

Impact of Job Rotation Stress on Nursing Work Performance among Clinical Nurses: Mediating Effects of Job Embeddedness and Moderated Mediating Effects of Resilience

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Purpose: This study investigated the effects of job embeddedness and resilience on the relationship between job rotation stress and nursing work performance among clinical nurses. **Methods:** We conducted a nationwide online survey with 205 nurses employed at advanced general or general hospitals. Data were collected from August 17 to October 5, 2021. We analyzed the data using various descriptive statistics, independent t-tests, one-way analysis of variance, Scheffé test, Welch test, Games-Howell test, Pearson's correlation coefficients, multiple regression, and the PROCESS macro with a 95% bias-corrected bootstrap confidence interval. These analyses were conducted using SPSS Windows Software version 23.0 and SPSS PROCESS macro version 3.5.2. **Results:** Nurses' job embeddedness mediated the relationship between job rotation stress and nursing work performance ($B=-0.02$, $p<.05$). Furthermore, their resilience moderated this mediated relationship, also known as moderated mediation, with job embeddedness as the mediating factor ($B=-0.02$, $p<.05$). **Conclusion:** These findings imply that, when devising a strategy to improve the nursing work performance of nurses undergoing job rotation, their resilience levels should be considered. Reducing job rotation stress while concurrently enhancing job embeddedness is essential for enhancing the nursing work performance of nurses with high levels of resilience.

Key Words: Occupational stress; Work performance; Resilience; Psychological; Nurses; Mediation analysis

INTRODUCTION

1. Rationale for the Study

As the largest professional group in healthcare facilities [1], nurses play the most direct and interactive role with healthcare service recipients and are considered crucial human resources for enhancing healthcare service quality [2]. Job rotation involves changing one's job without involving a promotion or pay adjustment by transferring to another job position or department [3,4]. Hospitals implement job rotation as a human resource management strategy to prevent employees from experiencing boredom

from monotonous routine work, enhance nurses' professional knowledge, and promote career development by offering diverse job experiences [5,6].

The various effects of job rotation when used as a job design method need to be verified at the organizational level. Previous studies in Korea and abroad on other professions have indicated that job rotation improves employee performance through various pathways [5,6] and has positive effects on organizational effectiveness, such as increased job satisfaction and reduced turnover intention [7]. However, contrary to the primary purpose of job rotation, nurses experience stress until they become accustomed to their new tasks, referred to as job rotation

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stress [8]. Job rotation stress leads to problems such as decreased nursing proficiency and expertise among experienced nurses and reduced work efficiency and competency in a new department [9,10]. These issues can serve as triggers for experienced nurses to consider searching for another job or resigning [10]. Thus, job rotation is a job stressor [9] with adverse effects on job engagement, a multidimensional motive for work [11], job satisfaction [12], and psychological well-being [13].

The concept of job embeddedness, which focuses on employee retention at an organization, has been attracting growing interest in the context of measures for nursing staff management [14]. Job embeddedness refers to the extensive and comprehensive network that influences individuals to remain with their current organization. Turnover decreases with increasing levels of connection that an organizational member has within this network, network harmony, compatibility, and magnitude of sacrifices linked to leaving the organization [15]. From the perspective of nursing staff management, increasing job embeddedness among nurses is crucial as it promotes nurses' intentions to continue working at the same hospital for extended periods, and prolonged tenure ensures the retention of skilled personnel, secures continuity in nursing care, and enhances a hospital's long-term competitiveness [14]. Job embeddedness among nurses is reportedly influenced by job stress [16]. In a study on non-nursing occupations, job rotation moderated the relationship between protean career orientation and job embeddedness, thereby affecting their job embeddedness [17]. Therefore, job rotation stress may have an impact on job embeddedness.

Furthermore, job embeddedness has been found to be significantly correlated with [18] or significantly predict nursing work performance [19,20]. Nursing work performance reflects how effectively nurses perform their responsibilities and roles related to patient care and represents the degree of successful clinical performance among nurses [21]. Nursing work performance has been extensively studied in recent years as an index of nursing productivity, the output of nursing, in Korea. A meta-analysis on nursing work performance among hospital nurses in Korea [22] reported that it has significant correlations with job stress and resilience. However, previous studies have reported contradictory findings regarding the direction of the relationship between nursing work performance and job stress, as some reported a positive correlation [23-25], whereas others reported a negative correlation [26-28]. Although no studies have directly investigated the relationship between job rotation or job rotation stress and nursing work performance, we can predict this relation-

ship based on previous findings on the relationship between job stress and nursing work performance.

Resilience refers to individual psychological and social characteristics that enable people to adapt and grow in the face of adversity [29]. Interest in resilience is mounting, particularly in its capacity as a source for overcoming adversity [30]. Individuals with high resilience exhibit a proactive and optimistic attitude when coping with stress and often demonstrate improved abilities after overcoming stress. In contrast, those with low resilience may experience a decline in their coping abilities and capabilities in response to stress, underscoring the importance of resilience in stress management [31]. According to a meta-analysis on resilience among Korean nurses [30], resilience showed a significant association with job-related variables such as job stress and nursing job performance. Additionally, previous studies have identified resilience as a moderating factor that reduces job stress [32,33]. Furthermore, resilience has been found to have significant correlations with job embeddedness [34,35] nursing job performance [36-38] or to be a significant predictor of these variables.

Although previous studies have examined the relationships between job rotation stress, job embeddedness, nursing work performance, and resilience separately, none have comprehensively reviewed the relationships between all four variables at once among nurses. Furthermore, as stated above, previous studies have reported inconsistent findings on the size or significance of these relationships, highlighting the need to identify the moderating factors that contribute to such discrepancies.

