized healthcare environments, systematic competency improvement programs should be supported. To achieve this, it is necessary to identify the key variables that influence the nursing management competency of nurse managers in small and medium-sized hospitals. Resilience was identified as a core variable [6] [7] [8].

Resilience, also known as adaptability, refers to the ability to actively cope with and minimize the negative impact of unexpected stressors from external stimuli and to respond proactively to the environment with one's overall skills [9]. Resilience transforms negative emotions into an optimistic direction in the face of adversity [9]. Resilience is positively correlated with leading nursing organizational culture in an innovative, relationship-oriented, and task-oriented manner [10]. Additionally, it has been studied to have a positive impact on nursing management competency[6]. However, in existing studies on the resilience of nurse managers in small and medium-sized hospitals, resilience was studied only as a compositional concept, and there were limitations in detailed factor studies. As a result, there have been limitations in examining the relationships between sub-variables

of resilience. Nurse managers in small and medium-sized hospitals face significant job stress when faced with challenges and changes [11]. However, they cope with job stress by seeking harmonious relationships, pursuing challenges and self-development, and caring for themselves [4]. The personal characteristics of nurse managers in small and medium-sized hospitals, such as relationship resilience, coping resilience, and self-care resilience, could be driving forces for positively accepting job stress and demonstrating management competency.

Meanwhile, a significant change after the COVID-19 pandemic is the widespread digitalization of society, and the healthcare sector is also undergoing a full-scale digitalization of medical services based on information technology, driven by the government's initiative to promote the next-generation industry [12]. Central to the rapidly changing medical field, hospitals require information literacy from nurses, the change agents of medical services. [3]. Information literacy refers to individuals' comprehensive ability to cultivate and perceive information needs, locate and evaluate necessary information, and use it effectively [13]. Nurse managers are responsible for adapting nursing paradigms in response to external changes in the social environment and preparing hospital nurses to acquire information literacy ability [14] [15]. According to previous studies, information literacy ability has been identified as a factor that positively influences nurses' self-leadership [14], problem-solving skills [11], evidence-based nursing [16], job satisfaction [14] [17] [23] [24], and nursing performance [11] [17] [18]. According to a study that analyzed 268 medical-related articles through a scoping review, individuals with high information use scores were reported to have high resilience [19]. However, more research is needed to analyze the relationshipbetween resilience and information literacy ability among nurse managers in small and medium-sized hospitals. This study aims to address the limitations of previous research and explore ways to improve the nursing management competency of nurse managers in small and medium-sized hospitals. The structural relationships between resilience and nursing management competency of nurse managers in small and medium-sized hospitals will be established to achieve this.The study will clarify the influence of variables based on information literacy ability in the structural relationships. The study will apply the moderation effects technique of structural equation modeling to achieve the research objectives.Based on the results of this study aim to provide foundational data for developing nursing management intervention programs for nurse managers in small and medium-sized hospitals in the future.

2. Research Methods

Research Model

The model of this study was constructed according to the diagram depicted in Figure 1. The objective was to identify relationships between variables to improve the management competency of Nurse Managers in small and medium-sized hospitals.

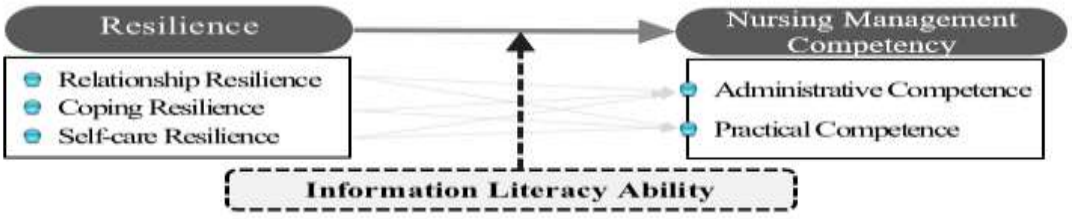

Figure 1. Research model

The nursing management competency of small and medium-sized hospital nurse managers is divided into administrative competence and practical competence and is set as the dependent variable. Resilience is divided into relationship resilience, coping resilience, and self-care resilience and set as independent variables. The information literacy of nurse managers in small and medium-sized hospitals is set as a moderating variable in the relationship between resilience and nursing management competency. Based on the research model, the following levels are established and tested.

Hypothesis 1: The resilience of nurse managers in small and medium-sized hospitals will positively influence their nursing management competency

1.1 Hypothesis: The relationship resilience of nurse managers in small and medium-sized hospitals will positively influence their administrative competence.

1.2 Hypothesis: Nurse managers in small and medium-sized hospitals' coping resilience will positively influence their administrative competence.1.3 Hypothesis: Nurse managers in small and medium-sized hospitals' self-care resilience will positively influence their administrative competence.

1.4 Hypothesis: Nurse managers in small and medium-sized hospitals' relationship resilience will positively influence their practical competence.1.5 Hypothesis: Nurse managers in small and medium-sized hospitals' coping resilience will positively influence their practical competence.

1.6 Hypothesis: Nurse managers in small and medium-sized hospitals' self-care resilience will positively influence their practical competence.

