



Research Article

Path Analysis of Career Decision-making Among Nursing Students: A Descriptive Cross-sectional Study

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SUMMARY

Purpose: A career refers to all the work-related activities and experiences that occur throughout an individual's life. As healthcare technology advances, jobs become more diverse, making nursing students' careers increasingly important. However, little is known about the career decision-making process of nursing students. To address this, we investigated how nursing students decide about their careers. This study aimed to conduct a path analysis of career decisions among nursing students based on the social cognitive model of career self-management.

Methods: This was a descriptive cross-sectional study. It recruited junior and senior nursing students from 18 universities in a metropolitan area of South Korea. In total, 439 nursing students participated in the study. Data were collected using a structured questionnaire between May 15 and June 5, 2023. The data were analyzed using descriptive statistics and path analysis.

Results: The hypothesized model showed acceptable model fit indices. The path analysis showed that career decision-making self-efficacy ($\beta = 0.52, p < .001$), career outcome expectation ($\beta = 0.11, p = .041$), and nursing competence ($\beta = 0.11, p = .046$) directly impacted career decisions. Furthermore, nursing competence ($\beta = 0.29, p < .001$), satisfaction with the nursing major ($\beta = 0.13, p < .001$), and the learning environment ($\beta = 0.12, p < .001$) indirectly influenced career decisions through the mediation of career decision-making self-efficacy and career outcome expectation.

Conclusion: Career decision-making self-efficacy and nursing competence are crucial factors in nursing students' career decisions. The proposed model provides a foundation for developing strategies to enhance nursing students' career decision-making. Nursing educators and institutions can use this model to design and implement a tailored career education curriculum that empowers nursing students to manage and advance their careers effectively.

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Introduction

A career includes all work-related activities and experiences that occur over an individual's lifetime and significantly impact the individual's life [1]. In recent years, careers within healthcare have become increasingly important as related professions have become highly specialized and diversified owing to advancements in healthcare technology [2,3]. In this context, nursing students

have career characteristics that differ from those of students in other majors. They develop knowledge and skills as nurses through intensive learning and practice during school and obtain a nursing license upon graduation [4]. For nursing students to be more capable of adapting to their changing roles as nurses after graduation and to continue to be successful as they engage in their workplaces, their career development should be organized from the time they are in college [5].

However, many nursing students believe their careers are predetermined and enter the hospital workforce without making any effort or reflecting on their career choices [6]. When there is no guidance for nursing students regarding their career decisions, they tend to make ill-informed career choices, potentially resulting in low job satisfaction and high turnover in their early careers. A potential negative spillover effect could be that patients are

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affected by a shortage of nurses [7]. Furthermore, in light of ill-informed career choices, nurses may experience disappointment and maladjustment in their nursing careers as they start to perceive a divergence from their career expectations, which may lead to early job separation [7]. Understanding the career choice process of nursing students is therefore an issue of paramount importance owing to its key role in human resource management and nursing education [8].

Career decision-making among nursing students is a critical issue, particularly in the context of global nursing workforce challenges. The International Council of Nurses (ICN) projects a shortage of 13 million nurses by 2030, highlighting the urgent need for action to mitigate potential future workforce challenges resulting from the attrition of nursing students and newly graduated nurses [9]. The average turnover rate among nurses in South Korea is 13.5%, with the resignation rate for newly graduated nurses within their first year of employment reaching 40.2% [10]. These issues emphasize the urgent need to better understand the factors that influence nursing students' career decisions, support career sustainability, and reduce career attrition.

Students are influenced by various factors when deciding on their careers, and understanding their career decision-making process requires knowledge of the interrelationships between the variables that influence career decisions [11,12]. Lent and Brown's [13] social cognitive career theory model of career self-management explains phenomena related to career development and focuses on how individuals manage their careers throughout their lives. The model provides an integrated career management framework that is useful for understanding nursing students' career decision-making processes. The literature revealed that the model has been applied to various populations, such as high school students, college students, workers, and reemployment seekers [14–18]. However, most studies targeting college students have focused on general undergraduate populations or psychology majors, with limited attention to comprehensive models or multiple influencing variables. Studies applying this model specifically to nursing students remain scarce. Therefore, this study contributes to the literature by extending the application of this model to nursing students, a group for whom career development is highly contextual and professionally specific.