Against this backdrop, this study investigated the effects of job embeddedness and resilience on the relationship between job rotation stress and nursing work performance among nurses who have experienced job rotation, with the aim of ultimately presenting foundational data for efficient human resources management.

2. Aims

The specific objectives of this study are as follows: first, investigate the levels of job rotation stress, nursing work performance, job embeddedness, and resilience among nurses; second, examine the differences in nursing work performance according to nurses' general characteristics; third, analyze the correlations between job rotation stress, nursing work performance, job embeddedness, and resilience among nurses; fourth, identify the mediating effect of job embeddedness on the relationship between job rotation stress and nursing work performance; fifth, identify the moderating effect of resilience on the relationship be-

tween job rotation stress, embeddedness, and nursing work performance; and sixth, examine the moderated mediating effect of resilience on the relationship between job rotation stress and nursing work performance as mediated by job embeddedness.

METHODS

1. Study Design

This was a cross-sectional survey study.

2. Study Participants

The target population was nurses currently working at a advanced general or general hospital in Korea who have experienced job rotation within the past six months. Of that group, nurses who could access an online survey and met the eligibility criteria were selected using convenience sampling. The inclusion criteria were as follows: 1) currently working as a nurse at a advanced general or general hospital in Korea, 2) experience with job rotation in the past six months, 3) clinical career ≥ 1 year before job rotation, 4) work on an inpatient floor (general ward, ICU), and 5) voluntary signing of informed consent to participate in the online survey. The exclusion criteria were as follows: 1) nurses working in outpatient clinics or administrative departments and 2) non-staff nurses (e.g., nurse managers).

This study selected nurses who had experienced job rotation within the past six months because nurses who have undergone job rotation typically require 3~6 months to adjust to a new department [11]. Additionally, the reason for targeting nurses with a minimum clinical career of one year before their recent job rotation is that it takes approximately 8~12 months for new graduate nurses to overcome the reality shock to develop and fulfill their roles [39]; thus, the intention was to exclude individuals who had recently experienced a combination of both adaptation stress as new graduate nurses and job rotation stress. Furthermore, we excluded nurses working in outpatient or administrative departments and those in positions higher than staff nurses, such as nurse managers, because nursing work performance measures nurses' patient care competencies and application of the nursing process [21].

The sample size was determined using G*Power 3.1.9.7 [40] software. For multiple regressions with a significance level (α) of .05, power ($1-\beta$) of .90, medium effect size of .15, and 22 independent variables (i.e., age, sex, marital status, religion, education level, total nursing career, clinical

career at current hospital, current work unit, clinical career at current unit, previous work unit, clinical career at previous unit, job position, employment type, shift pattern, number of job rotations experienced, salary, nursing management fee, hospital type, hospital location, job rotation stress, job embeddedness, and resilience), the minimum sample size was calculated to be 198. To account for a 10% no-response rate, a total of 220 nurses were recruited. Given the lack of studies investigating the relationship between job rotation stress and nursing work performance, a medium effect size was used with reference to a previous study analyzing the relationship between job stress and nursing work performance. A previous study [23] found a correlation coefficient of .16 for job stress and nursing work performance, and a meta-analysis on the factors associated with nursing work performance [22] found an effect size of .17 for this correlation. Thus, we used a medium effect size for determining the sample size.

3. Study Instruments

The study instruments consisted of surveys on job rotation stress, job embeddedness, nursing work performance, resilience, and participants' general characteristics. Data were collected using a structured questionnaire. We obtained permission in advance to use each instrument from the developer and adapter via e-mail.

1) Job rotation stress

We used the Nursing Job Rotation Stress Scale developed by Huang et al. [8] and adapted into Korean by Shin and Yoo [11]. It comprises ten items in total, with four items for emotional response, three items for communication, and three items for daily life. Each item is rated on a five-point Likert scale ranging from 1~5, and higher scores indicate higher job rotation stress. Cronbach's α was .90 at the time of study development by Huang et al. [8], .92 in Shin and Yoo [11], and .88 in this study.

2) Job embeddedness

We used the tool developed by Mitchell et al. [15], verified (16 items for organization domain) for construct validity for use in Korean hospital organizations by Kim [41], and validated for use with general hospital nurses by Cho [42]. It contains 16 items, with seven items for fit, three items for link, and six items for sacrifice. Each item is rated on a five-point Likert scale ranging from 1~5, and higher scores indicate higher job embeddedness. The α was .87 at the time of development by Mitchell et al. [15], .90 in

Cho [42], and .89 in this study.

3) Nursing work performance

We used the nursing work performance scale developed by Ko et al. [21]. It contains 17 items, with seven items for competency, four items for attitude, three items for willingness of nursing process, and three items for application of nursing process. Each item is rated on a four-point Likert scale ranging from 1~4, and higher scores indicate higher nursing work performance. Cronbach's α was .92 at the time of development in Ko et al. [21], and .88 in this study.

4) Resilience

We used the Connor-Davidson Resilience Scale developed by Connor and Davidson [29] and adapted into Korean by Baek et al. [43]. It contains 25 items across five subscales, including eight items for hardiness, seven items for persistence, five items for optimism, three items for support, and two items for spirituality. Each item is rated on a five-point Likert scale ranging from 0~4, and higher scores indicate higher resilience. Cronbach's α was .89 at the time of development by Connor and Davidson [29], .93 in Baek et al. [43], and .93 in this study.

5) Survey of general characteristics

General characteristics included five items for demographic factors (age, sex, marital status, religion, education level), 11 items for job-related characteristics (total nursing career, clinical career at current hospital, current work unit, clinical career at current unit, previous work unit, clinical career at previous unit, job position, employment type, shift pattern, number of job rotations experienced, salary), three items for organization-related characteristics (nursing management fee, hospital type, hospital location), and two items asking about the need for job rotation and appropriate job rotation cycle.