Hypothesis 2: The resilience of nurse managers in small and medium-sized hospitals will influence nursing management competency differently according to information literacy ability

2.1 Hypothesis: The relationship resilience of nurse managers in small and medium-sized hospitals will influence their administrative competence differently according to information literacy ability

2.2 Hypothesis: The coping resilience of nurse managers in small and medium-sized hospitals will influence their administrative competence differently according to information literacy ability

2.3 Hypothesis: The self-care resilience of nurse managers in small and medium-sized hospitals will influence their administrative competence differently according to information literacy ability

2. 4 Hypothesis: The relationship resilience of nurse managers in small and medium-sized hospitals will influence their practical competence differently according to information literacy ability

2.5 Hypothesis: The coping resilience of nurse managers in small and medium-sized hospitals will influence their practical competence differently according to information literacy ability

2.6 Hypothesis: The self-care resilience of nurse managers in small and medium-sized hospitals will influence their practical competence differently according to information literacy ability

Research instruments

Factor analysis was used to select survey items and validate the variables of resilience, nursing management competency, and information literacy ability of nurse managers in small and medium-sized hospitals. Principal component analysis was used to extract the components of all measured variables, and the varimax rotation method was used to simplify the factor loadings. The reliability of the scales used in this study was measured by calculating the reliability coefficient, which indicates the internal consistency of each factor.

Nursing Management Competency

The nursing management competency measurement instrument used in this study is a questionnaire consisting of 38 questions developed by Kim and Kim (2016), based on the performance indicators of the job description developed by Cho (2011) [20]. At the time of development, the questionnaire was

divided into six sections. Still, the validity analysis conducted for this study was divided into two sections and modified and supplemented with 35 questions.

The nursing management competency variables in the subdomains are planning and control, referred to as "administrative competence " variables, and organization, human resource management, and leadership, referred to as "practical competence" variables. The scoring criteria were based on a 5-point Likert scale, where 1 is "not at all", 2 is "poor", 3 is "fair", 4 is "good", and 5 is "very good". Higher scores indicate higher information literacy ability.

At the time of development, the reliability value (Cronbach's alpha) was 0.96. In this study, the reliability value of the nursing management competency instrument (Cronbach's alpha) is 0.938.When examined by subdomains, the reliability value (Cronbach's alpha) for "administrative competence" is 0.941, and for "practical competence" is 0.940.

Resilience

The resilience measure used in this study is the Korean Connor-Davidson Resilience Scale (K-CD-RISC), a 30-item questionnaire developed by Park and Park (2016) for nurses [21]. At the time of development, the questionnaire was divided into five domains. Still, in the validity analysis conducted for this study, resilience was divided into three domains and revised and supplemented with 13 questions.

The resilience subscales were named "'relationship resilience", "coping resilience" and "'self-care resilience". Scoring was based on a 5-point Likert scale, with 1 being "not at all", 2 being "poor", 3 being "fair", 4 being "good", and 5 being "very good". Higher scores indicate greater resilience.

The reliability value (Cronbach's alpha) at the time of instrument development was 0.95, and the reliability value (Cronbach's alpha) of the resilience instrument in this study was 0.937. For each subscale, the reliability value of "relationship resilience" (Cronbach's a) is 0.943, "coping resilience" (Cronbach's a) is 0.945, and "self-care resilience" (Cronbach's a) is 0.948.

Information Literacy Ability

The information literacy ability instrument used in this study is the 'Hospital Nursing Information Literacy Ability Measurement Tool' developed by Jo (2019) [22], a questionnaire consisting of 27 questions. At the time of development, the questionnaire was divided into 7 domains, but in the validity analysis conducted for this study, it was modified and supplemented with a total of 17 questions. The scoring criteria are based on a 5-point Likert scale, where 1 is "not at all", 2 is "poor", 3 is "fair", 4 is "good", and 5 is "very good".

Higher scores indicate higher information literacy ability. This study converted the ordinal scale to a nominal scale based on the mean.The reliability value (Cronbach's alpha) was 0.98 at the time of instrument development, and the reliability value (Cronbach's alpha) of this study's information literacy ability instrument is 0.941

Data Collection

The data collection period was from November 6, 2023, to December 6, 2023. The data collection method targeted nurse managers working in small and medium-sized hospitals with 100 to 300 beds in four cities (G city, M city, S city, L city) with similar urban environments using cluster sampling and simple random sampling methods. The data collection process involved obtaining verbal consent from the chief nurse manager, after which the researcher sent a text message containing a survey link with the research explanation and consent form. Nurse managers who voluntarily agreed to participate accessed the online survey link and completed the questionnaire. The questionnaire was designed to explain the ethical issues and to obtain consent to participate in the research.

The sample size for the study was calculated using the G*Power 3.1.9.7 for Windows program. The minimum number of samples required was calculated to be 200, with an average effect size of 0.15, a

significance level (α) of 0.05, a power of 0.95, and several predictors of 3. However, increasing the sample size to 220 was necessary, given the anticipated dropout rate.Considering the dropout rate of the subjects, a total of 220 individuals were randomly selected to receive the questionnaires. Three of the 210 copies collected were deemed unsuitable for analysis, and 207 copies (98.3% response rate) were finally analyzed.