Research shows that cognitive characteristics affect one's career development, with career decision-making self-efficacy and career outcome expectation being reported as important factors explaining career decisions [19]. Career decision-making self-efficacy is the belief that one can successfully perform various tasks related to career decisions [20]. Previous studies have shown that it positively influences career decision-making [21,22] and that greater confidence and self-efficacy in one's career are associated with more active exploration of career opportunities among nursing students [7]. Career outcome expectation is the belief that one's career decisions can produce valuable outcomes [23], has been shown to be significantly related to career decision-making among nursing students [2,22].

Learning environments include physical spaces, social interactions, curricula, and psychological contexts [24] and are important for efficient curriculum construction and academic success [25]. Previous studies have reported that the learning environment influences the intention to work as a nurse after graduation [26], and the learning environment, including facilities in the practice ward, influences students' intention to stay and work there [27]. However, previous studies have focused primarily on the clinical practice environment of nursing students, and there is a need to examine the relationship between the overall learning environment—including broader aspects of college life—and their level of career decision-making.

Satisfaction with the nursing major refers to students' subjective assessment of their educational experiences [28]. Previous studies have shown that this satisfaction serves as a motivating factor in planning for future careers [29] and is associated with greater comfort and decisiveness in career decision-making [30].

Nursing competence is essential for nursing students during college and their duties as nurses in various practice settings after graduation [31]. It refers to a nurse's ability to integrate personal traits, professional attitudes and values, as well as knowledge and skills into practice to provide safe, effective, and professional patient care [32,33]. Studies show that greater career competency is associated with better career decision-making [34], and that the clinical competence of nursing students also influences their career decisions [35]. Similarly, the core competency of wound, ostomy, and continence nurses influenced their career success, including career satisfaction, which may in turn facilitate more concrete and realistic preparation for future career development [36]. However, limited studies have examined the relationship between nursing students' careers and nursing competencies.

Accordingly, this study selected key variables by considering the components of the social cognitive model of career self-management and previous studies using path analysis. According to Lent and Brown [13], career decision-making is shaped by the interaction of learning experiences, cognitive factors (career decision-making self-efficacy, career outcome expectation), contextual factors and other related influences. In consideration of these factors, the variables in this study were defined as career decision-making self-efficacy, career outcome expectation, nursing competency, learning environment, and satisfaction with the nursing major.

Path analysis was used to test the hypothesized relationships based on the social cognitive career theory model of career self-management. This method is suitable for testing hypotheses by examining the relationships between variables within a theoretical background [37]. In line with this, path analysis has been widely used in previous studies using the social cognitive career theory framework in the context of career decision-making [15–18].

The purpose of this study was to identify the predictors of career decision-making among nursing students. The hypotheses are as follows.

- 1) Hypotheses with career decision as the endogenous variable; Hypothesis 1: Nursing competence affects career decision. Hypothesis 2: Career decision-making self-efficacy affects career decision. Hypothesis 3: Career outcome expectation affects career decision;
- 2) Hypotheses with career decision-making self-efficacy as the endogenous variable. Hypothesis 4: Learning environment affects career decision-making self-efficacy. Hypothesis 5: Nursing competence affects career decision-making self-efficacy. Hypothesis 6: Satisfaction with the nursing major affects career decision-making self-efficacy;
- 3) Hypotheses with career outcome expectation as the endogenous variable. Hypothesis 7: Learning environment affects career outcome expectation. Hypothesis 8: Satisfaction with the nursing major affects career outcome expectation. Hypothesis 9: Career decision-making self-efficacy affects career outcome expectation.

Material and methods

Study design

This descriptive cross-sectional study constructed and evaluated a hypothesized model of the factors influencing nursing

students' career decisions. The hypothesized model was based on Lent and Brown's [13] social cognitive model of career self-management and previous studies. The endogenous variables of this study were career decision, career outcome expectation, and career decision-making self-efficacy. The exogenous variables were nursing competence, learning environment, and satisfaction with the nursing major.

Participants

Participants were recruited from nursing schools at 18 universities in a metropolitan area of South Korea. The inclusion criteria were being a junior or senior nursing student. The exclusion criteria were being a student on a leave of absence or without clinical practice experience.