4. Data Collection

A self-report online questionnaire was used to collect data from August 17 to October 5, 2021. Recruitment announcements were posted on nursing-related online communities frequented by nurses. The snowball method was used for multiplicity sampling. Recruitment announcements specified the purpose of the study and eligibility criteria, and data were collected from nurses who voluntarily consented to participate. Nurses who wished to participate accessed the study questionnaire via an embedded QR code or online survey link. To enhance the com-

pleteness of survey responses and increase the response rate, a token of appreciation was provided to online survey participants. As a result, a total of 220 questionnaires were collected. After excluding 15 questionnaires for having insufficient responses (dropout rate: 6.8%), 205 questionnaires were retained for the final data analysis.

5. Data analysis

The collected data were encoded and entered into a computer for statistical analysis using SPSS/WIN 23.0 software and SPSS PROCESS macro 3.5.2[44]. Specifically, nurses' general characteristics, job rotation stress, job embeddedness, nursing work performance, and resilience were analyzed with descriptive statistics (frequency, percentage, mean, and standard deviation). Differences in nursing work performance according to general characteristics were analyzed using independent t-tests and one-way analysis of variance (ANOVA), followed by Scheffé tests for post hoc comparisons for cases with equal variances. For cases with unequal variances, the Welch test was used, followed by the Games-Howell test for post hoc comparisons. Pearson's correlation coefficients were used to analyze the correlations between major variables. Mediating, moderating, and moderated mediating effects were analyzed using Models 4, 1, and 15 of the PROCESS macro, respectively, and conditional effects and conditional effects based on Johnson-Neyman were analyzed. Statistical significance was tested using the bootstrapping method with 10,000 samples, and bias-corrected 95% confidence intervals (CI) were estimated to determine the lower and upper bounds. Conditional effects graphs for the moderated and moderated mediating effects were generated using the Easy Flow Statistic macro [45]. Cronbach's α coefficients were used to analyze the internal consistency reliability of the study instruments.

6. Ethical Considerations

This study was approved by the Institutional Review Board at Jeonbuk National University (IRB NO: JBNU-2021-07-015-001). To ensure the ethical protection of the study participants, the participants were informed that the collected data would be coded and that personal information and responses would be kept confidential and only be used for research purposes. The participants were also informed that the data would be securely stored in a locked facility for three years before being discarded and that they could discontinue or refuse their participation without facing any disadvantages.

RESULTS

1. Participants' General Characteristics

Participants were categorized into three age groups: <30 years ($n=110$, 53.7%), 30~39 years ($n=80$, 39.0%), and ≥ 40 years ($n=15$, 7.3%). Of the participants, 182 (88.8%) were women and 23 (11.2%) were men. A total of 165 (80.5%) were single and 40 (19.5%) were married. Most participants were not religious ($n=145$, 70.7%), and most had a Bachelor of Science in nursing ($n=186$, 90.7%). The most common length for participants' total nursing career was more than 1 year but less than 3 years ($n=64$, 31.2%), and the most common length of employment at their current hospital was <3 years ($n=89$, 43.4%). Most participants worked on general ward ($n=163$, 79.5%), and the length of employment in their current unit was 4~6 months ($n=132$, 64.4%) or 1~3 months ($n=73$, 35.6%). The most common previous work unit was general ward ($n=154$, 75.1%), and most participants had worked less than 3 years in their previous unit ($n=122$, 59.5%). Regarding job positions, 183 (89.3%) were staff nurses and 22 (10.7%) were charge nurses. Employment type was regular permanent employment ($n=203$, 99.0%) and temporary contract ($n=2$, 1.0%). The most common shift pattern was three shifts ($n=185$, 90.2%), and 115 (56.1%) participants had one job rotation. The most common salary was <50 million KRW ($n=128$, 62.4%). The most common nursing management fee was grade 2 ($n=93$, 45.4%), and hospital type was advanced general ($n=133$, 64.9%) or general ($n=72$, 35.1%). The most common hospital location was "city or province" ($n=109$, 53.2%). Regarding the need for job rotation, 140 (68.3%) participants supported it, whereas 65 (31.7%) did not. The prevailing opinion was that the appropriate length for a job rotation cycle was more than 5 year but less than 7 years ($n=81$, 39.5%), followed by more than 3 year but less than 5 years ($n=62$, 30.3%), ≥ 10 years ($n=30$, 14.6%), more than 1 year but less than 3 years ($n=23$, 11.2%), and more than 7 year but less than 10 years ($n=9$, 4.4%). The average cycle was 4.98 ± 2.72 years (Table 1).

2. Participants' Job Rotation Stress, Job Embeddedness, Nursing Work Performance, and Resilience

Mean job rotation stress and job embeddedness scores were 3.71 ± 0.72 and 3.09 ± 0.59 out of 5, respectively. Mean nursing work performance and resilience scores were 3.09 ± 0.32 and 2.41 ± 0.52 out of 4, respectively. The absolute values of standardized skewness and kurtosis were all below 2, indicating normal data distribution.

3. Differences in Nursing Work Performance according to Participants' General Characteristics

Nursing work performance differed according to previous work unit ($F=4.81$, $p=.012$), shift pattern ($F=3.58$, $p=.030$), nursing management fee ($F=4.84$, $p=.009$), and hospital location ($F=5.08$, $p=.007$) (Table 1). Post hoc tests showed higher nursing work performance among those who previously worked on general ward (3.12 ± 0.33) compared with those who previously worked in another unit (3.00 ± 0.16), among those who worked in a hospital with grade 1 nurse staffing (3.17 ± 0.34) compared with those who worked in a hospital with grade 2 staffing (3.02 ± 0.30), and among those who worked in a hospital in Seoul Special City (3.19 ± 0.33) compared with those who worked in a hospital in a "city or province" (3.03 ± 0.32). No significant differences were found according to shift patterns in the post hoc analysis.