Data Analysis

The data were analyzed using the R version 4.3.3 for Windows program to test the hypotheses. The specific analysis techniques are as follows:

The general characteristics of the subjects were analyzed using frequency and percentages. Based on general characteristics, differences in nursing management competency, resilience, and information literacy ability were analyzed using independent samples t-test and one-way ANOVA.Post-hoc tests were conducted when significant differences were found among groups in the analysis of variance.

The correlations between the subjects' administrative competence, practical competence, relationship resilience, coping resilience, self-care resilience, and information literacy ability are analyzed using Pearson's correlation coefficient.

Hypotheses were tested using structural equation modeling to verify the moderating effect of information literacy ability on the relationship between resilience and nursing management competence

3. Research Results

Differences in Nursing Management Competency, Information literacy Ability, and Resilience according to General Characteristics

Table 1 presents the findings of an investigation into the differences in the subjects' general characteristics, including religion, marital status, education level, nursing management careers, and clinical experience, and the differences in nursing management competency, information literacy ability, and resilience are as follows: The number of subjects who responded that they did not have religion was 69.6% (114 subjects), which was higher than the number of subjects who responded that they had religion (30.4% (63 subjects)). However, there was no significant difference in nursing management competency, information literacy ability, and resilience scores based on religion ($p>0.05$). Regarding marital status, 75.8% (157 subjects) were married, while 24.2% (50 subjects) were single. Married subjects showed significantly higher scores in nursing management competency, information literacy ability, and resilience than unmarried subjects ($p<.001$). Regarding the level of education, those with a 4-year bachelor's degree were the most (63.8% , 132 subjects), followed by those with a master's degree or higher (29.0%, 60 subjects), and 7.2% (15 subjects) with a 3-year associate's degree. Higher education levels were associated with significantly higher scores in nursing management competency, information literacy ability, and resilience ($p<.001$). The master's group had significantly higher nursing management competency, information literacy ability, and resilience than unmarried subjects ($p<.001$).

Those with less than three years of nurse manager careers were the largest at 58.0% (120 people), followed by those with less than ten years of nurse manager careers at 25.1% (52 people), and those with more than 10 years of nurse manager careers at 16.9% (35 people). The group with more than ten years of nurse manager career had significantly higher scores in nursing management competency, information literacy ability, and resilience ($p<.001$). Most nursing managers (66.7%, 138 subjects) indicated their clinical experience was less than 20 years.This was higher than the percentage of subjects with over 20 years of clinical experience (33.3%, 69 subjects. More clinical experience was associated with significantly higher scores in nursing management competency, information literacy ability, and resilience ($p<.001$).

Table 1. Difference analysis of Nursing Management Competency, Resilience, and Information

Literacy Ability according to General Characteristics

(N=207)

Characteristics		Total	Nursing Management Competency	Resilience	Information Literacy Competency
		N(%)	M±SD	M±SD	M±SD
	207(100.0)		3.73±0.64	4.00±0.59	2.75±0.63
Religion	Not have	144(69.6)	3.74±0.63	3.99±0.55	2.72±0.61
	Have	63(30.4)	3.71±0.67	4.02±0.68	2.83±0.67
	t(*p*)		0.32	0.46	1.19
Marital Status	Single	50(24.2)	3.17±0.45	3.23±0.28	2.12±0.37
	Married	157(75.8)	3.91±0.59	4.24±0.43	2.96±0.56
	t(*p*)		8.26***	15.56***	9.95***
Education Level	3-yr diploma	15(7.2)	2.83±0.48	3.29±0.47	1.71±0.35
	4-yr bachelor	132(63.8)	3.57±0.50	3.84±0.48	2.54±0.39
	≥master's	60(29.0)	4.33±0.43	4.52±0.05	3.47±0.34
	F(*p*)		86.9***	65.6***	212.6***
Nursing manager careers	<3years	120(58.0)	3.31±0.43	3.71±0.51	2.39±0.48
	3 ~ 9years	52(25.1)	4.06±0.15	4.27±0.41	3.10±0.36
	≥10years	35(16.9)	4.71±0.17	4.58±0.44	3.11±0.45
	F(*p*)		86.90***	65.60***	112.60***
Clinical Experience	〈20years	138(66.7)	3.48±0.46	3.85±0.57	2.58±0.55
	≧20years	69(33.3)	4.23±0.65	4.29±0.53	3.10±0.64
	t(*p*)		412.10***	57.20***	99.00***

M(Mean) SD(Standard Deviation), ***p<.001

Correlation Analysis of Nursing Management Competency, Resilience, and Information Literacy Ability

Nursing Management Competency, Resilience, Relationship Resilience, Coping Resilience, Self-Care Resilience, Information Literacy Ability variables were found to have statistically significant positive correlations with the dependent variable, as shown in Table 2. Sub-areas of nursing management competency, such as practical competence, demonstrated high correlations with administrative competence (r=.89, p<.001), information literacy ability (r=.76, p<.001), relationship resilience (r=.65, p<.001), coping resilience (r=.54, p<.001), and self-care resilience (r=.56, p<.001). Administrative competence showed high correlations with information literacy ability (r=.77, p<.001), relationship resilience (r=.61, p<.001), coping resilience (r=.57, p<.001), and self-care resilience (r=.52, p<.001). Information literacy ability demonstrated high correlations with relationship resilience (r=.64, p<.001), coping resilience (r=.72, p<.001), and self-care resilience (r=.57, p<.001). Relationship resilience showed high correlations with coping resilience (r=.68, p<.001) and self-care resilience (r=.77, p<.001). Coping resilience had a high correlation with relationship resilience (r=.68, p<.001).