The number of samples for path analysis is 10 to 20 times the number per observed variable [38], and a multiplier of 14 was applied in this study. There were 23 observed variables, and the minimum required sample size was calculated to be 322 participants. Considering a previous study conducted with nursing students [39] and the dropout rate commonly observed in online surveys [40], the target sample size was set at 460 participants, assuming a dropout rate of 30%. Of the 487 questionnaires collected, 439 were included in the data analysis after excluding 21 incomplete responses, 19 duplicates, and 8 partial responses.

Instruments

This study used a structured questionnaire with 138 items across seven parts: general characteristics; career decision scale; career outcome expectation scale; career decision-making self-efficacy scale; nursing competence scale; learning environment scale; and satisfaction with the nursing major scale. The content validity of all instruments was evaluated by five nursing faculty members, each with over 10 years of experience in career education. The content validity index (CVI) ranged from .88 to .95, indicating adequate content validity across all instruments. The CVI was .92 for career decision, .89 for career outcome expectation, .95 for career decision-making self-efficacy, .93 for nursing competence, .88 for learning environment, and .91 for satisfaction with the nursing major.

General characteristics

We collected data on participants' general characteristics through 18 questions capturing the following: gender, age, grade, pursuit of a second bachelor's degree, motivation for major selection, desired career fields, desired career job (immediately after and five years after graduation), role models, career-related conversations with parents, family income levels, university attended, impact of the pandemic on career decisions, double/minor degree, academic achievement, career-related education, club activity, internship experience, and mentoring.

Career decision

Career decision was assessed using the Career Decision Instrument developed by Lee and Jeong [41]. The instrument consists of 15 items covering three domains: suitability, concreteness, and certainty. Each item is rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A higher total score indicates a higher level of career decision-making, with the sum of all question scores ranging from 15 to 75. Cronbach's α of the scale was .92 at the time of development [41] and .82 in this study.

Career outcome expectation

Career outcome expectation was measured using the Engineering Outcome Expectation Measures developed by Lent et al [19], specifically its Korean version translated into Kim's [42] study. This instrument consists of 12 items covering two domains: intrinsic and extrinsic career outcome expectation. Each item is rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher total scores indicate higher levels of career outcome expectation, with the sum of all question scores ranging from 12 to 60. The Cronbach's α of the scale was .90 at the time of development [42] and .90 in this study.

Career decision-making self-efficacy

Career decision-making self-efficacy was evaluated using the Career Decision-Making Self-Efficacy Scale for Nursing Students developed by Jung and Yoo [43]. This tool consists of 17 items covering three domains: adapting to work, understanding one's major, and goal setting. Each item is rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A higher total score indicates higher career decision-making self-efficacy, with the sum of all question scores ranging from 17 to 85. The Cronbach's α was .92 at the time of the scale's development [43] and .91 in this study.

Nursing competence

Nursing competence was measured using the Nursing Competence Scale for graduating nursing students developed by Joo and Sohng [44]. This tool consists of 30 items covering eight domains: nursing professionalism, integrated nursing through critical thinking, nursing leadership, stress management, respect for life, nursing research, communication skills, and core nursing skills. Each item is rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A higher total score indicates a higher level of nursing competence, with the sum of all question scores ranging from 30 to 150. The Cronbach's α was .91 at the time of the scale's development [44] and .93 in this study.

Learning environment

The learning environment was assessed using the Johns Hopkins Learning Environment Scale developed by Shochet et al [45] and the Korean version translated by Kim [46] for research on medical students. The tool was modified and supplemented for this study to suit our sample of nursing students. This tool consists of 28 items covering seven domains: a community of peers, faculty relationships, academic climate, meaningful engagement, mentoring, inclusion and safety, and physical spaces. Each item is rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with Item 3 being reverse-scored. A higher total score indicates a more positive perception of the learning environment, with the sum of all question scores ranging from 28 to 140. The Cronbach's α was .91 during development [46] and .88 in this study.