4. Correlations between Job Rotation Stress, Job Embeddedness, Nursing Work Performance, and Resilience

Job rotation stress was significantly negatively correlated with job embeddedness ($r=-.21$, $p=.003$) and resilience ($r=-.16$, $p=.023$). Job embeddedness was significantly positively correlated with nursing work performance ($r=.33$, $p<.001$) and resilience ($r=.48$, $p<.001$). Nursing work performance was significantly positively correlated with resilience ($r=.49$, $p<.001$). No significant correlation was found between job rotation stress and nursing work performance ($r=.02$, $p=.783$) (Table 2).

5. Mediating Effect of Job Embeddedness on the Relationship between Job Rotation Stress and Nursing Work Performance

In the mediation analysis, we controlled for general characteristics that significantly differed in relation to nursing work performance. Accordingly, the significant general characteristics in the univariate analysis (i.e., previous work unit, shift pattern, nursing management fee, and hospital location) were entered as dummy variables in the multiple regression analysis. Prior to analyzing the mediating effect, the autocorrelation of the dependent variable and multicollinearity of the independent variables were tested in Steps 1 and 2. In both Step 1 ($du=1.86$ < $d=2.01$ < $4-du=2.14$; VIF 1.03~2.99; Tolerance .33~.97) and Step 2 ($du=1.87$ < $d=1.97$ < $4-du=2.13$; VIF 1.03~3.03; Tolerance .33~.97), the data were confirmed to be suitable for regression analysis.

Table 1. Differences in Nursing Work Performance Based on Participants' General Characteristics

(N=205)

Characteristics	Categories	n (%) or M±SD	Nursing work performance	
			M±SD	t or F (p) Scheffé
Age (yr)	< 30	110 (53.7)	3.06±0.30	1.22
	30~39	80 (39.0)	3.13±0.36	(.298)
	≥ 40	15 (7.3)	3.08±0.31	
		30.5±5.3		
Sex	F	182 (88.8)	3.09±0.32	-0.45
	M	23 (11.2)	3.12±0.37	(.650)
Marital status	Single	165 (80.5)	3.10±0.33	1.42
	Married	40 (19.5)	3.02±0.30	(.157)
Religion	No	145 (70.7)	3.09±0.33	-0.07
	Yes	60 (29.3)	3.09±0.32	(.943)
Education level	College	10 (4.9)	3.19±0.30	1.83
	University	186 (90.7)	3.08±0.32	(.164)
	≥ Master's degree	9 (4.4)	3.25±0.32	
Total nursing career (yr)	1~<3	64 (31.2)	3.08±0.35	0.48 [†]
	3~<5	51 (24.9)	3.05±0.26	(.700)
	5~<10	63 (30.7)	3.13±0.37	
	≥ 10	27 (13.2)	3.08±0.24	
		5.53±4.32		
Clinical career at current hospital (yr)	< 3	89 (43.4)	3.08±0.34	0.17
	3~<5	43 (21.0)	3.07±0.28	(.914)
	5~<10	56 (26.9)	3.11±0.36	
	≥ 10	18 (8.8)	3.09±0.24	
		4.73±4.04		
Current work unit	General ward	163 (79.5)	3.09±0.33	0.54
	ICU	42 (20.5)	3.06±0.30	(.588)
Clinical career at current unit (month)	1~3	73 (35.6)	3.04±0.28	-1.81
	4~6	132 (64.4)	3.12±0.35	(.072)
		4.07±1.62		
Previous work unit	General ward ^a	154 (75.1)	3.12±0.33	4.81 [†]
	ICU ^b	33 (16.1)	2.98±0.33	(.012)
	Etc ^{a,c}	18 (8.8)	3.00±0.16	a > c [†]
Clinical career at previous unit (yr)	< 3	122 (59.5)	3.10±0.33	0.46
	3~<5	43 (21.0)	3.07±0.32	(.713)
	5~<10	34 (16.6)	3.05±0.30	
	≥ 10	6 (2.9)	3.20±0.29	
		3.19±2.70		
Job position	Staff	183 (89.3)	3.08±0.33	-1.22
	Charge	22 (10.7)	3.17±0.24	(.223)
Employment type	Permanent position	203 (99.0)	3.09±0.32	-1.03
	Contract worker	2 (1.0)	3.32±0.21	(.305)
Shift pattern	Non-shift	11 (5.4)	3.30±0.34	3.58
	Two shifts	9 (4.4)	3.23±0.30	(.030)
	Three shifts	185 (90.2)	3.07±0.32	
Number of job rotations experienced	1	115 (56.1)	3.07±0.30	0.74 [†]
	2	48 (23.4)	3.15±0.40	(.480)
	≥ 3	42 (20.5)	3.07±0.28	
		1.79±1.20		
Salary (10,000 won)	< 5,000	128 (62.4)	3.11±0.34	0.66
	5,000~<7,000	65 (31.7)	3.05±0.32	(.519)
	≥ 7,000	12 (5.9)	3.12±0.21	
		4642.17±1131.21		
Nursing management fee [§] (grade)	1 ^a	90 (43.9)	3.17±0.34	4.84
	2 ^b	93 (45.4)	3.02±0.30	(.009)
	3~4 ^c	22 (10.7)	3.04±0.32	a > b [†]
Hospital type	Advanced general hospital	133 (64.9)	3.07±0.33	-1.42
	General hospital	72 (35.1)	3.13±0.31	(.156)
Hospital location	Seoul ^a	56 (27.3)	3.19±0.33	5.08
	Metropolitan city ^b	40 (19.5)	3.11±0.30	(.007)
	Cities and provinces ^c	109 (53.2)	3.03±0.32	a > c

*Emergency room, operating room; [†] Welch test; [‡] Games-Howell test; [§] Graded nursing management fee by levels of nurse staffing; M=Mean; SD=Standard deviation.