Table 2. Correlation among Nursing Management Competency, Resilience, Information Literacy Competency

Construct	Relationship Resilience	Coping Resilience	Self-care Resilience	Information Literacy Ability	Administrative Competence	Practical Competence
Relationship Resilience	1					
Coping	.68***	1				

Resilience						
Self-care Resilience	.67***	.71***	1			
Information Literacy Ability	.64***	.72***	.57***	1		
Administrative Competence	.61***	.57***	.52***	.77***	1	
Practical Competence	.65***	.54***	.56***	.76***	.89***	1
*** $p \leq .001$						

Hypothesis 1 Testing

The results of the model fit test for testing Hypothesis 1 are presented in Table 3. In the model fit assessment, the chi-square value was 2675.579 with 979 degrees of freedom, and the p-value was 0.000, indicating a significant fit. Various goodness-of-fit indices such as the Goodness-of-Fit Index (GFI), Normed Fit Index (NFI), Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and Adjusted Goodness-of-Fit Index (AGFI) all approached 1, indicating a good fit. The Root Mean Square Residual (RMR) value was 0.033, less than 0.05, and the Root Mean Square Error of Approximation (RMSEA) value was 0.071, less than 0.08.

Table 3. Model Fit Testing

	Absolute					Incremental			Parsimony
	$\chi^2(p)$	df	GFI	RMSEA	RMR	NFI	IFI	CFI	AGFI
Fit Index	2675.579(.000)	979	.902	.071	.033	.926	.918	.917	.914
Optimal Criterion	-	-	≥0.9	≤.08	≤.05	≥.9			≥.9
df (Degrees of Freedom) GFI (Goodness-of-Fit Index) RMSEA (Root Mean Square Error of Approximation) RMR (Root Mean Square Residual) NFI (Normed Fit Index), IFI (Incremental Fit Index), CFI (Comparative Fit Index), AGFI (Adjusted Goodness-of-Fit Index)									

Hypothesis 1 (The resilience of nurse managers in small and medium-sized hospitals will positively influence their nursing management competency) was tested through six sub-hypotheses, as shown in Table 4.

Hypothesis 1.1 (The relationship resilience of nurse managers in small and medium-sized hospitals will positively influence their administrative competence) was supported. The relationship resilience of nurse managers in small and medium-sized hospitals was found to have a significant positive impact on administrative management competency (standardized coefficient=0.386, z=3.264, p=0.001).

Hypothesis 1.2 (The coping resilience of nurse managers in small and medium-sized hospitals will positively influence their administrative competence) was supported. The coping resilience of nurse managers in small and medium-sized hospitals was found to have a significant positive impact on administrative management competency (standardized coefficient=0.295, z=2.235, p=0.025).

Hypothesis 1.3 (The self-care resilience of nurse managers in small and medium-sized hospitals will positively influence their administrative competence) was rejected. Self-care resilience of nurse managers in small and medium-sized hospitals did not show a significant impact on administrative management competency (standardized coefficient=0.032, z=0.292, p=0.771).

Hypothesis 1.4 (relationship resilience of nurse managers in small and medium-sized hospitals will positively influence their practical competence) was supported. The relationship resilience of nurse managers in small and medium-sized hospitals was found to have a significant positive impact on practical management competency (standardized coefficient=0.506, z=4.135, p=0.000).

Hypothesis 1.5 (coping resilience of nurse managers in small and medium-sized hospitals will positively influence their practical competence) was rejected. Coping resilience of nurse managers in small and medium-sized hospitals did not show a significant impact on practical management competency (standardized coefficient=0.086, z=0.662, p=0.508).

Hypothesis 1.6 (self-care resilience of nurse managers in small and medium-sized hospitals will positively influence their practical competence) was rejected. Self-care resilience of nurse managers in

small and medium-sized hospitals did not show a significant impact on practical management competency (standardized coefficient=0.125, z=1.145, p=0.252).

Table 4. Results of Testing Hypothesis 1

Path	Coefficients		Standard error	z-value	*p*	Result
	Non-standardized	Standardized				
H 1.1 Relationship Resilience →Administrative competence	.526	.386	.161	3.264	.001 ¨	Supported
H 1.2 Coping Resilience →Administrative competence	.339	.295	.151	2.235	.025 ˙	Supported
H 1.3 Self-care Resilience → Administrative competence	.032	.032	.109	0.292	.771	Not Supported
H 1.4 Relationship Resilience → Practical competence	.582	.506	.141	4.135	.000 ¨	Supported
H 1.5 Coping Resilience → Practical competence	.083	.086	.125	0.662	.508	Not Supported
H 1.6 Self-care Resilience → Practical competence	.104	.125	.091	1.145	.252	Not Supported
˙$p \leq 0.05$, ¨$p \leq 0.01$						

Validation of Hypothesis 1 shows that the resilience of nurse managers in small and medium-sized hospitals partially influences their nursing management competency [Figure 2]. It can be observed that the resilience of nurse managers in small and medium-sized hospitals affects administrative competence through its relationship with nursing management competency. Relationship resilience and coping resilience impact administrative competence. Particularly, Relationship Resilience significantly influences administrative competence.