Satisfaction with the nursing major

Student satisfaction with the choice of nursing as a major was assessed using the Program Evaluation Survey developed by Braskamp et al [47], translated into Korean by Kim and Ha [48], and modified for research with nursing students by Lee [49]. The tool consists of 18 items covering four domains: general satisfaction, curriculum satisfaction, social perception satisfaction, and relationship satisfaction. Each item is rated on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A higher total score indicates a higher level of satisfaction with the nursing major, with the sum of all question scores ranging from 18

to 90. The Cronbach's α of the scale was .90 at the time of development [49] and .90 in this study.

Data collection

After obtaining consent from the dean of the College of Nursing, an official letter requesting assistance, a recruitment announcement, and a description of the study were sent to each participating university. A preliminary survey was conducted to determine the duration of the survey, participants' comprehension of the questions, and clarity of the content. The total time to complete the preliminary survey was approximately 15–20 minutes, and no problems were identified.

Before administering the questionnaire, screening questions were formulated and applied before participants were provided access to the questionnaire to ensure that they met the eligibility criteria. If a response did not meet the criteria, the questionnaire was automatically terminated. Recruitment announcements were posted on departmental bulletin boards and online social network platforms (e.g., messenger group chats of the targeted nursing colleges) that agreed to data collection. Participants accessed the survey through a URL or QR code. The data were collected from May 15 to June 5, 2023. The researcher compensated the participants after the survey period.

Data analysis

Data analysis was conducted using SPSS version 26.0 and AMOS version 29.0. Participant characteristics were analyzed using descriptive statistics. Skewness and kurtosis were used to assess the normality of variables. Correlations between variables were analyzed using Pearson's correlation coefficient, and multicollinearity was tested using tolerance and the variance inflation factor (VIF).

Structural equation modeling was used to examine the path between the main variables in the model. The path coefficient was estimated using maximum likelihood. Model fit was evaluated using chi-square (χ^2), goodness-of-fit index (GFI), standardized root mean square residual (SRMR), comparative fit index (CFI), incremental fit index, and normed fit index (NFI) [50–52]. Bootstrapping was applied to test the statistical significance of the hypothesized model's direct, indirect, and total effects. It was analyzed using a phantom variable approach to test the model's multimediated effects and individual pathways [53].

Ethical considerations

This study was approved by the Institutional Review Board of Yonsei University (IRB No. IRB No. 4-2023-0332). Participants who volunteered to participate in the study completed the questionnaire via a Google Forms survey after providing electronic informed consent. The consent form included information on the study's purpose, method, data collection process, protection of personal information, consent process, and withdrawal. The researcher emphasized that there was no disadvantage to choosing not to participate or stopping participation midway through the survey.

Results

General characteristics of participants

Among the 439 participants, 387 (88.2%) were women, 256 (58.3%) were seniors, 35 (8.0%) held a second bachelor's degree, and 12 (2.7%) had two degrees. The mean age was 22.34 (SD = 2.19)

years. The motivation for selecting a major was interest and aptitude for 177 (40.3%) respondents, and a high employment rate after graduation for 150 (34.2%) respondents. Regarding their desired career, 381 (86.8%) expressed wanting to work as a nurse in a hospital immediately after graduation. Five years after graduation, only 122 (27.8%) participants wanted to work as nurses in hospitals (Table 1).

Correlation among variables, normality, and multicollinearity

The results of the Pearson correlation analysis showed a significant relationship between career decisions and career decision-making self-efficacy ($r = .67, p < .001$), satisfaction with the nursing major ($r = .57, p < .001$), nursing competence ($r = .56, p < .001$), learning environment ($r = .51, p < .001$), and career outcome expectation ($r = .49, p < .001$) (Table 2). The skewness of the variables was below 2 (range: -0.59 – 0.13), and the kurtosis below 7 (range: -0.37 – 0.94), satisfying the assumption of normality [54]. The VIF was below 10 (range: 1.89 – 2.67), and the tolerance was above 0.10 (range: 0.38 – 0.53), confirming the absence of multicollinearity.

Table 1 Participants' General Characteristics (N = 439).