For analyzing the mediating effect of job embeddedness on the relationship between job rotation stress and nursing work performance, job rotation stress was found to significantly affect job embeddedness in Step 1 ($X \rightarrow M$, $B = -0.15$, $p = .009$). In Step 2, job rotation stress did not have a significant direct effect on nursing work performance ($X \rightarrow Y$, $B = 0.05$, $p = .110$), whereas job embeddedness did have a significant effect on nursing work performance ($M \rightarrow Y$, $B = 0.16$, $p < .001$). The mediating effect of job embeddedness was analyzed with bootstrapping. Job embeddedness had a significant indirect effect with a bias-corrected 95% CI of $-0.05 \sim -0.01$. Thus, job embeddedness mediated the effects of job rotation stress on nursing work performance (Table 3-A, Appendix 1-A).

6. Moderating effect of resilience on the relationship between job rotation stress, job embeddedness, and nursing work performance

After controlling for general characteristics that significantly differed in relation to nursing work performance, moderation analysis was performed (Table 3-B, Appendix 1-B). Resilience did not significantly moderate the effect of job rotation stress on job embeddedness ($X^*W \rightarrow M$, $B = -0.02$, $p = .803$), but did significantly moderate the effect of job rotation stress on nursing work performance ($X^*W \rightarrow Y$, $B = -0.16$, $p < .001$). Resilience also significantly moderated

the effect of job embeddedness on nursing work performance ($M^*W \rightarrow Y$, $B = 0.14$, $p = .017$).

7. Moderated Mediating Effect of Resilience on the Effect of Job Rotation Stress on Nursing Work Performance through the Mediation of Job Embeddedness

In the above mediation and moderation analyses, job embeddedness significantly mediated the effect of job rotation stress on nursing work performance ($B = -0.02$, Bootstrap 95% CI = $-0.05 \sim -0.01$), and resilience significantly moderated the effects of job rotation stress ($X^*W \rightarrow Y$, $B = -0.16$, $p < .001$) and of job embeddedness ($M^*W \rightarrow Y$, $B = 0.14$, $p = .017$) on nursing work performance. However, resilience did not significantly moderate the effect of job rotation stress on job embeddedness ($X^*W \rightarrow M$, $B = -0.02$, $p = .803$). Thus, Model 15 of the SPSS PROCESS macro [44] was used to examine the moderated mediating effect of resilience based on these results. The hypothesized model is shown in Figure 1-A. Additionally, we controlled for the general characteristics that significantly differed in relation to nursing work performance in the moderated mediation analysis, and the CI was presented with numbers up to the fourth decimal point.

The results showed that the Bootstrap 95% CI did not include 0, confirming the significant moderated mediating

Table 2. Correlation between Variables

($N=205$)

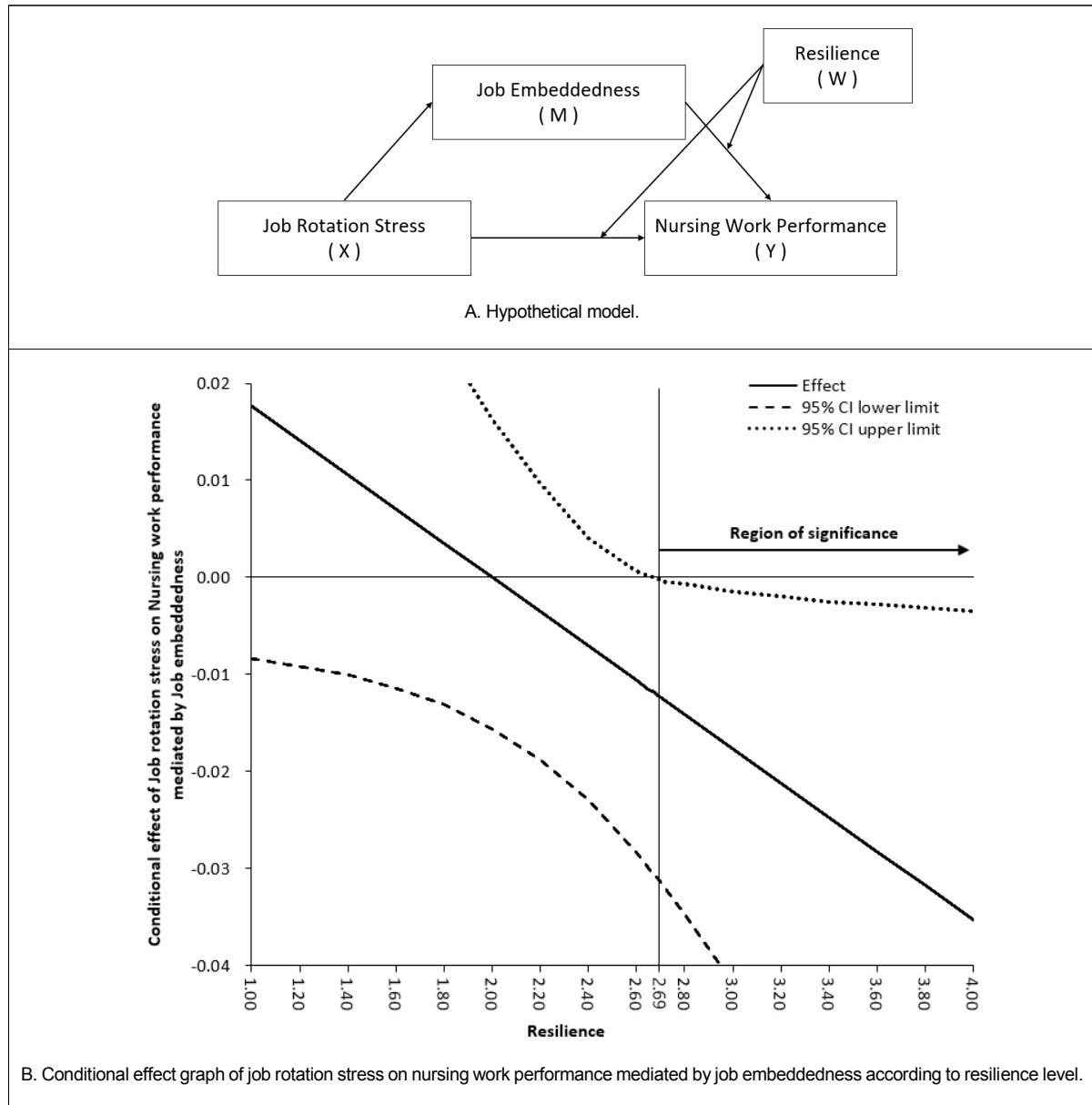
Variables	Job rotation stress	Job embeddedness	Nursing work performance
	$r(p)$	$r(p)$	$r(p)$
Job embeddedness	-.21 (.003)		
Nursing work performance	.02 (.783)	.33 (< .001)	
Resilience	-.16 (.023)	.48 (< .001)	.49 (< .001)