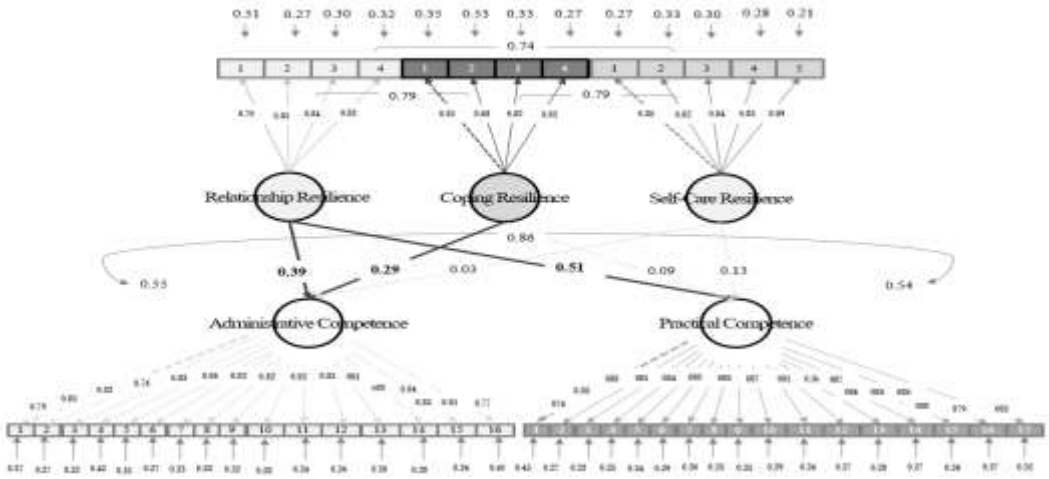

Figure 2. Visualization of hypotheses testing

Hypothesis 2 Testing

Model Fit for Testing Moderation Effects in Research Model

The results of the model fit validation for Hypothesis 2 are shown in Table 5. To verify the effect of information literacy ability as a moderating variable, the unconstrained model was set as the research model, and the constrained model restricted the measurement variables for comparison and analysis of the fit of the two models. The fit indices for the research model show that the chi-square value for the unconstrained model is 4988.8 with 1958 degrees of freedom and a p-value of 0.000. The chi-square value for the constrained model is 5045.1 with 1999 degrees of freedom and a p-value of 0.000. Other fit indices, such as the Goodness of Fit Index, Normed Fit Index, Incremental Fit Index, Tucker-Lewis Index, Comparative Fit Index, and Adjusted Goodness of Fit Index, are all close to 1. The Root Mean Square Residual values of 0.044 and 0.039 are less than 0.005, and the Root Mean Square Error of Approximation values of 0.078 and 0.079 are less than 0.08. The difference in chi-square values between the unconstrained and constrained models is 56.329, with a p-value of 0.05. Therefore, it can

be concluded that Information literacy ability has a moderating effect.

Table 5. Model Fit for Testing Moderation Effects in Research Model

Model	Absolute					Incremental			Parsimony
	χ^2 (p)	df	GFI	RMSEA	RMR	NFI	IFI	CFI	AGFI
Unconstrained	4988.8(.000)	1958	.918	.079	.039	.918	.911	.918	.925
Constrained	5045.1(.000)	1999	.914	.078	.044	.912	.908	.916	.913
Difference(Δ)	56.329(.05)	-	.004			.006	.003	.002	.012

df (Degrees of Freedom) GFI (Goodness-of-Fit Index) RMSEA (Root Mean Square Error of Approximation) RMR (Root Mean Square Residual) NFI (Normed Fit Index), IFI (Incremental Fit Index), CFI (Comparative Fit Index), AGFI (Adjusted Goodness-of-Fit Index)

Moderating Effect of Information Literacy Ability in Unconstrained Model

Hypothesis 2 (The relationship resilience of nurse managers in small and medium-sized hospitals will influence their nursing management competency differently according to information literacy ability) is tested through six sub-hypotheses using the unconstrained model [Table 6]. The hypothesis 2 was partially verified by testing it with an unconstrained model.

2.1 Hypothesis (the relationship resilience of nurse managers in small and medium-sized hospitals will influence their administrative competence differently according to information literacy ability) was accepted. There was a significant difference between the group with high information literacy ability (path coefficient=0.962, z=2.973, p=0.003, standardized coefficient=0.739) and the group with low information literacy ability (path coefficient=0.349, z=1.836, p=0.066, standardized coefficient=0.277) in terms of the relationship between relationship resilience and administrative competence. Therefore, relationship resilience has a greater impact on administrative competence in groups with high information literacy ability.