Characteristics	Categories	n (%) or M \pm SD
Gender	Women	387 (88.2)
	Men	52 (11.8)
Age (in years)		22.34 \pm 2.19
Grade	Junior (3rd)	183 (41.7)
	Senior (4th)	256 (58.3)
Second bachelor's degree	Yes	35 (8.0)
	No	404 (92.0)
Double/minor degree	Double degree	12 (2.7)
	Minor degree	5 (1.1)
	None	422 (96.2)
Academic achievement	Upper (≥ 4.0)	174 (39.6)
	Middle ($\geq 3.0, < 4.0$)	252 (57.4)
	Lower (< 3.0)	13 (3.0)
Motivation for major selection	Interest and aptitude	177 (40.3)
	Employment rate	150 (34.2)
	Recommendation of others	42 (9.6)
	According to grade	36 (8.2)
	Influence of relatives who are nurses	26 (5.9)
Desired career fields	Field of license application	8 (1.8)
	Nursing	424 (96.6)
	None nursing	15 (3.4)
Desired job immediately after graduation	Hospital nurse	381 (86.8)
	Others	58 (13.2)
Desired job five years after graduation	Hospital nurse	122 (27.8)
	Others	317 (72.2)
Role model	Yes	203 (46.2)
	No	236 (53.8)
Frequency of career conversation with parents	Usually	284 (64.7)
	Sometimes	114 (26.0)
	Rarely	41 (9.3)
Family economic status	> Average	105 (23.9)
	Average	281 (64.0)
	< Average	53 (12.1)
University Institution type	Private	427 (97.3)
	National, public	12 (2.7)
Influence of pandemic on career decision	Yes	108 (24.6)
	No	331 (75.4)
Career-related program	Yes	269 (61.3)
	No	170 (38.7)
Club	Yes	347 (79.0)
	No	92 (21.0)
Internship	Yes	55 (12.5)
	No	384 (87.5)
Mentoring	Yes	138 (31.4)
	No	301 (68.6)

M = mean; SD = standard deviation.

Table 2 Correlations Between Variables (N = 439).

Variables	1	2	3	4	5	6
	r	r	r	r	r	r
1. Career decision	1					
2. Career outcome expectation	0.491**	1				
3. Career decision-making self-efficacy	0.666**	0.602**	1			
4. Nursing competence	0.561**	0.634**	0.737**	1		
5. Learning environment	0.506**	0.526**	0.624**	0.583**	1	
6. Satisfaction with the nursing major	0.573**	0.566**	0.644**	0.624**	0.717**	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Path analysis

The hypothesized model showed acceptable model fit indices: $\chi^2 = 56.55$, $p < .001$, degree of freedom = 3, GFI = 0.96, SRMR = 0.04, CFI = 0.97, and NFI = 0.96. The recommendation when evaluating the fit of models with a low degree of freedom is that the root mean square error of approximation is unsuitable [55] and that it is better to consider SRMR and CFI [56]. The degree of freedom of this model was low at 3, and thus, the fit indices of SRMR and CFI were used; their values showed that the model met the criteria for a good fit. Thus, this hypothesized model fits the data well.

According to the path analysis results, all nine paths of the hypothesized model were statistically supported, and no modifications to the proposed model were required. The explanatory power of the variables affecting career decisions was 46.0%, with 61.6% for career decision-making self-efficacy and 42.3% for career outcome expectation (Figure 1).

The bootstrap method obtained level values for 2,000 samples with a 95% confidence level. The path coefficients for the hypothesized model were all statistically significant ($p < .05$) (Table 3). Path analysis showed that career decision was directly influenced by career decision-making self-efficacy ($\beta = 0.52$, $p < .001$), career outcome expectation ($\beta = 0.11$, $p = .041$), and

nursing competence ($\beta = 0.11$, $p = .046$). Career outcome expectation was directly influenced by career decision-making self-efficacy ($\beta = 0.37$, $p < .001$), satisfaction with the nursing major ($\beta = 0.24$, $p < .001$), and learning environment ($\beta = 0.12$, $p = .043$). Career decision-making self-efficacy was directly influenced by nursing competence ($\beta = 0.51$, $p < .001$), learning environment ($\beta = 0.19$, $p < .001$), and satisfaction with the nursing major ($\beta = 0.19$, $p = .002$).

To test the significance of each pathway's indirect effects, multiple mediation effects were identified using phantom variables (Table 4). The multiple mediation effects of career decision-making self-efficacy and career outcome expectation were significant in the relationship between the exogenous variables and career decisions. Nursing competence ($\beta = 0.29$, $p < .001$), satisfaction with the nursing major ($\beta = 0.13$, $p < .001$), and the learning environment ($\beta = 0.12$, $p < .001$) indirectly influenced career decisions by the mediation of career decision-making self-efficacy and career outcome expectation. Nursing competence directly influenced career decisions and also indirectly impacted career decision-making by mediating career decision-making self-efficacy and career outcome expectation.