Table 3. Mediating Effect of Job Embeddedness and Moderating Effects of Resilience

($N=205$)

Path			B	SE	t	p	R ²	F (p)
3-A. Mediating effect of job embeddedness	Step 1	$X \rightarrow M$	-0.15	0.06	-2.62	.009	.16	2.56 (.008)
		$X \rightarrow Y$	0.05	0.03	1.61	.110	.20	4.95 (< .001)
	Step 2	$M \rightarrow Y$	0.16	0.04	4.37	< .001		
		Indirect effect $X \rightarrow M \rightarrow Y$	B -0.02		Bootstrap SE 0.01		Bootstrap 95% CI -0.05 ~ -0.01	
3-B. Moderating effect of resilience		$X^*W \rightarrow M$	-0.02	0.09	-0.25	.803	.28	0.06 (.803)
		$X^*W \rightarrow Y$	-0.16	0.04	-3.65	< .001	.36	13.31 (< .001)
		$M^*W \rightarrow Y$	0.14	0.06	2.41	.017	.33	5.83 (.017)

CI=Confidence interval; M=Job embeddedness; W=Resilience; SE=Standard error; X=Job rotation stress; Y=Nursing work performance.



Control variables=Previous work unit, shift pattern, nursing management fee, hospital location.

Figure 1. Moderated mediating effects of resilience.

effect of resilience ($B = -0.02$, Bootstrap 95% CI = $-0.0460 \sim -0.0002$). Therefore, resilience has a moderated mediating effect on the effect of job rotation stress on nursing work performance through the mediation of job embeddedness. In the effect of job rotation stress on nursing work performance, job embeddedness had a significant mediating effect when resilience was high ($W = M + 1SD$, $B = -0.02$, Bootstrap 95% CI = $-0.0391 \sim -0.0012$), but did not have a significant mediating effect when resilience was low ($W = M - 1SD$, $B = 0.00$, Bootstrap 95% CI = $-0.0144 \sim 0.0213$) or average ($W = M$, $B = -0.01$, Bootstrap 95% CI = $-0.0231 \sim 0.0039$)

(Table 4). The conditional effect domain for the moderated mediating effect of resilience was examined, and this effect was found to be significant when resilience was > 2.69 . Thus, the effect of job rotation stress on nursing work performance through the mediation of job embeddedness was significant when resilience was > 2.69 (Figure 1-B).

DISCUSSION

This study is significant in shedding light on the current status of Korean nurses who have experienced job rotation

Table 4. Moderated Mediating Effects of Resilience

(N=205)

	Path	B	SE	t	p	R ²	F (p)
Step 1	X→M	-0.15	0.06	-2.62	.009	.11	2.56 (.008)
Step 2	X→Y	0.44	0.12	3.77	< .001	.38	8.99 (< .001)
	M→Y	-0.24	0.14	-1.64	.104		
	W→Y	0.43	0.26	1.65	.100		
	X*W→Y	-0.15	0.04	-3.33	.001		
	M*W→Y	0.12	0.06	2.14	.033		

W	X→M→Y (Indirect effect)		
	B	Bootstrap SE	Bootstrap 95% CI
Moderated mediation index	-0.02	0.01	-0.0460~-0.0002
M-1SD (1.88)	0.00	0.01	-0.0144~-0.0213
Mean (2.41)	-0.01	0.01	-0.0231~-0.0039
M+1SD (2.93)	-0.02	0.01	-0.0391~-0.0012