2.2 Hypothesis (the coping resilience of nurse managers in small and medium-sized hospitals will influence their administrative competence differently according to information literacy ability) was rejected. There was no significant difference between the group with high information literacy ability (path coefficient=0.300, z=0.848, p=0.396, standardized coefficient=0.219) and the group with low information literacy ability (path coefficient=0.242, z=1.403, p=0.161, standardized coefficient=0.255) in terms of the relationship between coping resilience and Administrative competence. Therefore, the influence of information literacy ability on the relationship between coping resilience and administrative competence is not significant. 2.3 Hypothesis (the self-care resilience of nurse managers in in small and medium-sized hospitals will influence their administrative competence differently according to information literacy ability) was rejected. There was no significant difference between the group with high information literacy ability (path coefficient=0.106, z=0.665, p=0.506, standardized coefficient=0.105) and the group with low information literacy ability (path coefficient=0.013, z=0.104, p=0.917, standardized coefficient=0.017) in terms of the relationship between self-care resilience and administrative competence. Therefore, the influence of information literacy ability on the relationship between self-care resilience and administrative competence is not significant.

2.4 Hypothesis (the relationship resilience of nurse managers in small and medium-sized hospitals will influence their practical competence differently according to information literacy ability) was accepted. There was a significant difference between the group with high information literacy ability (path coefficient=0.685, z=2.623, p=0.009, standardized coefficient=0.617) and the group with low information literacy ability (path coefficient=0.536, z=2.693, p=0.07, standardized coefficient= 0.443) in terms of the relationship between relationship resilience and practical competence. Therefore, relationship resilience has a greater impact on practical competence in groups with high information literacy ability.

2.5 Hypothesis (the coping resilience of nurse managers in small and medium-sized hospitals will

influence their practical competence differently according to information literacy ability) was rejected. There was no significant difference between the group with high information literacy ability (path coefficient=0.203, z=0.702, p=0.482, standardized coefficient=0.174) and the group with low information literacy ability (path coefficient=0.034, z=0.209, p=0.834, standardized coefficient=0.037) in terms of the relationship between coping resilience and practical competence. Therefore, the influence of information literacy ability on the relationship between coping resilience and practical competence is not significant.

2.6 Hypothesis (the self-care resilience of nurse managers in small and medium-sized hospitals will influence their practical competence differently according to information literacy ability) was rejected. There was no significant difference between the group with high information literacy ability (path coefficient=0.200, z=1.507, p=0.132, standardized coefficient=0.233) and the group with low information literacy ability (path coefficient=0.081, z=0.686, p=0.493, standardized coefficient=0.114) in terms of the relationship between self-care resilience and practical competence. Therefore, the influence of information literacy ability on the relationship between self-care resilience and practical competence is not significant. In conclusion, it is verified that nurse managers in small and medium-sized hospitals' relationship resilience significantly influences their administrative and practical competencies according to their information literacy ability.

Table 6. Moderating Effect of Information Literacy Ability in Unconstrained Model

Hypotheses	Unconstrained Model								
	Path coefficient		z-value		*p*		Standardized coefficient		Result
	High	Low	High	Low	High	Low	High	Low	
H 2.1 Relationship Resilience → Administrative Competence	.962	.349	2.973	1.836	.003**	.066	.739	.277	Supporting
H 2.2 Coping resilience → Administrative Competence	.300	.242	.848	1.403	.396	.161	.219	.255	Rejecting
H 2.3 Self-care Resilience → Administrative Competence	.106	.013	.665	.104	.506	.917	.105	.017	Rejecting
H 2.4 Relationship Resilience → Practical Competence	.685	.536	2.623	2.693	.009**	.07*	.617	.443	Supporting
H 2.5 Coping Resilience → Practical Competence	.203	.034	.702	.209	.482	.834	.174	.037	Rejecting
H 2.6 Self-care Resilience → Practical Competence	.200	.081	1.507	.686	.132	.493	.233	.114	Rejecting
*$p \leq 0.05$, **$p \leq 0.01$									

Moderating Effect of Information Literacy Ability in Constrained Model

Hypothesis 2 (The resilience of small hospital nurse managers will have different effects on nursing management competency depending on the level of information literacy ability) is tested through six sub-hypotheses using the constrained model [Table 7]. Hypothesis 2 was partially verified by testing it with a constrained model.These findings are by the results of both the unconstrained and constrained model validations. The hypotheses 2.1 (The relationship adaptability of small hospital nurse managers will have different effects on nursing management competency depending on the level information literacy ability) and 2.4 (The relationship adaptability of small hospital nurse managers will have different effects on Nursing Management Competency depending on the level of information literacy ability) were both accepted. Significant differences were found between the group with high information literacy ability (path coefficient=0.963, z=2.952, p=0.003, standardized coefficient=0.738) and the group with low information literacy ability (path coefficient=0.307, z=1.758, p=0.079, standardized coefficient=0.267) in terms of the relationship between resilience and nursing management competency among small medium sized hospital nurse managers. Similarly, significant

differences were found between the group with high information literacy ability (path coefficient=0.692, z=2.591, p=0.010, standardized coefficient=0.619) and the group with low information literacy ability (path coefficient=0.484, z=2.888, p=0.004, standardized coefficient=0.447) in terms of the relationship between relationship resilience and nursing management competency.