Discussion

This study aimed to identify predictors of career decisions among nursing students based on Lent and Brown's [13] social cognitive model of career self-management and other previous studies. The results supported all the hypothesized paths in the proposed model. This study found that career outcome expectation, career decision-making self-efficacy, nursing competence, learning environment, and satisfaction with the nursing major exert both direct and indirect influences on the level of career decision-making. The result of the study is distinct from that of previous studies in that it shows an integrated analysis to understand the career decision-making processes of nursing students.

Among the variables that directly affected career decisions, career decision-making self-efficacy had the most significant effect. This result is similar to that of studies in which nursing students' career decision-making self-efficacy scores were a

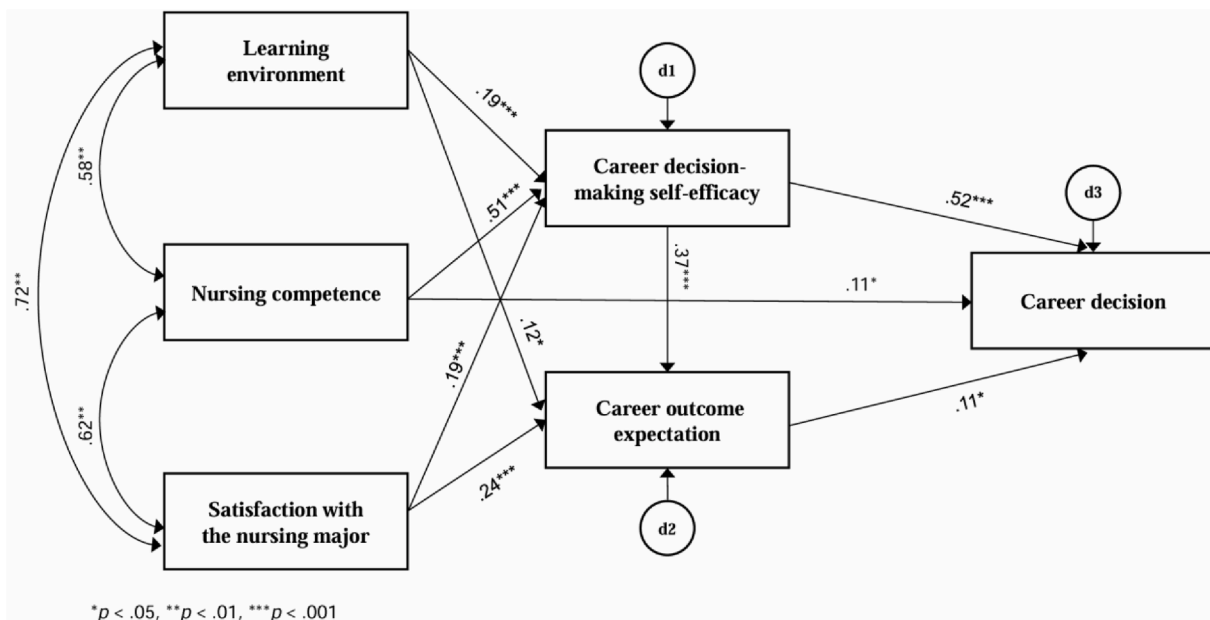


Figure 1. Standardized coefficients of the hypothesized model.

Table 3 Effects of the Hypothesized Model ($N = 439$).