W	B	Bootstrap SE	LLCI	ULCI
1.00	0.02	0.02	-0.0084	0.0585
1.20	0.01	0.02	-0.0092	0.0498
1.40	0.01	0.01	-0.0100	0.0410
1.60	0.01	0.01	-0.0114	0.0326
1.80	0.00	0.01	-0.0131	0.0242
2.00	0.00	0.01	-0.0157	0.0163
2.20	0.00	0.01	-0.0188	0.0097
2.40	-0.01	0.01	-0.0229	0.0040
2.60	-0.01	0.01	-0.0283	0.0006
2.67	-0.01	0.01	-0.0305	0.0001
2.68	-0.01	0.01	-0.0308	0.0000
2.69	-0.01	0.01	-0.0311	0.0000
2.70	-0.01	0.01	-0.0314	-0.0001
2.80	-0.01	0.01	-0.0347	-0.0007
3.00	-0.02	0.01	-0.0418	-0.0015
3.20	-0.02	0.01	-0.0495	-0.0020
3.40	-0.02	0.01	-0.0582	-0.0025
3.60	-0.03	0.02	-0.0669	-0.0028
3.80	-0.03	0.02	-0.0759	-0.0031
4.00	-0.04	0.02	-0.0852	-0.0035

CI=Confidence interval; LLCI=Lower limit confidence interval; M=Job embeddedness; SE=Standard error; ULCI=Upper limit confidence interval; W=Resilience; X=Job rotation stress; Y=Nursing work performance.

based on a nationwide survey amid little research data on Korean nurses who have experienced job rotation. The major findings are discussed below.

In this study, job embeddedness was found to significantly mediate the relationship between job rotation stress and nursing work performance; however, the indirect effect of job rotation stress on nursing work performance was not significant. These results suggest that job embeddedness decreases as job rotation stress increases, and this lowered job embeddedness causes nursing work performance to decline. While we could not locate previous studies that reported results identical to ours (i.e., that job rotation stress has a significant indirect effect on nursing work performance through job embeddedness), a study conducted on advanced general hospital nurses [18] reported that job embeddedness significantly mediates the relationship between nursing work environment and performance. In addition, our finding that job rotation stress significantly lowers job embeddedness was similar to the results of a previous study on a prediction model for career satisfaction among nurses who have experienced job rotation [11], in which job rotation stress was found to have a direct negative effect on job engagement. This can be attributed to the shared characteristics of job embeddedness and job engagement, both of which are positive work-related characteristics. This consistency in findings underscores the importance of multifaceted efforts to reduce job rotation stress, given the significance of job embeddedness at both the individual and organizational levels. Furthermore, our results showing a positive correlation between job embeddedness and nursing work performance are similar to previous findings that job embeddedness has a positive effect on nursing work performance [20]. This highlights that the importance of increasing job embeddedness to improve nursing work performance. Thus, exploring strategies that simultaneously reduce job rotation stress and boost job embeddedness is essential for enhancing nursing work performance. To decrease job rotation stress among experienced nurses, unexpected job rotations should be minimized by establishing regular job rotation schedules. Additionally, a job rotation system that aligns with nurses' preferences for rotations to desired departments could be beneficial. To support nurses in their adjustment to a new department, organizations must guarantee orientation and training periods, allow preceptorship, and provide encouragement. Moreover, improving the working environment by implementing more support for nurses and fostering teamwork among colleagues is vital for enhancing job embeddedness. Furthermore, adequate staffing should be ensured to prevent unfairly

excessive workloads for individual nurses, and nurses should be provided with opportunities to collaborate with various healthcare professionals to gain a better understanding of other healthcare professionals in the hospital and foster better relationships.

Resilience had a significant moderated mediating effect on the relationship between job rotation stress and nursing work performance through the mediation of job embeddedness. Thus, resilience had a moderated mediating effect. The effect in which "job embeddedness decreases with increasing job rotation stress and results in lower nursing work performance" (i.e., "job embeddedness increases with decreasing job rotation stress and results in higher nursing work performance") was evident only when resilience was high. Resilience is a psychosocial characteristic that drives an individual to adapt and grow after facing adversity [29], and people with high resilience often demonstrate improved abilities after coping with and overcoming stress using a proactive and optimistic attitude [31]. As such, resilience tends to moderate stress, which may be the reason underlying the mechanism in which nurses with high resilience (>2.69 out of 4) had lower job rotation stress, which in turn increased job embeddedness and thus resulted in higher nursing work performance. Although studies were difficult to find that examined the moderated mediating effects of resilience on the relationship between job rotation stress and nursing work performance as mediated by job embeddedness, resilience was found to moderate stress in other domains. Specifically, in this study, nurses with high resilience (>2.69) exhibited low job rotation stress and high job embeddedness, ultimately leading to significantly higher nursing work performance. These results are similar to those of a previous study on call center employees [32] showing that resilience significantly moderated the relationship in which organizational commitment decreased as job stress increased, and those with high resilience showed high emotional and normative commitment compared to those with low resilience. Furthermore, our results can be understood in the context of a previous study on local police officers [33], which found that resilience significantly moderated the relationship in which depression increased as job stress increased but decreased as resilience increased.

Thus, we found that the intensity of the mediating effect of job embeddedness in the relationship between job rotation stress and nursing work performance varies according to resilience levels. Therefore, it is important to first assess the resilience levels among nurses who have experienced job rotation and develop tailored strategies to re-

duce their job rotation stress. To enhance nursing work performance among nurses who have experienced job rotation, those with high resilience would benefit from strategies that aim to reduce job rotation stress and boost job embeddedness. However, for nurses with low resilience, resilience should be cultivated first before programs aiming to reduce job rotation stress are implemented. If not, these programs may not be effective in boosting nursing work performance in nurses with low resilience. To increase resilience, strategies that improve self-control and interpersonal competencies, such as those proposed by Kim [46], should be considered. In addition, studies should identify other mediators or moderators of the relationship between job rotation stress and nursing work performance among nurses with low resilience. Our findings will contribute to facilitating efficient human resource management for nurses, consequent improvement in organizational performance, and research on nurses who have experienced job rotation.