Therefore, it can be seen that relationship resilience has a greater impact on nursing management competency in groups with high information literacy ability.Hypotheses 2.2, 2.3, 2.5, and 2.6 were rejected as there were no significant differences in the influence between the group with high information literacy ability and the group with low information literacy ability. The verification of hypothesis 2 using both the unconstrained and constrained models revealed that the relationship resilience of small medium sized hospital nurse managers has partially different effects on the nursing management competency depending on the level of information literacy ability. The relationship resilience of small hospital nurse managers has different effects on nursing management competency and practical competence depending on the level of the information literacy ability. In particular, it can be observed that relationship resilience exerts the most pronounced influence on nursing management competency when the information literacy ability is high.

Table 7. Moderating Effect of Information Literacy Ability in Unconstrained Model

Hypotheses	Constrained Model								
	Path coefficient		z-value		*p*		Standardized coefficient		Result
	High	Low	High	Low	High	Low	High	Low	
H 2.1 Relationship Resilience → Administrative Competence	.963	.307	2.952	1.758	.003**	.079	.738	.267	Supporting
H 2.2 Coping Resilience → Administrative Competence	.280	.286	0.833	1.495	.405	.135	.221	.245	Rejecting
H 2.3 Self-care Resilience → Administrative Competence	.099	.013	0.731	0.087	.465	.931	.103	.014	Rejecting
H 2.4 Relationship Resilience → Practical Competence	.692	.484	2.591	2.888	.010**	.004**	.619	.447	Supporting
H 2.5 Coping Resilience → Practical Competence	.196	.030	1.75	0.171	.481	.864	.154	.028	Rejecting
H 2.6 Self-care Resilience → Practical Competence	.181	.096	1.588	0.720	.112	.471	.221	.105	Rejecting
*$p \leq 0.05$, **$p \leq 0.01$									

Difference Analysis between Unconstrained Model and Constrained Model

The unconstrained research model was established as the baseline model, and the constrained model constrained the measurement variables. The results of hypothesis testing between the two models were then compared and analyzed. The analysis of the difference between the unconstrained and constrained models based on the impact of relationship resilience on nursing management competency depending on the level of information literacy ability is shown in [Table 8]. In the constrained model, it was found that relationship resilience has different effects on administrative competence based on the level of information literacy ability, and there was a significant difference between the unconstrained model and the constrained model (Unconstrained χ^2=923.99, Constrained χ^2=959.87, $\triangle\chi^2$=35.8, p=0.007). The level of information literacy ability is considered crucial in the relationship between relationship resilience and administrative competence. In the constrained model, the impact of coping resilience on administrative competence based on the level of information literacy ability was not different. Still, there was a significant difference between the unconstrained and the constrained models

(Unconstrained χ^2=907.56, Constrained χ^2=938.20, $\triangle\chi^2$=30.6, p=0.031). In the constrained model, the impact of self-care resilience on administrative competence based on the level of information literacy ability was not different. Still, there was a significant difference between the unconstrained model and the constrained model (Unconstrained χ^2=946.59, Constrained χ^2=982.29, $\triangle\chi^2$=35.6, p=0.011). In the constrained model, the impact of relationship resilience on practical competence based on the level of information literacy ability was not different, and there was no significant difference between the unconstrained model and the constrained model (Unconstrained χ^2=1031.0, Constrained χ^2=1059.1, $\triangle\chi^2$=28.16, p=0.080). Similarly, in the constrained model, the impact of coping resilience on practical competence based on the level of information literacy ability was not different, and there was no significant difference between the unconstrained model and the constrained model (Unconstrained χ^2=1000.4, Constrained χ^2=1024.1, $\triangle\chi^2$=23.72, p=0.206). Furthermore, in the constrained model, the impact of self-care resilience on practical competence based on the level of information literacy ability was not different, and there was no significant difference between the unconstrained model and the constrained model (Unconstrained χ^2=1098.7, Constrained χ^2=1126.7, $\triangle\chi^2$=28.05, p=0.108).

Table 8. Difference Analysis between Unconstrained and Constrained model

Hypotheses	**Difference between Unconstrained/Constrained Model**			**Result**
	χ^2	$\triangle\chi^2$	*p*	
H 2.1 Relationship Resilience → Administrative Competence	923.99/959.87	35.8	.007**	Difference
H 2.2 Coping Resilience → Administrative Competence	907.56/938.20	30.6	.031*	Difference
H 2.3 Self-care Resilience → Administrative Competence	946.59/982.29	35.6	.011*	Difference
H 2.4 Relationship Resilience → Practical Competence	1031.0/1059.1	28.16	.080	Similarity
H 2.5 Coping Resilience → Practical Competence	1000.4/1024.1	23.72	.206	Similarity
H 2.6 Self-care Resilience → Practical Competence	1098.7/1126.7	28.05	.108	Similarity
$^{*}p \leq .05$, $^{**}p \leq .01$				

Implications And Conclusion

This study utilized structural equation modeling with the R version 4.3.3 for Windows program to analyze hypothesis testing and moderation effects on the impact of resilience on nursing management competency based on the level of Information Literacy Ability among 207 nurse managers in small and medium-sized hospitals.