Endogenous variable	Exogenous variable	Direct effect	Indirect effect	Total effect	SMC
		β (p)	β (p)	β (p)	
Career decision	Nursing competence	0.11 (.046)	0.29 (.001)	0.39 (.001)	0.46
	Career outcome expectation	0.11 (.041)	-	0.11 (.041)	
	Career decision-making self-efficacy	0.52 (.001)	0.04 (.041)	0.56 (.001)	
	Satisfaction with the nursing major	-	0.13 (.001)	0.13 (.001)	
	Learning environment	-	0.12 (.001)	0.12 (.001)	
Career outcome expectation	Learning environment	0.12 (.043)	0.07 (.001)	0.2 (.001)	0.42
	Satisfaction with the nursing major	0.24 (.001)	0.07 (.002)	0.31 (.001)	
	Nursing competence	-	0.19 (.001)	0.19 (.001)	
	Career decision-making self-efficacy	0.37 (.001)	-	0.37 (.001)	
	Learning environment	0.19 (.001)	-	0.19 (.001)	
Career decision-making self-efficacy	Nursing competence	0.51 (.001)	-	0.60 (.001)	0.62
	Satisfaction with the nursing major	0.19 (.002)	-	0.19 (.002)	
	Learning environment	-	-	-	

SMC = squared multiple correlations.

Table 4 Multiple Mediation Effects of the Hypothesized Model by Phantom Variables ($N = 439$).

Effect	Categories	B	β	SE	p
Direct effect	NC → CD	0.12	0.18	0.30	.046
Indirect effect	NC → CDMSE → CD	0.31	0.26	0.01	.001
	NC → CDMSE → COE → CD	0.02	0.02	0.28	.031
Total effect	NC → CD	0.45	0.39	0.05	.001
Direct effect	-	-	-	-	-
Indirect effect	LE → COE → CD	0.01	0.01	0.28	.044
	LE → CDMSE → CD	0.11	0.10	0.01	.001
	LE → CDMSE → COE → CD	0.01	0.01	0.28	.024
Total effect	LE → CD	0.13	0.12	0.03	.001
Direct effect	-	-	-	-	-
Indirect effect	SNM → CDMSE → CD	0.09	0.10	0.01	.001
	SNM → CDMSE → COE → CD	0.01	0.01	0.28	.020
	SNM → COE → CD	0.03	0.03	0.28	.029
Total effect	SNM → CD	0.13	0.13	0.03	.001

CD = career decision; CDMSE = career decision-making self-efficacy; COE = career outcome expectation; LE = learning environment; NC = nursing competence; SNM = satisfaction with the nursing major; SE = Standard Error.

significant predictor of career decisions and were reported as the most explanatory variable [21,57,58]. In addition, the results showing that self-efficacy directly and indirectly affect career decisions were consistent with those of previous studies [15,22,59]. Career decision-making self-efficacy predicts the role of nursing students as future professional nurses and is an essential factor in career choice [21,60]. Cho's [61] study showed that enhancing student self-management through a student-led career planning program effectively improved career decision-making self-efficacy and career decisions. Therefore, it is necessary to encourage students to proactively plan their careers and strengthen self-management to enhance their career decision-making self-efficacy. Providing detailed career information on various nursing specialties, including career opportunities and pathways, can enhance career decision-making self-efficacy [5]. Continuous attention and effort from educators are necessary to provide students with career counseling opportunities with mentors and to help them recognize their strengths, limitations, and career-related needs [7].

Career outcome expectation was found to have a direct effect on career decision. This result is consistent with previous studies [2,22]. Career decision-making self-efficacy and career outcome expectation mediated the relationships between the exogenous variables (nursing competence, learning environment, and satisfaction with the nursing major) and career decisions. These findings are consistent with those of several studies showing the important mediating effect of career decision-making self-efficacy

on career decisions [15,22,59]. In nursing education, it is necessary to find ways to promote career decisions by necessary by considering the relationships between the cognitive characteristics (career outcome expectation, career decision-making self-efficacy) and the endogenous variables in our study model.

Nursing competence had a direct effect on career decisions and an indirect effect through mediated career decision-making self-efficacy and career outcome expectation. The results of this study show that nursing competence during college significantly impacts future career choices. This finding is consistent with the results of prior studies showing that clinical competence influences career decision through career decision-making self-efficacy [58]. Students' competence is considered an important factor in determining their careers [34,62]. Therefore, exploring career education curricula that link nursing competencies with career education is necessary. Integrated career courses and competency-based customized career guidance programs that consider the components of nursing competencies should be implemented [61]. In addition, educational institutions should structure educational programs and ensure the integration of nursing education with clinical practice to enhance nursing students' competencies [32]. Clinical mentoring and preceptorship programs should be implemented to enhance nursing students' professional knowledge and competencies [32]. Recently, the skills of nursing graduates have been in demand in various practical fields, such as hospital nursing, public health nursing, and pharmaceutical nursing, and further research is needed to examine the relationship between nursing competence and career outcomes.