CONCLUSION

This study sheds light on job rotation stress, job embeddedness, nursing work performance, and resilience levels and associated characteristics among nurses and empirically verifies the mediating effect of job embeddedness and moderated mediating effect of resilience in the relationship between job rotation stress and nursing work performance. Job embeddedness increased as job rotation stress decreased, resulting in higher nursing work performance, and this mediating effect was significant only when resilience was high. Thus, strategies should focus on reducing job rotation stress and boosting job embeddedness to enhance nursing work performance among nurses with high resilience, whereas interventions to increase resilience should be implemented before the provision of job rotation stress reduction programs in nurses with low resilience. Amid scarce research on nurses who have experienced job rotation, this study aimed to provide insights into the current situation of this population in South Korea using a nationwide survey. This study is particularly significant in that it sheds light on the causal relationships between job rotation stress, job embeddedness, nursing work performance, and resilience among nurses. These findings can contribute to better management of nursing human resources and improved organizational performance, and promote further research on nurses who have experienced job rotation.

Based on this study's findings, we suggest the following recommendations. First, when developing strategies to re-

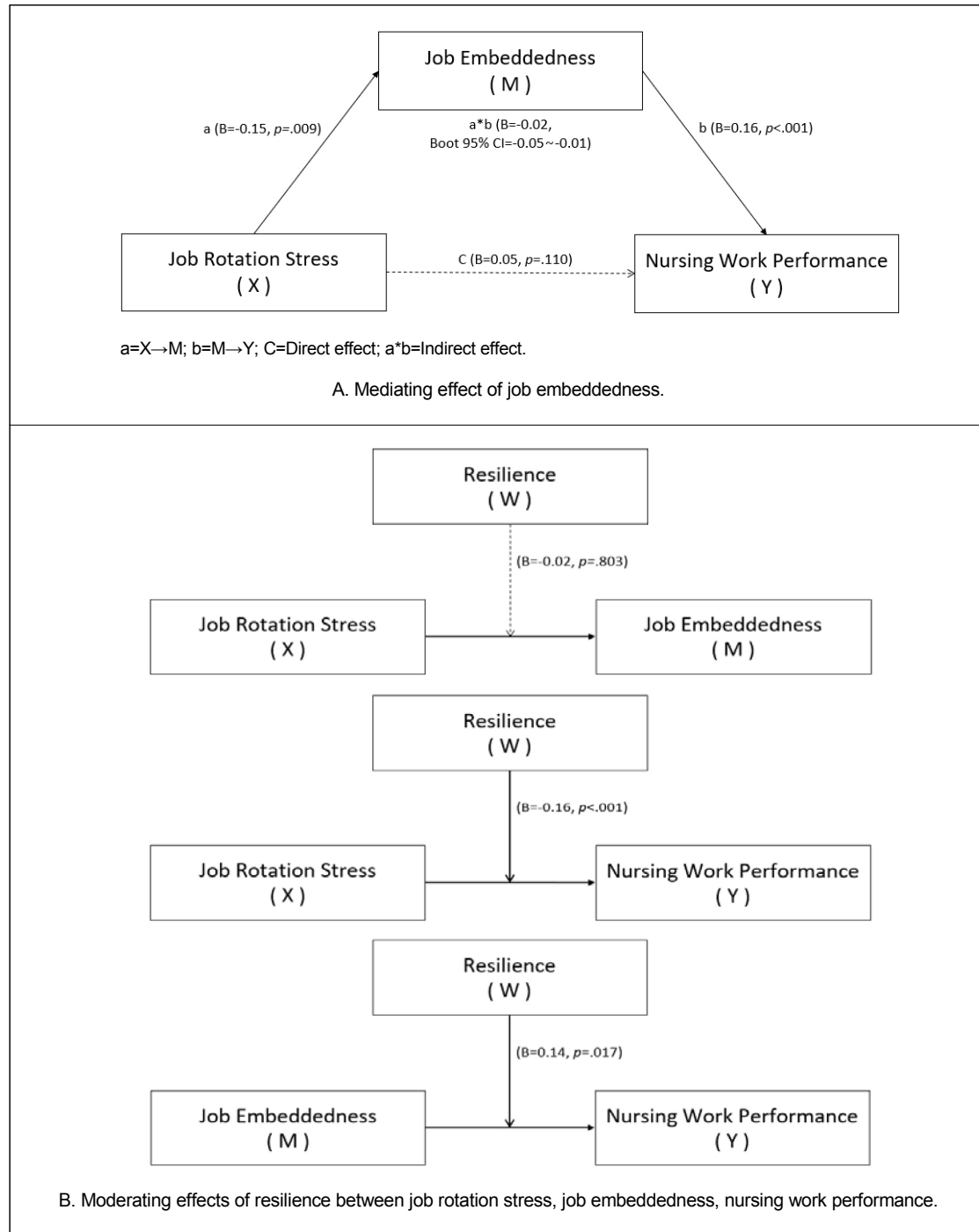
duce job rotation stress among nurses, their resilience levels should be assessed first to formulate tailored strategies. Second, to enhance the nursing work performance of nurses in job rotation, we suggest developing and evaluating programs aimed toward reducing job rotation stress and improving job embeddedness for nurses with high resilience. Third, studies should investigate the effects of job rotation stress on nursing work performance in nurses with low resilience and identify causal pathways. Fourth, studies should explore potential mediators and moderators other than job embeddedness and resilience in the relationship between job rotation stress and nursing work performance.

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Appendix 1. Mediating and moderating effects of variables

Control variables=Previous work unit, shift pattern, nursing management fee, hospital location.