The main research findings of this study are as follows. Hypothesis 1 (The resilience of nurse managers in small and medium-sized hospitals will positively influence Nursing Management Competency) was partially supported. Hypothesis 2 (The resilience of nurse managers in small and medium-sized hospitals will have different effects on Nursing Management Competency based on the level of Information Literacy Ability) was partially supported. This study aims to compare the results with previous studies and provide implications for future research.

Firstly, a comparison is made between the results of this study and those of previous studies that examined the resilience and nursing management competency levels of nurse managers in small and medium-sized hospitals. The resilience score of nurse managers in small and medium-sized hospitals was 4.11 out of 5 in the previous study [6], while the nursing management competency score was 3.92 out of 5. In this study, the resilience score of nurse managers in small and medium-sized hospitals was 4.00 out of 5, while the nursing management competency score was somewhat low at 3.73 out of 5. The resilience according to general characteristics was found to be higher in the group under 45 than in the group over 46. However, education, religion, clinical experience, and nursing management careers were not statistically confirmed [6]. The nursing management competency was found to be statistically significantly higher in the group aged 46 or older and those with a master's degree or higher[6].

In this study, the statistical analysis revealed that nursing management competency was significantly higher in the group aged 46 or older and those with a master's degree or higher. Both resilience and nursing management competency were significantly higher in the married group, the group with a master's degree or higher, the group with many nurse managers careers, and the group with a lot of clinical experience. The observed differences in resilience and nursing management competency according to general characteristics can be attributed to the design of this study, which employed cluster sampling and simple random sampling methods to collect data, taking into account gender and regional environment to control exogenous variables. This approach is understandable and justifies the need for further research to ascertain the specific requirements of nurse managers in small and medium-sized hospitals.

Secondly, in previous research, resilience, an independent variable, was divided into five sub-variables [6]. In this study, resilience was revealed into three sub-variables through factor analysis. The sub-variable of "relationship resilience" from previous studies is the same as the sub-variable of this study. The sub-variables of "situational resilience" and "expert resilience" from previous studies were grouped and named "coping resilience" in this study.

The findings of previous studies on the concepts of "philosophical resilience " and "temperament resilience" align with the results of this study on the concept of "self-care resilience." In a previous study, it was demonstrated that resilience has a significant impact on nursing management competency. However, the sub-variables contributing to this impact still need to be verified [6]. This study sought to verify the impact of the sub-variables of resilience on nursing management competency. The results indicated that the effect of ‘relationship resilience’ on nursing management competency was the most significant.

The results of this study permit the inference that relationship resilience is of great importance for nurse managers in small and medium-sized hospitals. This is evidenced by comparison with previous studies. A phenomenological study on the job experiences of nurse managers in small and medium-sized hospitals [4] revealed that nurse managers endure many hardships and face difficulties coordinating opinions that arise within various human relationships. Nurse managers must navigate numerous challenges in coordinating diverse perspectives and opinions across various human relationships, including those with patients, doctors, guardians, nurses, and nursing assistants. In contrast to large hospitals, nurse managers’work in small and medium-sized hospitals is not subdivided. In contrast to large hospitals, the role of nurse managers in small and medium-sized hospitals needs to be categorized.. Consequently, nurse managers must possess the capacity to adapt their interpersonal relationships to foster amicable interactions with a diverse range of stakeholders, including nurses, hospital administrators, and other departments.

In contrast to large hospitals, nurses frequently change jobs in small and medium-sized hospitals, necessitating nurse managers to employ strategies to retain nursing staff.These strategies include interviewing and encouraging nurses. For the management to maintain a continuous interest in the nursing department, the nursing department must regularly repor on its activities and strive to maintain a positive interpersonal relationship with the management. Nurse managers at small and medium-sized hospitals endeavor to resolve conflicts between various occupational groups amicably and to minimize friction with other departments.Consequently, it was determined that it is a pressing issue to recognize the significance of relationship adaptation flexibility and to identify strategies for enhancing interpersonal relationships.

Third, in the preceding study that measured nurses' information literacy ability, the range was from a maximum of 3.39 points [11] to a minimum of 2.89 points [15]. In this study, the information literacy ability of nurse managers in small and medium-sized hospitals, measured 2.75 points, was lower than that of nurses. Since this study measured the information literacy ability of nurse managers in small and medium-sized hospitals in some regions, there are limitations in generalizing that the information literacy ability of nurse managers in small and medium-sized hospitals in South Korea is lower than

that of nurses. Further studies are recommended on the impact of information literacy ability on the relationship between information flexibility and nursing management skills among nurse managers in the metropolitan region.

4. Conclusion

The study has verified that nurse managers' high information literacy ability in small and medium-sized hospitals positively influences resilience, leading to an increase in administrative and practical competency. This study first clarifies the structural relationship between resilience and nursing management skills in nurse managers in small and medium-sized hospitals. Another important aspect is demonstrating the moderating effect of information literacy ability in the relationship between resilience and nursing management skills. The results of this study can be utilized as an effective strategy for developing educational programs for nurse managers in small and medium-sized hospitals who encounter difficulties in interpersonal relationships. Providing interpersonal relationship training and information literacy education together in developing management capacity enhancement programs for nurse managers in small and medium-sized hospitals can enhance the effectiveness of education in the future.

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