The learning environment indirectly influenced career decisions by mediating between career decision-making self-efficacy and career outcome expectation. These results are similar to those of previous studies that show that the learning environment indirectly influences career decisions by mediating grit [63] and that it influences career design competency by mediating career decision-making self-efficacy and career outcome expectation [64]. This finding is also in line with previous studies reporting that the learning environment influences nursing students' intention to pursue employment as nurses after graduation [26,27]. Nursing education institutions should pay attention to students' perceptions of the learning environment and continuously improve its quality [65]. Positive perceptions of the clinical learning environment increase trust and respect for professors, practice managers, and mentors and influence students' future intentions to work as nurses by establishing satisfactory relationships with them [27]. Learning occurs through interactions, and psychologically safe learning environments are formed based on trust and belief in the educators [65]. Therefore, it is necessary

to establish positive relationships with professors and conduct programs or extracurricular activities where students can share their learning experiences and provide feedback to their peers. Previous studies have focused primarily on the clinical practice environment of nursing students. However, attention to the physical environment of nursing colleges and convenience of school facilities is also necessary. Further studies are required to improve the overall experience and learning environment of college life for nursing students.

Satisfaction with the nursing major indirectly influenced career decisions by mediating between career decision-making self-efficacy and career outcome expectation. This finding is supported by a previous study reporting that satisfaction with the nursing major influences nursing students' career decisions [30,35,66]. Nursing students' perceptions of empowerment are effective in enhancing satisfaction with the nursing major [67]. Fostering a supportive educational environment and maintaining continuous engagement from educators is necessary to improve students' career decision-making.

A career is not a temporary choice but a continuous development throughout an individual's life [1]. Nursing students need to strategize their career path and make important professional career decisions [5]. Nursing students' career paths do not end with graduation and should be open to modification and adaptation based on individual aptitude, interest, and environmental circumstances. It is thus necessary to provide nursing students with career education to empower them to continue to manage their careers not only during their college years but also in their nursing practice after graduation.

Limitations and recommendations

This study has some limitations. First, it only included junior and senior nursing students at four-year general universities in a metropolitan area of South Korea. It did not include students from rural areas or colleges. Therefore, the generalizability of the findings may be limited. Second, to investigate the causal relationships of nursing students' career decisions with various other associated variables, data were collected cross-sectionally and analyzed using the path analysis method; thus, we could not explore antecedent relationships or longitudinal changes for each variable. Third, a structured questionnaire may not adequately reflect an in-depth understanding of nursing students' career decision-making processes. Finally, the study considered a variety of variables, including the learning environment and satisfaction with the major. Still, it did not include additional factors such as external economic conditions or changes in personal life.

Future research should include a longitudinal study to determine changes in nursing students' career choices over time, including changes by year of study and follow-up after graduation. It should also adopt a mixed methods approach with a qualitative component, focusing on tool development to reflect nursing students' career characteristics. Furthermore, subsequent studies should consider the core components of the career self-management model to organize career education programs and courses for nursing students and evaluate their effectiveness.

Conclusion

In conclusion, this study showed the direct and indirect relationships between nursing students' career decisions with career decision-making self-efficacy, career outcome expectation, nursing competence, satisfaction with the nursing major, and the learning environment. In particular, career decision-making self-efficacy and nursing competence were directly and indirectly

enhanced and were shown to have the strongest influence on nursing students' career decisions. The learning environment, nursing competence, and satisfaction with the nursing major influenced career decisions by mediating career decision-making self-efficacy and career outcome expectation.

The proposed model can help develop strategies to improve nursing students' career decision-making levels. We recommend creating an individualized, competence-based career education plan considering the relationship between core nursing competencies and career decision-making self-efficacy. Nursing educators and institutions can use the proposed model in the design and creation of career education guidelines, programs, and courses tailored to nursing students, empowering these students to effectively manage their careers.

Ethical statement

This study was approved by the Institutional Review Board of Yonsei University (IRB No. 4-2023-0332).

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Conflict of interest

The authors declare no conflict of interest.

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